CLIENT NAME	GBP Australia Pty Ltd
PROJECT DESCRIPTION	EPA VIC – Section 22 Response
LOCATION	Gardner Lane, Poowong, Victoria
PROJECT NUMBER	W14269F
DATE	25 April 2016

DATE	REVISION #	COMMENT	AUTHOR
25 February 2016	Rev 01	Initial	Peter Gilbertson
01 March 2016	Rev 02	Revised	Peter Gilbertson
08 March 2016	Rev 03	Summary included	Peter Gilbertson
24 March 2016	Rev 04	EIP & CLC included	Peter Gilbertson
14 April 2016	Rev 05	EIP & CLC included	Peter Gilbertson
25 April 2016	Rev 06	EIP updated	Peter Gilbertson

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1 SUMMARY

1.1 EPA Victoria Section 22 Notice

EPA Victoria issued a Section 22 notice on 20th November 2015 which required GBP Australia to:

Attachment

1. Submit a wastewater management master plan which must include the following:
   a. details of the selected option to upgrade the wastewater treatment system and associated facilities.
   b. the design information, including design criteria and timeline for upgrading the wastewater treatment system and associated facilities;
   c. confirming capacity and configuration of the primary treatment system (pumps, tanks, screens etc.) and key items of plant;
   d. confirming wastewater generation of 27 kL/day from the proposed rendering plant;
   e. confirming effluent flows and loads pumped to the effluent holding lagoons;
   f. confirming size and capacity of irrigation storages and irrigable land;
   g. confirming pond and lagoons lining configuration and condition;
   h. establishing average and 90th percentile monthly rainfall and evaporation based on long term meteorological data for the area;
   i. water and nutrient (N, P, K) balance budgets for the site in accordance with EPA water balance model, and check organic and salinity loadings to establish limiting inputs;
   j. establishing sustainable long-term effluent application rates (i.e. ML/ha.yr) in accordance with EPA Publication 464.2 *Guidelines for Environmental Management: Use of Reclaimed Water* for the average and 90th percentile wet year cases.
   k. the assessment of the need for constructing cut-off drains around the perimeter of the irrigation area.

2. Submit an environmental improvement plan (EIP). The EIP must be prepared in accordance with EPA Publication 464.2, *Guidelines for Environmental Management: Use of Reclaimed Water*. It must include the details of the on-going water monitoring program for the wastewater treatment system and soil and groundwater monitoring for the re-use of the irrigation area.

3. Establish a community liaison committee (CLC) and evidence of engaging the CLC about 1 and 2.

4. Provide the design of first flush system for the raw material bin and finished product load out areas.

5. Provide the roof design for the solid area.

To provide expert advice for the response to the Section 22 Notice, Wiley engaged CEE Consulting Engineers (*CEE*) to provide a Report on the Wastewater Management Existing Conditions Assessment and Master Plan. This Report is included in Appendix 1 of this response.

The summary response to the Section 22 Notice is provided in Section 2 below, with the relevant items from the Notice highlighted in orange.

2 EPA VICTORIA SECTION 22 NOTICE: SUMMARY RESPONSE

1. Submit a Waste Water Management Master Plan

As noted above this is shown in *Appendix 2. – CEE Report of April 2016 GBP Australia Pty Ltd Poowong Export Abattoir: Environmental Improvement Plan for Recycled Water Use on Farm*, as noted below.

Description Of Wastewater System

- Wastewater Treatment
  - Overview
  - Major Process Steps and Facilities
  - Estimation of Lagoon Capacities
  - Current Operation
- Effluent Reuse
  - Overview
  - Farm Site Description
  - Major Facilities
  - Current Operation

Wastewater Flows And Loads

- Wastewater Flows
- Screened Wastewater Characteristics and Loads

Assessment of Existing Wastewater Treatment Facilities and Performance

- Summary of 2015 Wastewater Monitoring and Performance
  - Fan Screw Press (Inlet Screen)
  - Anaerobic Lagoons
  - Aerobic Lagoon
  - Holding Lagoon

Assessment of Existing Effluent Storage and Irrigation Facilities

- Effluent Storages
- Irrigation Land Available
- Pasture Assessment
- Land Capability Assessment
- Effluent Application Rates
- Water Balance
- Effluent Quality and Loads
- Soils Assessment
- Conclusion

Impact of Rendering Wastes on Wastewater Treatment Plant Performance and Effluent Reuse

Recommended Wastewater Management Upgrade Plan

- Wastewater
- Anaerobic Lagoons
- Aerated Lagoon
- Winter Storage
- Effluent Reuse
- Increase area irrigated
- Increase phosphorus removal from irrigated areas and minor sodicity realignment on small area
- Annual

TABLE 1 : EIP COMMITMENTS

No.	Commitment description	Timeline	How
1	Upgrade the abattoir wastewater treatment plant to achieve Class C recycled water quality (including chlorination if required) and to improved performance, reduced odour emissions and risks	Dec 2016	Refer all commitments in Section 6.1 and Wastewater Management Plan (CEE 2016)
2	Increase area irrigated by approximately 23 ha up to 78 ha (Plot 8 - Northern hay paddock)	Dec 2016	Extend effluent supply pipeline to new hydrants
3	Improve pasture to achieve a higher level of productivity overall on the property	April 2016 to June 2019	Refer Sections 62.2 and 6.2.3 and An Agricultural Consultant is to be engaged to provide ongoing advice and supervision of pasture improvement plan as per EIP
4	Increase phosphorus removal from irrigation areas to achieve an effective phosphorus balance	April 2016 to June 2019	Engage Agricultural Consultant to provide ongoing advice and supervision as per EIP (refer section 6.2.2)
5	Add gypsum to top hill paddock to address and correct high sodicity issue	Sept 2016	Engage Agricultural Consultant to provide ongoing advice and supervision as per EIP (refer section 6.2.6)
6	Adhere to buffer distances between irrigation areas, water courses and sensitive receptors	Current	Limit areas irrigated to designated zones (refer section 6)
7	Undertake all monitoring as detailed in the EIP	Ongoing to next EIP review	Refer EIP Section 7
8	Review EIP at least once every three years	Sep 2019	Review EIP and auditing in June 2019 (refer section 7)
9	Provide and maintain fences and warning signs	June 2016	Install warning signs (note purchased) (refer section 6.12)
10	Operate and maintain the recycled water storages in accordance with regulatory requirements	Current	Monitor effluent level and ensure freeboard of at least 300 mm
11	Recommission the existing bore at bottom hill below wastewater treatment plant and install a second monitoring bore to monitoring groundwater in centre of farm	Sept 2016 to Mar 2017	Engage contractor to recommission existing bore and install new bore (refer section 6.7)
12	Providing rain gauge that automatically switches off the irrigation pumps if a manually pre-set rainfall event is exceeded.	Sep 2016	Engage contractor to provide, install and commission (refer section 6.6)
13	Install an anemometer at an approved location and fitted with a manually adjustable wind speed and direction switch to automatically stop irrigation when wind speed exceeds a present wind speed and/or the wind is blowing in a particular direction.	Dec 2016	Engage contractor to provide, install and commission (refer section 6.6)
14	Notify EPA prior to emergency overflow events from recycled water storages	Current	Monitor effluent flows and storage levels monthly
15	Immunise on-site workers against water-borne illnesses.	Sept 2016	Workers to visit doctor (refer section 6.11)
16	Provide on-site workers with appropriate protective equipment to minimise inhalation and skin contact with recycled water aerosols.	Current	Provide and maintain relevant equipment doctor (refer section 6.11)
17	Provide measures to ensure workers do not consume food and drink while working directly with recycled water.	Current	Induction of workers doctor (refer section 6.11)
18	Samples of recycled water are to be obtained, preserved and analysed in accordance with A Guide to the Sampling and Analysis of Water, Wastewaters, Soils and Wastes (EPA Victoria, 1991 Publication 168).	Current	As per guidelines (refer section 7)

No.	Commitment description	Timeline	How
19	EPA is to be immediately notified of issues with non-compliant water.	Current	Review all monitoring data by quality manager
20	Prepare operating manuals and procedures for the wastewater treatment plant and the farm, including recycled water application. Update with EIP review	December 2016	Engage contractor to assist in preparation (refer section 6.10)
21	Prepare and maintain irrigation operation log	December 2016	Engage contractor to assist in preparation (refer section 7)
22	Emergency or incident reports (noncompliance with the objectives) will be submitted in writing to the appropriate regulatory agency as soon as practicable.	Current	As per requirements
23	Records of all monitoring results and analyses to demonstrate compliance with the Guidelines to be kept for at least ten years.	Current	All data is kept onsite in Quality managers office (refer section 7.6)
24	Records of all inspection and maintenance programs will be kept on site.	Current	All data is kept onsite in Quality managers office (refer section 7.6)
25	Provide an undertaking that the audit program for the scheme will comply with the principles in ISO 14010's Guidelines for Environmental Auditing.	Jun 2017	As per guidelines (refer section 7.6)
26	An appropriately qualified independent auditor or internal expert will undertake annual audits	Jun 2017	Appoint qualified contractor to undertake annual audit at end of each irrigation season (refer section 7.6)

3. Community Liaison Committee (CLC)

GBP have undertaken to engage with the local community and establish a Community Liaison Committee. The committee will meet to consider areas addressed in the Section 22 Notice and summarised in this response, as well as consider matters relating to the CLC's Terms of Reference.

A facilitator has been engaged and the following timeline is in place:

- Tuesday 5th April 2016 - preparation meeting with representatives from the community and a facilitator provided by the South Gippsland Shire Council. EPA VIC was invited to this meeting. The minutes of this meeting are provided in Appendix 1.
- The next meeting will be held AFTER the publication of this Response on the EPA VIC public access website. The main agenda item will be to address this Response to the EPA VIC Section 22 notice. Consultants to GBP and EPA VIC have undertaken to attend this meeting.
- Minutes will be distributed as soon as possible after this meeting.

GBP are committed to ensure this process is carried out to improve understanding and relationship with the local community.

4. Design of First Flush system

Need for First Flush Facilities

Pollutants deposited on to uncovered process areas can be dislodged and entrained in rainfall runoff. Usually the stormwater that initially runs off an area will be more polluted than the stormwater that runs off later, after the rainfall has 'cleansed' the catchment (i.e. uncovered process area). The stormwater containing this high initial pollutant load is called the 'first flush'.

First flush collection systems are employed to capture and isolate this most polluted runoff, with subsequent runoff being diverted directly to the stormwater system.

Uncovered Areas

The following uncovered areas, associated with the proposed rendering plant, have been identified to require first flush facilities:

- Raw material hopper bund (6.5 m x 5.0 m = 33 m^2)
- Tallow truck loading bay (20.0 m x 5.5 m = 110 m^2)

The total area of these two impervious and bunded areas is 143 m^2.

Preferred Options

The following two options are preferred for the management of all wash water and rainwater runoff from designated uncovered process areas:

- Option 1 – Direct discharge to the existing abattoir collection and treatment system
- Option 2 – Install approved propriety first flush diversion system on the drainage lines from both designated areas

Option 1 – Direct discharge to the existing abattoir collection and treatment system

The major components and features are:

1. Collection pit with removable strainer at low point in each bunded area.
2. Individual drain lines to direct all screened wash water and rainwater runoff to the existing wastewater collection system for treatment in the existing facilities.
3. Estimated total annual volume of waste discharged to existing wastewater system approximately 140 kL/yr, which is equivalent to a very minor increase in total wastewater flow of 0.12 per cent.
4. Gravity discharge with no pumping or electrically operated valves.
5. No discharge to stormwater.

Option 2 – Install approved propriety first flush diversion system on the drainage lines from both designated areas (e.g. Cleanawater)

The major components and features are:

1. Collection pit with removable strainer at low point in each bunded area.
2. Individual drain lines to direct all screened wash water and rainwater runoff to a common pit fitted with automatic electrically operated diversion valve (triggered by rainfall).
3. The diversion valve is open during normal (i.e. dry weather) operation. All wash water drains (by gravity) to the existing wastewater system (as for Option 1).
4. The diversion valve closes automatically after 10 mm or programmed amount of rainfall falls on the designated areas. All subsequent 'clean runoff overflows the collection pit to the existing stormwater system.

5. Provide the Roof Design for the Solids Area

As noted in the CEE report Section 5 and Figure #5.2, the solids collection area already has a roof installed over the storage area, see below:

GBP installed this as part of their ongoing commitment to improving the performance of the existing waste handling systems.

Appendix I – CEE Engineers Waste Water Report: April 2016

As attached.

GBP Australia Pty Ltd
Poowong Exports Abattoir

Wastewater Management

Existing Conditions Assessment and Master Plan

14 April 2016

CEE

GBP Australia Pty Ltd

Poowong Exports Abattoir
Wastewater Management
Existing Conditions Assessment and Master Plan

Prepared for:

Wiley & Co Pty Ltd
on behalf of
GBP Australia Pty Ltd
286 Maribyrnong Road
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Document History and Status

Version	Date	Status/Comment	Originator	Project Manager	Reviewer
V1	Feb 16	Draft	JLA/TP	JLA	
V2	24 Mar 16	Revised draft	JLA/TP	JLA	BS/PG
V3	14 Apr 16	Revised draft to EPA for review	JLA/TP	JLA	BS/PG

Report Limitations

This report constitutes the professional opinion and judgment of Consulting Environmental Engineers. It has been prepared in accordance with an agreement between *CEE* and the Organisation to whom this report is addressed. The services performed by *CEE* have been conducted in a manner consistent with the level of quality and skill generally exercised by members of its profession and consulting practices.

This report is prepared solely for the use of the person or organisation for which this report is addressed and in accordance with the terms of engagement for the commission. Any reliance of this report by third parties shall be at such party's sole risk. The report may not contain sufficient information for the purposes of other parties or for other uses. This report shall only be presented in full and shall not be used to support any other objectives than those set out in the report, except where written approval is provided by *CEE*

Contents

1 Introduction

1.1 Background

GBP Australia Pty Ltd own and operate an export abattoir located in Gardner Lane, Poowong. Wastewater generated is treated anaerobically and aerobically on-site prior to winter storage and effluent irrigation in summer on the associated farm.

The abattoir has a process capacity of 250 to 480 cattle per day, depending on carcass weight. The site operations include the following: holding pens, slaughter floor, offal processing, boning and packing rooms, paunch handling, and chilling and freezer rooms.

In May 2015, CEE undertook a preliminary review the Poowong abattoir wastewater treatment system to provide input the EPA Works Approval Application (WAA) for the proposed rendering facility.

The two primary goals of this CEE consultancy were to assess the potential odour impacts from the proposed rendering operations and to undertake a preliminary assessment of the wastewater treatment system and identify and discuss measures to mitigate any impacts that may potentially cause environmental nuisance or environmental harm.

The CEE report (23 July 2015) identified a number of potentially suitable options to improve the wastewater treatment performance, process reliability and odour emissions for the existing anaerobic, aerobic and holding lagoons.

The application for EPA Works Approval (No. 1001995) was submitted on 31 July 2015. Subsequently, EPA have requested that additional information is required to be supplied and actions taken before the Works Approval will be issued, including:

1. Wastewater management master plan
2. Environmental improvement plan (EIP)
3. Establish a community liaison committee (CLC) and evidence of engaging the CLC about items 1 and 2
4. Provide design of first flush system for the raw material bin and finished product load out areas
5. Provide roof design for the solids area.

Wiley & Co Pty Ltd on behalf of GBP Australia Pty Ltd (GBP) engaged CEE Pty Ltd, Consulting Environmental Engineers and Scientists (CEE), in December 2016 to undertake items 1 to 4 above.

1.2 Objectives of Consultancy

The objectives of this consultancy were to assess the performance and capacity of the existing wastewater treatment and effluent reuse facilities and operations, and to develop and describe the wastewater management master plan for future operations.

1.3 Scope of Work

The scope of work involved the following tasks:

1. Site inspection of abattoir site and associated wastewater treatment and effluent reuse systems
2. Review of available information and identify gaps in required information and data
3. Undertake wastewater sampling and monitoring program to confirm present and projected future wastewater flows and loads
4. Confirm configuration, sizing and suitability of the various treatment processes and facilities
5. Establish flows and loads pumped to the effluent storage lagoons
6. Confirm size and capacity of irrigation storages
7. Undertake soil sampling and testing of effluent irrigation areas and associated land capability assessment
8. Determine irrigation area available for effluent reuse, with appropriate allowances for buffer distances to watercourses and property boundaries and slope, soil and groundwater limitations
9. Establishing average and 90th percentile monthly rainfall and evaporation based on long term meteorological data for the region
10. Undertake water and nutrient balance budgets for the site in accordance with EPA water balance model
11. Establish sustainable long-term effluent application rates (i.e. ML/ha.yr) in accordance with EPA Publication 464.2 Guidelines for Environmental Management: Use of Reclaimed Water for the average and 90th percentile wet year cases
12. Prepare existing conditions assessment of facilities and operation of the wastewater treatment and effluent reuse facilities, including land capability assessment, site issues, constraints and opportunities (Existing Conditions Report)
13. Develop and prepare wastewater management master plan for future operations

2 Current Abattoir Production and Water Use

2.1 Abattoir Production

The current average daily production is 395 cattle per day, based on the 2014/15 annual throughput of about 95,000 cattle and 240 production days per year. The average daily hot standard carcass weight (HSCW) produced is estimated to be 99 t HSCW/d, based on an average weight of 250 kg/carcass.

2.2 Water Consumption

The current average daily water consumption (on production days) is estimated to be 520 kL/d, based on daily potable water meter readings for the period September 2015 to January 2016. This average value is similar to the average value observed in 2010 of 497 kL/d (ALS 2011 WAA). The estimated current annual water consumption is 125 ML/yr, based on 240 production days.

3 Description of Wastewater System

3.1 Wastewater Treatment

3.1.1 Overview

The existing wastewater treatment system was installed in 1993. It is based on technology developed by the CSIRO and designed by John Green of Australian Meat Technology. The system is designed to remove solids for composting, and biologically remove some nutrients to improve the water quality for irrigation.

3.1.2 Major Process Steps and Facilities

- Coarse screen to remove trash and large solids
- Flow attenuation tank
- Two screw presses (duty/standby) to remove paunch manure and fine solids for composting
- Two anaerobic lagoons (in series) to remove organics and stabilise settled solids
- Mechanically aerated lagoon, operated as sequencing batch reactor to remove organics and some nitrogen
- Effluent holding lagoon prior to reuse as cattle stockyard washwater or pumping to three winter storages.

Figure 3-1 shows an aerial view of the abattoir and wastewater treatment plant site and Figure 3-1 shows a simplified process flow sheet of the wastewater treatment and reuse system.

The leading surface dimensions (i.e. length and width) of most of the treatment lagoons were directly measured using a walker travel wheel (provided by GBP), including anaerobic lagoon 2, aerobic lagoon and the holding lagoon. These leading dimensions were also determined using Google Earth and found to be similar (i.e. within 5 % accuracy). The leading surface dimensions of the remaining lagoons were based on Google Earth imagery.

Figure 3-1 Aerial View of Abattoir and Wastewater Treatment Plant Site

(Source Google Earth)

3.1.3 Estimation of Lagoon Capacities

The depth and internal bank slope of the treatment and effluent lagoons were based on:

- Previous reports submitted to EPA (ALS 2011 – Works Approval Application, Ecowise Environmental 2007 – EPA Licence Renewal and Land Capability Assessment).
- Advice from GBP operator
- External height of lagoon embankments
- Observed internal bank slopes and CEE experience with lagoon construction
- Visual inspection and measurement of effluent storages 1 and 2 during drawn down state.

The volume of each lagoon was then estimated using CEE lagoon volume model, which uses the average length and width of the base, internal bank slope, depth to liquid surface and freeboard.

The estimated volume for each lagoon was then given a sensitivity check with varying depths to give an estimated minimum and maximum working volume.

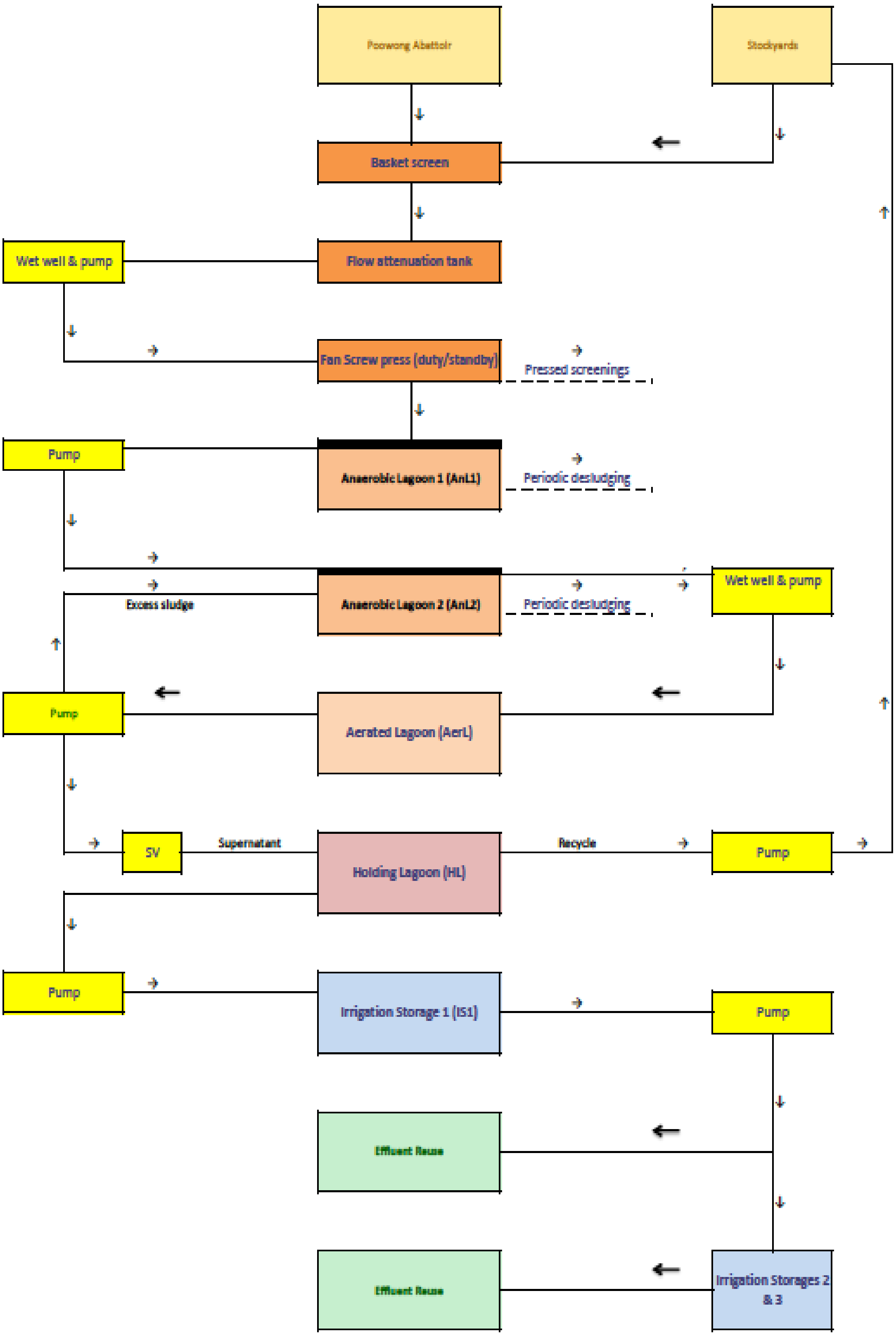


Figure 3-2 Wastewater Treatment and Reuse Process Flow Sheet

3.1.4 Current Operation

The plant generally operates automatically and is normally only attended during working hours of 6 am to 4 pm to check operations, undertake manual sludge transfers as required and undertake routine testing and maintenance. An alarm is raised (red light) when there is an aerator fault.

Normal Operation

Normal operation involves the following:

- All wastewater from the abattoir (including paunch) flows by gravity through the coarse basket screen, through a small flow attenuation tank into a collection sump and then pumped to the duty screw press
- Filtered water from the screw press flows by gravity to the first anaerobic lagoon (AnL1, smaller bottom lagoon)
- The solids removed by the screw press (~ 4 m^3/d) are stockpiled on-site and carted offsite weekly.
- Effluent from the first anaerobic lagoon (AnL1) is pumped on level control to the second anaerobic lagoon (AnL2, larger upper lagoon)
- Effluent from the second anaerobic lagoon (AnL2) is pumped to an intermittently mechanical aerated lagoon (AerL) to achieve biological carbonaceous and partial nitrogen removal. This lagoon is operated automatically in a batch mode involving a sequence of intermittent settling, decant and aeration (with two 11 kW surface aerators operated by timers)
- Supernatant (decant) from AerL is pumped on level control to the holding lagoon (HL) following settling and excess solids are pumped daily back into the second anaerobic lagoon.
- Effluent from the holding lagoon is either reused for cleaning the livestock holding pens or is pumped on level control to the winter storages.

Periodic Operation

Periodically the two anaerobic lagoons and the holding lagoon are desludged. The last desludging was February 2016.

3.2 Effluent Reuse

3.2.1 Overview

Effluent from the abattoir has been reused on the associated farming property for about 40 years.

The primary function of the farming operation is to sustainably reuse the treated wastewater generated by the abattoir and that cannot be economically reused in some other part of the plant.

A secondary function of the farm is to act as a temporary holding and refattening property as an adjunct to the abattoir operation, with high stock numbers being depastured at the property from time to time.

3.2.2 Farm Site Description

The farm has an approximate area of 128 ha, including 30 ha of recently acquired land at the north end of the farm. An estimated 55 ha of the farm is currently developed for irrigation, and an additional 23 ha of the new northern land is considered suitable for irrigation development (i.e. total of 78 ha). Figure 3-3 shows a plan of the Poowong abattoir farm

On the eastern side of the farm (adjacent to Houlahan's Lane) the land consists of several large gently sloping north facing paddocks. On the western side of the farm a ridgeline follows the line of Gardner Lane.

Natural drainage on the site is to the north and northeast (Pheasant Creek and Lang Lang River).

Soils are similar over most of the property and consist of dark brown clay loam at the surface gradually becoming heavier with depth but with ill defined soil horizon boundaries. The soils are moderately deep and merge to weathered rock at about 1.5 m on the gentler slopes, but only persist to about 1.2 metres on steeper parts of the property.

3.2.3 Major Facilities

- Three winter storages with total capacity of 58 ML to 82 ML (refer Section 6)
- Total winter storage capacity 63 ML to 87 ML, including 5 ML in holding lagoon
- Seven existing irrigation paddocks with total irrigable area of 54 ha
- Additional 23 ha of irrigable land (recently purchased but not developed) at north end of farm
- Total potential irrigable land 78 ha
- Run-off collection dam (nominal capacity 0.5 ML
- 150 mm dia rising main header with a series of in-ground hydrant points
- Two hard hose irrigators (travelling gun irrigators) can be coupled to the hydrants

3.2.4 Current Operation

Effluent from the abattoir wastewater treatment plant is pumped to the main winter storage (IST1) located on the southern boundary of the farm and then as required pumped to two other storages to the north.

Irrigation is generally undertaken from October to March using the two travelling irrigators. Irrigation is rotated around the paddocks based on irrigation requirements by regularly changing the hydrants connected, which generally have multiple run alignments. Each hydrant services a number of possible irrigation runs (up to 300 m long) and some of the runs overlap close to the hydrant point.

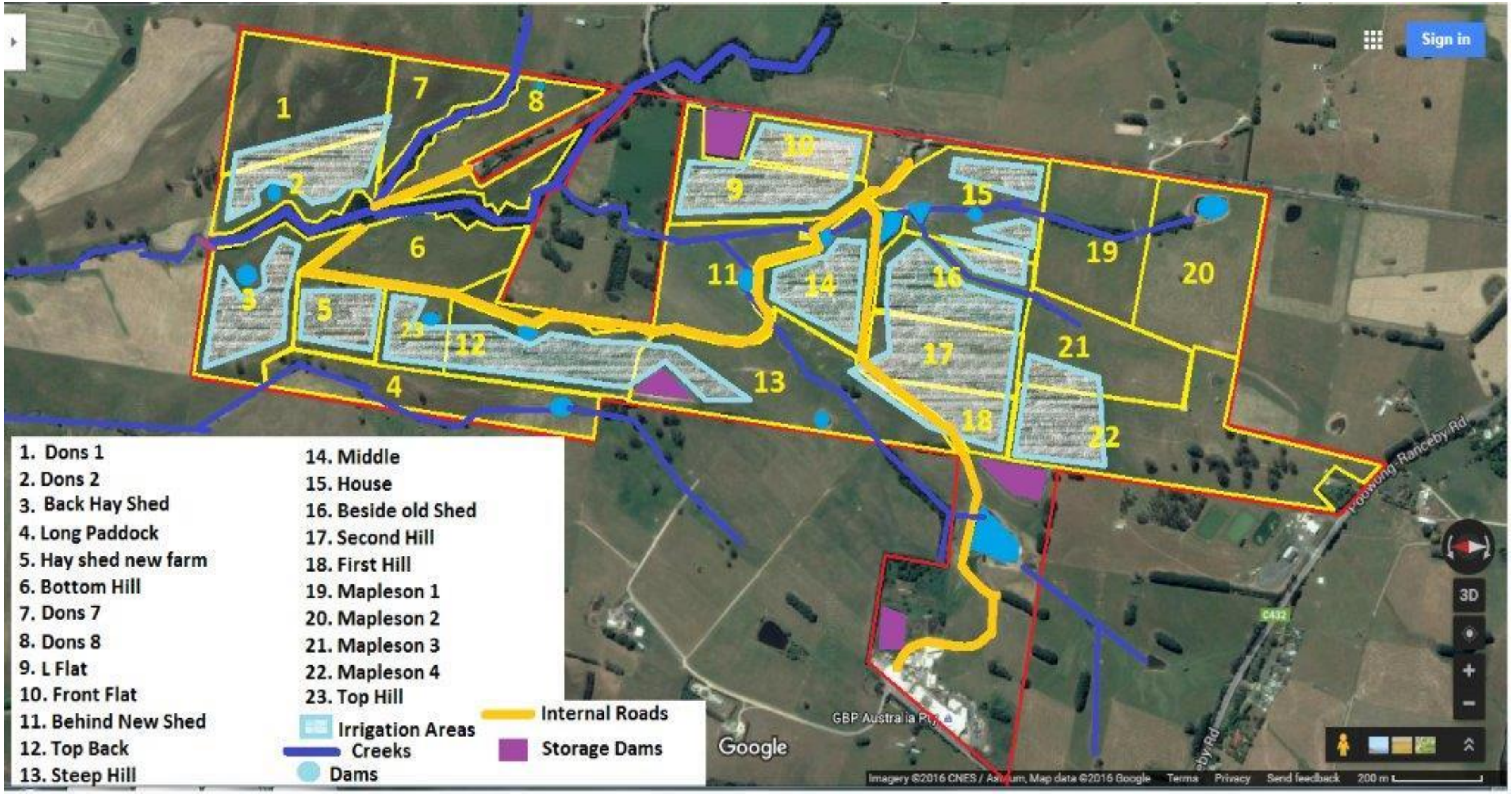


Figure 3-3 Plan of Poowong Abattoir Farm

4 Wastewater Flows and Loads

4.1 Wastewater Flows

The current average daily wastewater flow is estimated to be 484 kL/d, based on the average daily potable water consumption water meter readings of 520 kL/d and on an adopted ratio of wastewater flow to water use of 93% (Reference: Peter Gilbertson 2016 water balance). The estimated current annual wastewater flow is 116 ML/yr. No wastewater flow monitoring data is currently available, although a flow meter is located on the irrigation pump discharge, which is currently being replaces and can be used for future monitoring.

The additional future wastewater flow from the rendering facilities is 27 kL/d (reference: WAA, Wiley 2015).

Table 4-1 summarises the estimated current and projected future wastewater flows.

Table 4-1 Estimated Current and Projected Future Wastewater Flows

Item	Units	Current Abattoir 2015	Proposed Rendering	Future Abattoir & Rendering	% Increase
Daily	kL/d	484	27	511	5%
Weekly	kL/week	2,420	135	2555	
Annual	ML/yr	116	7	123	

4.2 Screened Wastewater Characteristics and Loads

Current wastewater characteristics and loads are based on wastewater monitoring of the screened wastewater stream undertaken at the plant in March and December 2015 (two sampling days), and on CEE's extensive experience with abattoir wastewaters.

Table 4-2 and Table 4-3 summarise the estimated current and projected future screened wastewater characteristics and loads, respectively.

The Tables shows that the addition of rendering wastes to the abattoir wastes will increase the total flow to the treatment plant 6% and the organic load (SS and BOD) 4% to 12%.

Table 4-2 Summary of Estimated Current and Projected Future Screened Wastewater Characteristics

Item	Units	Estimated Current 2015	Proposed Rendering	Projected Future	% increase
BOD total	mg/L	3250	8300	3450	6%
BOD filtered	mg/L	555		590	6%
COD	mg/L	7200		7660	6%
SS	mg/L	3200	4220	3190	0%
Total N	mg/L	275	440	286	4%
Total P	mg/L	54	74	53	-2%

Table 4-3 Summary of Estimated Current and Projected Future Screened Wastewater Loads

Item	Units	Estimated Current 2015	Proposed Rendering	Projected Future	% increase
Flow	kL/d	480	27	507	6%
BOD total	kg/d	1560	224	1750	12%
COD	kg/d	3450		3880	12%
SS	kg/d	1540	114	1610	5%
Total N	kg/d	130	12	140	8%
Total P	kg/d	26	2	27	4%

5 Assessment of Existing Wastewater Treatment Facilities and Performance

5.1 Summary of 2015 Wastewater Monitoring and Performance

Wastewater monitoring of the wastewater treatment plant was undertaken in March and December 2015 to assess plant loads and performance of the various treatment processes. Table 5-1 and Figure 5-1 present a summary of this wastewater monitoring together with historical results for the primary irrigation lagoon (winter storage).

Table 5-1 Summary of Wastewater Monitoring for Treatment Plant (Mar and Dec 2015)

Wastewater Stream / Characteristic		Abattoir waste[1]	Screened effluent[2]	Anaerobic lagoon 1 (AnL1) effluent[2]	Anaerobic lagoon 2 (AnL2) effluent[2]	Aerated lagoon (AerL) effluent (decant)[3]	Holding lagoon (HL) effluent[4]	Irrigation lagoon 1 (IL1)[5]
BOD total	mg/L	3820	3250	1,500	150	94	27	29
BOD filt.	mg/L		555	560	75	43	36	
COD	mg/L	8470	7200	4,400	535	298	180	
SS	mg/L	4570	3200	1,100	160	56	16	35
TKN	mg/L					98	49	46
NOX	mg/L					0.5	5	1.4
Total N	mg/L	310	275	170	160	98	54	47
Total P	mg/L	63	54	43	41	35	32	21
pH								7.8
TDS	mg/L						820	660
Na	mg/L							138
K	mg/L							34
Ca	mg/L							17
Mg	mg/L							10
E. coli	MPN/100 mL							>2400[4]

Notes

1. Estimate based on screened wastewater values and typical fan screw press removals
2. Based on wastewater monitoring on 4 Mar 2015 (grab) and 17 Dec 2015 (composite)
3. Based on wastewater monitoring on 4 Mar and 27 Mar 2015 (grabs) and 17 Dec 2015 (composite)
4. Based on wastewater monitoring on 17 Dec 2015 (single composite)
5. Based on wastewater monitoring on quarterly monitoring Oct 2012 to Dec 2015 (14 grab samples) and 17 Dec 2015 (composite)

A summary of CEE process calculations for the wastewater treatment plant is presented in Attachment B.

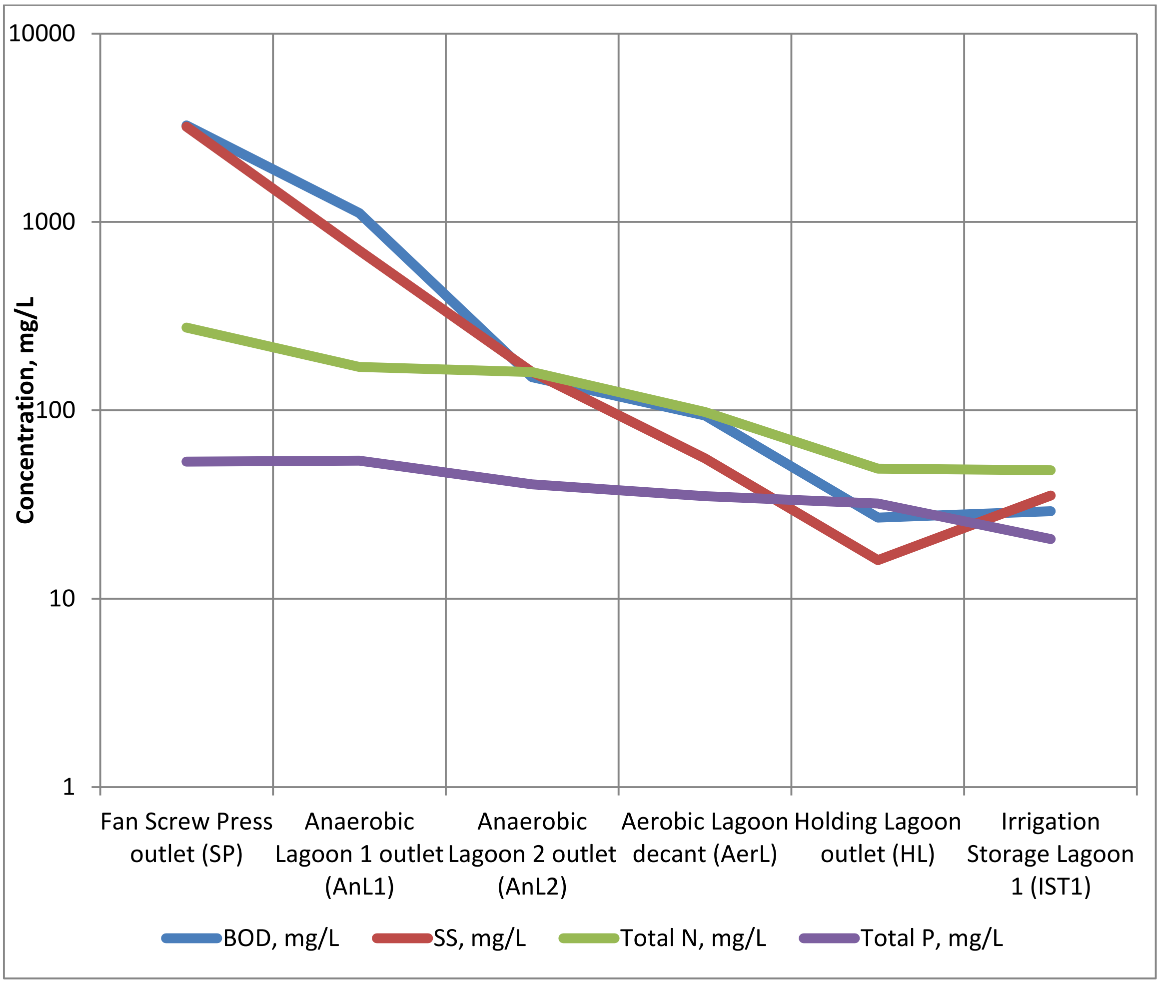


Figure 5-1 Wastewater Treatment Performance 2015

Overall the treatment plant achieves on average the following removal of relevant constituents:

- BOD 99%
- SS 99%
- Total N 84%
- Total P 67%

The plant produces an effluent quality similar to the EPA guidelines for irrigation of Class C water quality of BOD 20 mg/l and SS of 30 mg/L (refer later section).

The assessment of each process step of the wastewater treatment plant is discussed under the following sub-headings:

- Description
- Technology status and applicability
- Capacity
- Condition
- Performance
- Redundancy and Risk

5.2 Fan Screw Press (Inlet Screen)

5.2.1 Description

- Two Fan screw presses (model PSS3 – 520) provide duty and standby equipment to remove paunch manure and fine solids following coarse screening of the abattoir wastes. Each screw press has a diameter of 200 mm, with screen mesh apertures of 0.75 mm and driven by 5.5 kW motor
- Filtered water from the duty screw press flows by gravity to the first anaerobic lagoon (AnL1, smaller bottom lagoon)
- The solids removed by the screw press (~ 4 m^3/d) are stockpiled in a covered enclosure beneath the screw presses and carted offsite weekly for composting.

Figure 5-2 shows photographs of the pre-treatment facilities.

5.2.2 Technology Status and Applicability

- Screw presses are the equipment of choice for the initial treatment in the animal processing industry, for both the 'red' (abattoir) and 'green' (paunch) waste streams.

5.2.3 Capacity

- The capacity of each press is 40 m^3/hr each (source AWE).

5.2.4 Condition

- Both screw presses are relatively new and are in good condition.

5.2.5 Performance

The screw presses are estimated to remove approximately 30% of the solids (SS) load, based on the observed daily removal of ~4 m^3/d (~0.7 t SS/d) of material. This removal rate is in line with industry experience at similar facilities. BOD, Total N and total P removals are expected to be in the range 10% to 15%.

5.2.6 Redundancy and Risk

- Reliable equipment with low risk of malfunction
- Standby unit provided
- Screened material contained within covered enclosure and removed weekly to mitigate odour emissions.

5.2.7 Overall Assessment

- Well suited and sized
- Adequate capacity and standby

- Good performance

Coarse screening and flow attenuation tank.

Anaerobic lagoon 2 and Holding lagoon in background

Screw Press and covered dewatered screenings below

Figure 5-2 Photographs of Wastewater Pre-treatment Facilities

5.3 Anaerobic Lagoons

5.3.1 Description

- Two uncovered lagoons operate in series to provide anaerobic treatment of the screened wastewater
- Table 5-2 summarises the leading size and operating parameters for the two anaerobic lagoons
- Figure 5-3 shows photographs of the anaerobic lagoons
- The surface of each lagoon is covered with a thick layer of dried solids (i.e. crust) that provides a barrier between the liquid contents of the lagoon and the atmosphere which reduces odour emissions. The crust builds up overtime and is partially removed annually with an excavator (i.e. only the top layer of the crust is removed so that the lagoon surface remains covered)
- No mixing is provided
- Solids settling in the lagoons undergo anaerobic digestion (i.e. stabilisation)
- The digested solids are periodically removed as required (i.e. 1 to 3 years) with a mechanical excavator and carted off-site by contractor. The lagoons were cleaned of solids by external contractor on 27th January, 12th February and 1st March 2016 when a total of twenty(20) truck and trailer loads of waste were removed.
- Effluent from the first lagoon (AnL1) is pumped on level control to the second lagoon (AnL2). The discharge into AnL2 is at the surface (odour source)
- Effluent from the second lagoon overflows a baffled control weir into a wet well and gravity flows to the aerobic lagoon (AerL).

Table 5-2 Anaerobic Lagoon Design Data and Loadings

Lagoon/Item	Units	Anaerobic lagoon 1 (AnL1)	Anaerobic lagoon 2 (AnL2)	Comment
Surface area @TWL	m2	644	1806	Based on Google Earth
Depth @ TWL	m	3.2	3.2	GBP
Volume @TWL	ML	1.0	3.9	CEE calculation
Freeboard	mm	300 nom.	300 nom.	
Cover		Dried crust	Dried crust	
Unmixed/Mixed		unmixed	unmixed	
Organic loading	kg COD/ m3.d	2.4	0.4	AnL1 - high, AnL2 - moderate
Hydraulic retention time (HRT) (Avg)	d	3.0	11	AnL1 - low, AnL2 - moderate

Anaerobic Lagoon 1

Surface water dam in valley (centre) and Winter storage on top of hill (centre)

Anaerobic Lagoon 2 Inlet (note above surface discharge which is odourous)

Anaerobic Lagoon 2 Outlet to aerated lagoon

Figure 5-3 Photographs of Anaerobic Lagoons

5.3.2 Technology Status and Applicability

- Anaerobic digestion is the preferred process for treating screened high strength industrial with high soluble solids content (e.g. abattoir and food processing wastes).
- Anaerobic digestion requires minor energy input and offers the potential to be a net energy producer (e.g. hot water and/or power) if the treatment facility (e.g. lagoon or basin) is covered and the gas generated is recovered.
- Uncovered lagoons (with crust layer on the surface) are well suited (and often used) where there is adequate separation distance to sensitive land uses (e.g. houses) in order to avoid odour issues.

5.3.3 Capacity

- Unheated/unmixed anaerobic lagoons are typically designed to operate with an average range of 10 to 20 days and an organic loading with typical range of 0.25 to 0.5 kg COD/m^3
- The first anaerobic lagoon (AnL1) operates as the primary settling lagoon and is highly loaded with an average hydraulic retention time of 3 days and an average organic loading of 2.4 kg COD/m3.d
- The second anaerobic lagoon (AnL2) is moderately loaded with an average hydraulic retention time of 11 days, and an average organic loading of 0.4 kg COD/m^3.d.
- Based on the estimated excess sludge production approximately 200 t SS/yr (refer below), desludging of the first lagoon is required at least annually and the second lagoon at least every two years.

5.3.4 Condition

- The earthen lagoon embankments of the lagoons are covered with heavy vegetation, which makes assessment of the condition of the lagoon walls difficult and creates safety issue (e.g. snakes). However, the lagoons are now about 20 years old and any issues should have been apparent for some time. It is recommended that the top and sides of the embankments be slashed and maintained to enable improved visual inspection.
- Screened wastewater currently cascades down the bank of anaerobic lagoon 2 in to anaerobic lagoon 1. This has resulted in erosion of the embankment, which requires remediation and extending the screened wastewater pipeline down to the first anaerobic lagoon.

5.3.5 Performance

- The first anaerobic lagoon (AnL1) removes approximately 1.0 t SS/d (i.e. 66% SS removal) and the second anaerobic lagoon (AnL2) removes a further 0.45 t SS/d. Overall the two anaerobic lagoons achieve the following removals:
  - SS and BOD 95 %
  - Total N 42 %
  - Total P 24 %

- These removal efficiencies are considered very good and reflect the two stage treatment.

- Excess sludge production is estimated to be about 200 t SS/yr (2-4 ML/yr of sludge), based on allowing for destruction of about half of the volatile solids due to anaerobic digestion and 5 % to 10 % digested solids content.

A summary of the performance of the anaerobic lagoon performance is given on Table 5-3.

5.3.6 Redundancy and Risk

- The operation of the two anaerobic lagoons enables continuous anaerobic treatment if one of the lagoons is not available (albeit at reduced performance).
- Standby pumps for pumping effluent from each lagoon are provided in the maintenance shed
- No alarms are provided on the effluent pump stations on the outlet of each lagoon. This is a particular issue for operation of the first anaerobic lagoon, being the lower of the two lagoons and the one less frequently inspected.
- There is increased potential for odour emissions from the second lagoon due to the surface inlet discharge form the first lagoon (refer Figure 5-3).
- There appears to be insufficient freeboard in anaerobic lagoon 2 (i.e. <300 mm). This was particularly evident in late 2015 due to partial blockage of the outlet overflow weir with scum build-up. The situation has improved following removal of scum around the outlet during recent desludging (i.e. GBP advised desludging occurred in February 2016) (refer Figure 5-3), however could still be an issue and needs to be checked (i.e. freeboard measured) and increased to achieve a minimum freeboard of 300 mm.

Table 5-3 Performance of Two Stage Anaerobic Treatment Facilities (2015)

Item	Units	WWTP monitoring 2015	Performance % removal	Comments
Discharge concentrations				
BOD	mg/L	150	95%	Typical 60-90%
BOD filtered	mg/L	75	87%	
COD	mg/L	535	93%	Typical 60-90%
SS	mg/L	160	95%	Typical 60-90%
Total N (TKN)	mg/L	160	42%	Typical 10-15%
Total P	mg/L	41	24%	Typical 10-15%
Sludge production				
Annual sludge production	t/yr		200	dry solids
	m^3/yr		2 to 4 ML	as 5% to 10% sludge

5.3.7 Overall Assessment

- Anaerobic lagoon treatment is well suited given the adequate buffer to sensitive receptors
- Lagoons are well sized with adequate capacity resulting in good performance
- Screened wastewater is currently eroding the embankment of anaerobic lagoon 2 as it discharges down the hill to the first anaerobic lagoon. The screened wastewater pipeline requires extension to the first anaerobic lagoon to avoid further erosion and the embankment of the second anaerobic lagoon needs to be remediated.
- Discharge from the first anaerobic lagoon in to the second lagoon needs to be modified to achieve submerged discharge to minimise odour emissions
- Insufficient monitoring is undertaken to automatically detect faults (e.g. no flow) at the two effluent pump stations. Need to minimise risk of lagoons overflowing in the event of effluent pump failure
- Visibility of and access to anaerobic lagoon 2 is limited due to excessive vegetation, which limits access to pump station (safety issue with snakes) and inspection of the banks for leakage/spills
- Frequency of desludging of lagoons and partial removal of surface scum crust should be increased to at least annually to maximise effective treatment volume
- Freeboard on anaerobic lagoon 2 appears inadequate and needs to be checked and increased to achieve >300 mm
- The integrity of lagoon liners and impact of any seepage on groundwater quality downstream should be monitored by reinstating the monitoring bore located near the watercourse below the lagoons and monitor bore water quality.

5.4 Aerobic Lagoon

5.4.1 Description

Table 5-4 summarises the leading size and operating parameters for the aerated lagoon and Figure 5-4 shows photographs of the aerobic lagoon and the holding lagoon.

- A single intermittently aerated lagoon provides aerobic treatment of the anaerobically treated wastewater
- The estimated volume of the aerated lagoon is approximately 0.9 ML, which is considerably less than the 3.0 ML that is reported in the ALS 2011 WAA
- Effluent from the second anaerobic lagoon (AnL2) is transferred to the aerated lagoon (AerL)
- Supernatant (decant) from AerL is pumped on level control to the holding lagoon (HL)
- Excess sludge is pumped once per day to the second anaerobic lagoon
- The automatic sequencing of the intermittent settling, decant and aeration is as follows:

Aeration	2 pm to ~ 3 am
Settling	~3 am to 5 am
Supernatant decant (pumped) to HL	5 am to 6 am
Filling	6am to 8 pm
Sludge transfer to ANL2	between 8 am to 10 am (1 hr/day, manual).

5.4.2 Technology Status and Applicability

- The intermittently decant aerated lagoon (IDAL) process is a well established and proven technology used for both organic and nitrogen removal. The process requires low operator input and is well suited for animal processing waste treatment following anaerobic pre-treatment as energy requirements are minimised.

Table 5-4 Aerated Lagoon Existing Operating Data

Item	Units	Value	Reference, Comments
Volume	ML	1.1	Based on 3.2 m depth @ TWL (assumed)
Surface area	m^2	720	Google Earth
Hydraulic retention time (HRT)	d	2.3	
Organic loading	kg BOD/m^3.d	0.06	Medium loading
Organic loading	kg COD/m^3.d	0.23	Medium loading
Aerators (11 kW)	No.	2	
Aerator power (total)	kW	22	

5.4.3 Capacity

- The aerated lagoon is operated within the normal design range (i.e. moderately loaded). The average hydraulic retention time is 2.3 days compared with typical design range of ~2 days, and the organic loading is 0.23 kg COD/m^3.d compared with a typical design range of 0.1 to 0.5 kg COD/m^3.d.
- There is sufficient aeration capacity installed to oxidise the organic and ammonia loads present in the anaerobic lagoon discharge.

5.4.4 Condition

- The earthen lagoon embankments appear to be in sound condition
- The surface aerators are over 10 years old and likely to be in need of more ongoing maintenance
- Electrical cabling, instrumentation, control and alarm detection require upgrading.

	Aerobic Lagoon during filling mode
	Holding lagoon Inlet bottom right and Outlet centre left

Figure 5-4 Photographs of Aerobic Lagoon and Holding Lagoon

5.4.5 Performance

Table 5-5 summarises current performance and effluent quality.

- Performance of the aerated lagoon is generally poor, with only ~40 % removal of organics and nitrogen.
- The aerated lagoon was originally designed to achieve complete oxidation of organic matter and also significant biological nitrogen removal (i.e. nitrification and denitrification). Neither is currently being achieved due to insufficient aeration and active biomass.

5.4.6 Redundancy and Risk

- Spare aerator available
- No standby pump is provided
- Limited freeboard available at TWL

5.4.7 Overall Assessment

- Well suited process to follow anaerobic treatment
- Well sized lagoon with adequate capacity, however performance is poor due to limited aeration capacity
- Alarms required upgrading to connect to the site PLC/SCADA system
- Plastic wave margin has deteriorated in places and requires repairing and or replacement

Table 5-5 Aerated Lagoon Existing Operating Data and Assessed Performance

Item	Units	Effluent Quality 2015	Reference, Comments
Performance			
BOD	% removal	38%	Low, Typical performance >90-95%
BOD filtered	% removal	43%	Low, Typical performance >90-95%
COD	% removal	44%	Low, Typical performance >90-95%
SS	% removal	65%	Low, Typical performance >90-95%
Total N	% removal	39%	Low, Typical performance 60-80%
Total P	% removal	14%	
Discharge concentrations			
BOD	mg/L	94	High, Poor performance
BOD filtered	mg/L	43	High, Poor performance
COD	mg/L	300	High, Poor performance
SS	mg/L	56	High, Poor performance
Total N	mg/L	98	High, Poor performance
Total P	mg/L	35	Average
Ammonia N	mg/L	98	No N oxidation
Power required (high speed aerators)			
100% nitrification/0% denitrification	kW	37	
65% nitrification/65% denitrification	kW	30	

5.5 Holding Lagoon

5.5.1 Description

The holding lagoon has a nominal capacity of 9.5 ML, based on a surface area of 3960 m^2 (reference Google Earth) with an assumed water depth of 3.2 m. The lagoon operates as a facultative lagoon. Effluent from the holding pond is pumped on level control the main winter storage on the farm. Table 5-6 summarises the existing design and operating parameters and year 2015 effluent monitoring data.

5.5.2 Capacity

- The average hydraulic retention time is 28 days.
- The holding lagoon is lightly loaded with an assessed organic loading of 0.01 kg COD/m^3.d
- The organic surface loading is estimated to be approximately 80 kg BOD/ha.d, which is a moderate loading for Southern Victoria.
- Odour emissions are likely to be a minor issue with the current operating conditions.

5.5.3 Condition

- The earthen lagoon embankments appear to be in sound condition

Table 5-6 Holding Lagoon Existing Operating Data and Effluent Quality

Item	Units	Current 2015	Reference, Comments
Holding lagoon (HL)			
Volume	ML	9.5	Assume 3.2 m deep
Surface area	m^2	3960	
Unmixed/Mixed		unmixed	
Hydraulic retention time (HRT)	d	28	
Organic loading	kg COD/m^3.d	0.01	Low lowing
Surface loading	kg BOD/ha.d	81	Moderate loading, potential minor odour
Effluent discharge concentrations			
BOD	mg/L	27	
COD	mg/L	180	
SS	mg/L	16	
Total N	mg/L	54	
Total P	mg/L	32	
Ammonia N	mg/L	49	
NO_X	mg/L	5	

5.5.4 Performance

- The lagoon achieve minor organic removal (i.e. BOD 10% removal), however nitrogen removal is good (35%)

5.5.5 Redundancy and Risk

- Standby pump is provided in maintenance shed
- No alarm on pump provided

5.5.6 Overall Assessment

- Well sized with adequate capacity resulting in good performance
- Provides capacity to store up to 5 ML of winter effluent flows
- Alarms required to detect faults (e.g. no flow) at the effluent pump station (with connection to the site PLC/SCADA system) to minimise risk of lagoons overflowing in the event of effluent pump failure

6 Assessment of Existing Effluent Storage and Irrigation Facilities

6.1 Effluent Storages

6.1.1 Description

Three large earthen dams are located on the farm to provide winter storage of effluent (i.e. during the non-irrigation season). Additional winter storage is also available in the Holding lagoon at the wastewater treatment plant site. Figure 6-1 shows photographs of the winter storages.

6.1.2 Capacity

The estimated total capacity of all storage lagoons is 74 ML, based on 300 mm minimum freeboard (range 63 ML to 87 ML), as summarised in Table 6-1. The leading surface dimensions of most of the storages were measured using a walker travel wheel (i.e. effluent storages 1 and 2). These leading dimensions were also determined using Google Earth and found to be similar (i.e. within 5 % accuracy). The leading surface dimensions of the remaining lagoons were based on Google Earth imagery. The assessed range in depths were based on visual inspections and advice from the Farm Manager.

6.1.3 Condition

Condition of the earthen embankments of the storages appear sound. There is no visual sign of seepage (e.g. green patches downslope of the embankments)

6.1.4 Performance

The storages are reported to have never overflowed. This includes during the recent three wet years (2011-2013 (all assessed to be greater than 1 in 10 wet years with annual rainfall of 1250 mm to 1280 mm). This period included peak abattoir production during 2013.

6.1.5 Overall Assessment

- Adequate capacity to store effluent in greater 1 in 10 wet year (refer later in this Section)
- Low potential impact of seepage

Table 6-1 Summary of Effluent Storage Capacities

Item	Estimated Capacity, ML	Estimated Capacity Range, ML	Comment
Winter storage 1	32	25 to 36	Top dam (South end)
Winter storage 2	9	7 to 10	West side
Winter storage 3	29	26 to 36	East side
Holding lagoon	5	5	~ half capacity available for storage
Total storage capacity	74 ML	63 ML – 87 ML	

	Holding Lagoon Inlet bottom right and Outlet centre left
	Winter Storage 1 at southern end of farm (looking west to abattoir)
	Winter Storage 2 on west side of farm (looking south)

Figure 6-1 Photographs of Recycled Water Storages

	Plot 1 (paddock 18 with paddock 17 in background) at southern end of farm. View from top dam looking east
	Plot 4 (paddock 22 – Arnold's Farm) View looking south from top dam
	Plot 1 (Paddock 17 with paddock 14 in background) at southern end of farm View looking northeast

	Plot 2 (Paddock 2) View north
	Plot 8 (Paddock 5 with paddock 3 in background). New North paddocks not currently irrigated. Proposed additional irrigation area View north
	Plots 6 and 3 (Paddock11 with paddocks 9 and 10 in background) View south east from centre of farm Catch dam in centre right Plot 3 irrigated below house on east boundary (centre left)

Figure 6-2 Photographs of Farm Irrigation Paddocks

6.2 Irrigation Land Available

Seven paddocks are currently developed and used for effluent irrigation on the farm with total irrigable area of 55 ha. An additional 23 ha of irrigable land (recently purchased but not developed) is located at the north end of farm. Total potential irrigable land is 78 ha.

Table 6-2 summarises the current and potential new effluent reuse facilities.

6.3 Pasture Assessment

The farm has fair quality pastures, which are dominated by couch grass, bent grass, soft brome, paspalum, wild radish and Prince of Wales feather. Where ryegrass and other improved species are present, they appear to be of only moderate vigour and perhaps are older cultivars of ryegrass not suited to irrigation. There is considerable potential for improving pastures and restoring a vigorous pasture sward.

6.4 Land Capability Assessment

The quantity and quality of effluent used for irrigation can have a major impact on surface water (i.e. run-off), soil properties and groundwater, as such irrigation must be managed to ensure that it is applied in a sustainable manner. The common limitations to sustainable irrigation with recycled water include: (a) hydraulic loading (i.e. annual unit quantity applied, ML/ha.yr), (b) nutrient loads (i.e. TN and TP annual loads, kg/ha.yr) and salinity/sodicity load on the soil. Limitations may also occur due undesirable changes in soil pH.

Table 6-2 Summary of Effluent Irrigation Areas

Plot Number	Paddock Number	Area, ha	Paddock names
Existing irrigation development 1	14, 16, 17, and 18	25	Middle, Beside old shed, Second hill and First hill
2	12 and 23	8	Top back and Top hill
3	9 and 10	6	L flat and Front flat
4	Part 21 and 22	4	Mapleston 3 and 4 (Arnolds)
5	15	5	House
6	11	3	Behind new shed
7	13	4	Steep hill
Total existing area		**55 ha**	
Proposed new irrigation 8	1 (part), 2, 3 & 5	23 ha	Dons 1 and 2, Back hay shed and Hay shed new farm
Total existing and potential irrigation area		**78 ha**	

6.4.1 Effluent Application Rates

The volume of water required for irrigation depends on the soil type, drainage, proposed plants/crops, evaporation and annual rainfall. The demand for effluent reuse at the site is seasonal and occurs generally in the warmer months from the end of October to early April, although the irrigation season can extend or shorten depending on actual rainfall. Due to slow plant growth during the low temperature winter months, there is very little demand by plants during that period.

6.4.2 Water Balance

Sustainable effluent application rates, irrigation area and winter storage requirements were predicted using the CEE Water Budget Model. This model is based on Victorian EPA Guidelines (EPA Publication #168).

Long-term regional rainfall and evaporation data was reviewed. Rainfall data was based on the average of monthly average values for Nyora (Bureau of Meteorology (BOM) station at Nyora Post Office No. 86281 (years 1970-2015), located 8 km west of Poowong).

Evaporation data was based on average monthly values for BOM stations at Cranbourne (No. 86375) (years 1990-2014) and Melbourne (No. 86071) (years 1955-2014)

Figure 6-3 shows the monthly rainfall and evaporation data adopted for the Poowong region for the average rainfall year and for the 1 in 10 wet year.

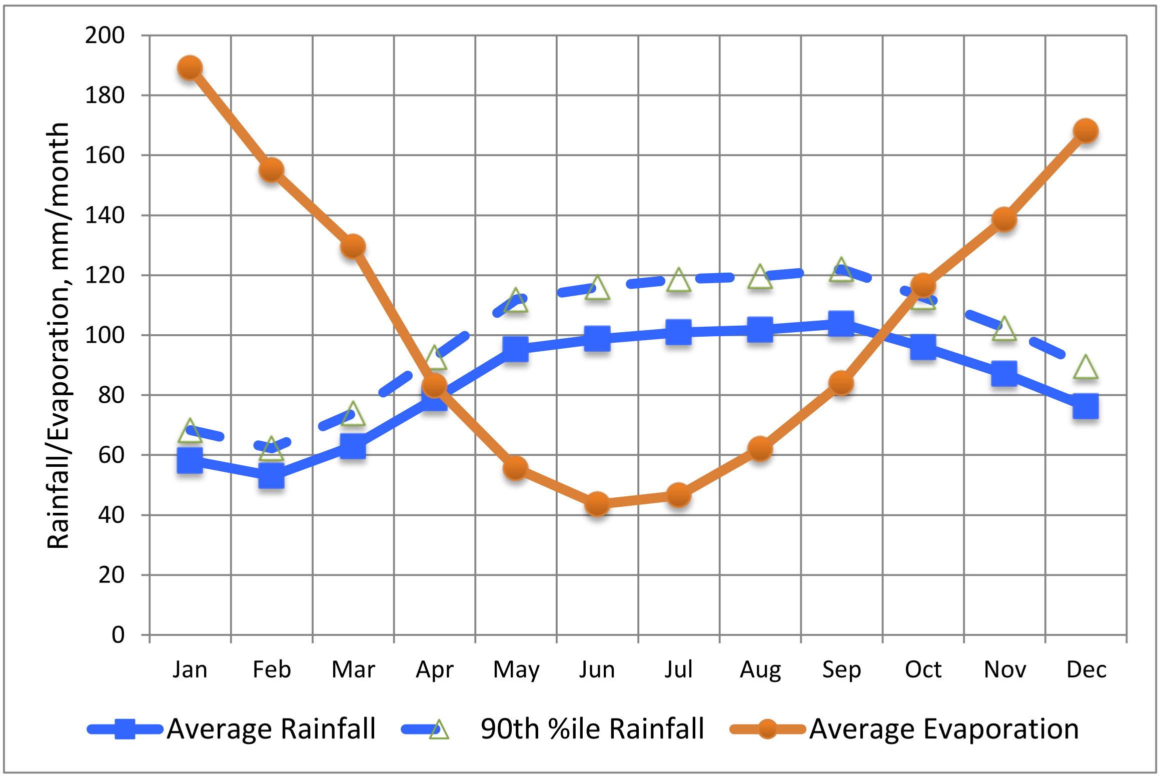


Figure 6-3 Monthly Rainfall and Evaporation for Poowong Region

Attachment C summarises the CEE Water Budget Model methodology and resultant water balance spreadsheets for average, wet and dry year cases for the existing situation and for the projected future operation.

The estimated average irrigation demand for pasture (average effluent application rate) was calculated to be 2.6 ML/ha.yr. This is for an average rainfall season. For the 90th percentile wet year, this irrigation demand is down to 2.0 ML/ha.yr. Experience in the region indicates that average water application rates of 2.5 to 3.0 ML/ha.yr are typical for irrigated pasture.

The CEE water budget model also predicts that a recycled water storage volume of 67 ML is required for an average rainfall season and up to 80 ML for the 90th percentile wet year case. This compares with the estimated existing winter storage capacity of 71 ML (estimated range 60 ML to 84 ML).

As such the water balance model predicts that there may be an effluent storage volume shortfall in wet years at full production. However, the CEE water balance is considered conservative due in particular to the conservative evaporation rates adopted (i.e. average of Cranbourne and Melbourne evaporation data) and that monthly rainfall and evaporation data is adopted rather than daily.

Further, past performance during recent wet years shows sufficient storage was available and no discharge to watercourse occurred.

It is also noted that during wet years production is generally lower (i.e. reduced wastewater flow) due to lack of stock.

6.4.3 Effluent Quality and Loads

Table 6-3 summarises the average effluent characteristics and annual loadings applied to the farm, together with the annual effluent volume and nutrient loadings applied per hectare.

The following comments are made on the current effluent loadings applied to the 55 ha of pasture presently irrigated:

- The annual effluent volume applied of 2.1 ML/ha.yr is less than the predicted average value for long-term sustainable effluent irrigation of 2.6 ML/ha.yr (i.e. 20 % margin of safety) and aligns well with the 90th percentile wet year loading.
- The annual total nitrogen (TN) load applied of 100 kg TN/ha.yr is considered moderately high, and while this value is less than the annual crop demand for highly vigorous pastures/crops (e.g. oaten hay cereal crop of 160 kg TN/ha.yr, and perennial rye grass or tall fescue of 180 kg TN/ha.yr), the management of the pastures will need to be such that nitrogen inputs from recycled water are balanced by nitrogen removal in crop and animal products.
- The annual total phosphorus (TP) load applied of 44 kg TP/ha.yr is considered high and exceeds the crop demand of most crops/pasture (exception lucerne). Phosphorus removal through vigorous crop and pasture growth is an integral part of future management.

- The average effluent TDS concentration of 660 mg/L is considered low to medium and is not likely to present a hazard in this high rainfall environment.

The effluent quality parameters that are most likely to potentially cause problems for soils and sustainable irrigation are:

- Total salinity (measured by electrical conductivity)
- Sodium saturation (measured by sodium adsorption ratio or SAR)
- pH
- Total nitrogen
- Total phosphorus.

The Supplementary Report to the Works Approval Application, Water Balance prepared by ALS in March 2011 contains data for salinity and SAR. Appendix C, which is attached to this report, contains data for the nitrogen and phosphorus in the aerobic lagoon. These data are summarised in Table 6-4, together with the 2015 effluent monitoring data.

Table 6-3 Summary of Current Effluent Characteristics and Loadings Applied to Farm

Item	Units	Value
Irrigation lagoon 1 concentrations		
pH		7.8
BOD	mg/L	29
SS	mg/L	35
Total N	mg/L	47
TKN	mg/L	46
NOX	mg/L	1.4
Total P	mg/L	21
TDS	mg/L	656
Ca	mg/L	17
Mg	mg/L	10
K	mg/L	34
Na	mg/L	138
Irrigation lagoon 1 annual loads		
Flow	ML	116
BOD	t/yr	3.4
SS	t/yr	4.1
Total N	t/yr	5.5
Total P	t/yr	2.4
TDS	t/yr	76
Effluent Irrigation Unit loadings		
Area (existing developed)	ha	55
Loadings		
Flow	ML/ha.yr	2.1
TN	kg N/ha.yr	100
TP	kg P/ha.yr	44

Table 6-4 Summary of Effluent Parameters That Potentially Cause Problems for Soils and Sustainable Irrigation

Parameter	ALS 2011 report	CEE 2015 monitoring	Comment
Total salinity	990 uS/cm (595 mg/L)	660 mg/L	Slight increase
SAR	6.9		
pH	6.9	7.8	Increased
Total nitrogen	24 mg/L	48 mg/L	Doubled
Total phosphorus	22 mg/L	21 mg/L	Similar

The Supplementary Report to the Works Approval Application, Water Balance interpreted these data as not presenting any significant risk for application to land by way of irrigation. This is largely correct for the salinity although care would be needed if applying this water to poorly drained soils. It is also largely correct for both pH and SAR. The nitrogen and phosphorus levels are however quite high for irrigation water and care will need to be used to ensure that the nitrogen and phosphorus inputs to the soil do not exceed the capacity of the soil and crops which are growing in the soil to fully utilize and prevent any incursions to surface waterways and groundwater.

It is noted that the nitrogen level in the irrigated water is currently double that reported in the ALS 2011 report.

6.4.4 Soils Assessment

The soils on the irrigation farm are yellow brown gradational soils developed on weathered Cretaceous sandstones and mudstones. The soils are similar over most of the property with a dark brown clay loam at the surface gradually becoming heavier with depth but with ill defined soil horizon boundaries. The soils are moderately deep and merge to weathered rock at about 1.5 m on the gentler slopes, but only persist to about 1.2 metres on steeper parts of the property.

Soil Sampling Procedure

Soil samples were collected from three depths along four different transects. Three transects were selected within the existing irrigation area of the farm and were in the Top Hill paddock, the West paddock, the East Flats. These areas have been irrigated regularly with recycled water for some years. The fourth site was at the north end of the farm in one of the New North paddocks where there has been no history of irrigation. This area has only recently been purchased. Thus the fourth site is a good indication of soil conditions prior to the current regime of irrigation with recycled water.

Sampling procedure was to collect surface soil samples (0 to 10 cm) with a foot auger from at least 20 individual sampling spots along a defined transect. The transect routes in each of the four paddocks have been marked on Figure 6-4. Subsoil samples were collected at the first, fifth, tenth, fifteenth and twentieth sampling spots by hand auguring with an eidermann auger to specific depths and collecting soil from within the auger. Care is taken to avoid contamination across sampling depths. Collected samples from each nominated depth are bulked together during sampling collection and then thoroughly mixed prior to bagging and short term storage prior to transfer to the soil analytical laboratory.

All soil samples were forwarded to CBSP Laboratories for analyses.

Soil data

The soil analytical data is provided in the following Table. Interpretation of the data for each of the key analytes of salinity, sodicity, pH, nitrogen and phosphorus is undertaken below.

Salinity

Soil salinity is commonly measured as the electrical conductivity (E.C.) of a 1:5 soil water suspension and the conductivity gives a direct measurement of the concentration of free salts in the soil. The measurement covers all salts in the soil, not just sodium chloride. Values of less than 0.3 dS/m indicate low and harmless salt content. Values above 0.3 dS/m up to around 0.6 dS/m indicate a mild level of salinity. Values above 0.6 dS/m indicate that toxic levels of salt may be present and potentially restricting plant growth.

With exception of the surface soil sample in the Big Dam Hill paddock (paddocks 17 and 18), all values obtained were less than 0.3 dS/m. The surface soil sample (o to 10 cm) in the Big Dam Hill paddock had an electrical conductivity of 0.36 dS/m indicating that there is some minor salinity here, but there is no increase with depth, and this mild salinity is most likely due to impeded drainage in the topsoil (see below). Overall the soils have either none or very little residual or induced salinity.

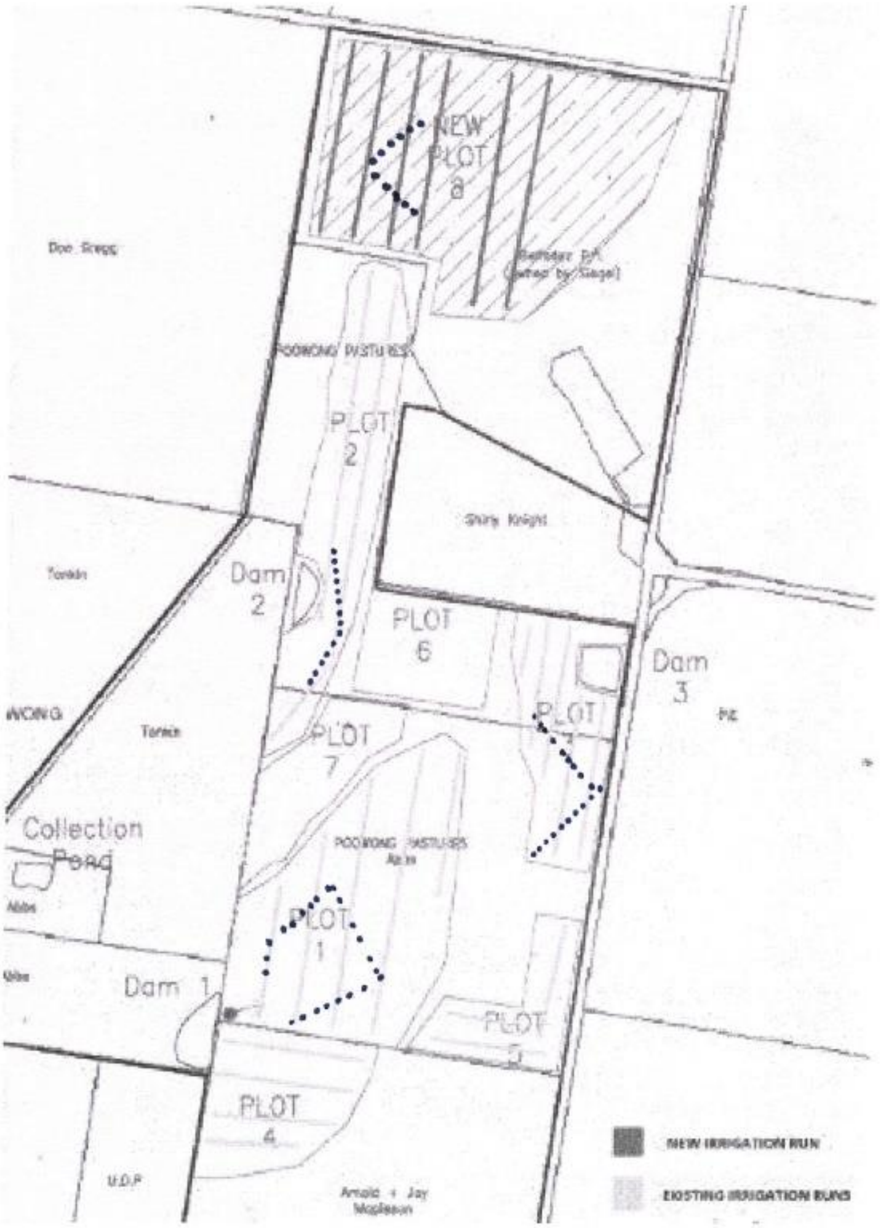


Figure 6-4 Soil Sampling Transects

Sample ID		Below the House			Big Dam Hill			Back Hill			Hay Paddock		
Sample Name	Units	PABS 1	PABS 2	PABS 3	PABS 4	PABS 5	PABS 6	PABS 7	PABS 8	PABS 9	PABS 10	PABS 11	PABS 12
Irrigation		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
Sample Depth From		0-10 cm	10-20 cm	20-40 cm	0-10 cm	10-20 cm	20-40 cm	0-10 cm	10-20 cm	20-40 cm	0-10 cm	10-20 cm	20-40 cm
Crop		Pasture	Pasture	Pasture	Pasture	Pasture	Pasture	Pasture	Pasture	Pasture	Pasture	Pasture	Pasture
pH (1:5 Water)		5.8	5.8	6.0	6.3	6.9	6.5	5.7	5.7	5.7	5.5	5.7	5.8
pH (1:5 CaCl2)		4.7	4.8	4.7	5.9	5.7	5	4.9	4.6	4.5	4.6	4.6	4.5
Elect. Conductivity	dS/m	0.13	0.15	0.07	0.36	0.19	0.12	0.11	0.07	0.04	0.07	0.05	0.02
Phosphorus (Colwell)	mg/kg	284	204	45	493	179	35	152	97	31	35	13	7
Phosphorus (Olsen)	mg/kg	83	83	22	129	59	17	47	28	13	13	5.4	3.4
Total Phosphorus	mg/kg	1215	836	295	1845	741	230	942	645	278	605	389	231
Phosphorus Buffer Index		183	190	161	173	168	228	180	162	198	170	154	156
Calcium (Amm-acet.)	meq/100g	5.0	5.2	3.3	8.1	5.0	2.0	9.0	7.3	5.3	10.0	8.9	7.2
Potassium (Amm-acet.)	meq/100g	2.2	2.1	1.6	3.5	1.4	0.3	2.5	2.1	1.9	2.0	1.8	2.0
Magnesium (Amm-acet.)	meq/100g	1.4	1.4	1.1	1.7	1.0	0.57	1.3	1.2	0.9	0.44	0.49	0.54
Sodium (Amm-acet.)	meq/100g	0.81	0.94	0.86	3.2	2.3	2.3	0.37	0.36	0.39	0.3	0.22	0.24
Calcium/Magnesium Ratio		3.6	3.8	3.1	4.7	5.0	3.5	6.7	6.1	5.9	23	18	13
Aluminium	meq/100g	0.25	0.32	0.63	0.03	0.04	0.53	0.2	0.51	1.34	0.43	0.55	0.96
Cation Exch. Cap.	meq/100g	9.4	9.6	6.7	16	9.7	5.2	13	11	8.5	13	11	10
Sodium % of Cations (ESP)	%	8.6	9.8	12.8	19.2	23.7	44.2	2.8	3.3	4.6	2.4	1.9	2.4
Ammonium nitrogen	mg/kg	6.0	4.0	<1	2.0	1.0	<1	14.0	2.0	<1	4.0	2.0	7.0
Nitrate nitrogen	mg/kg	36	47	8	72	27	11	25	20	8.0	12	9.0	4.0
Total nitrogen	%	0.42	0.32	0.14	0.47	0.27	0.13	0.53	0.33	0.15	0.5	0.31	0.15
Organic carbon	%	3.0	2.4	1.1	5.2	2.2	1.3	4.2	2.9	1.5	3.6	2.6	1.0
Carbon nitrogen ratio		7.2	7.6	7.9	11.1	8.1	9.6	7.8	8.8	10.0	7.3	8.4	6.5
Sulphur	mg/kg	24	21	6.1	27	12	7.7	12	7.8	5.9	6.8	2.9	1.9
Chloride	mg/kg	28	28	19	85	63	70	23	9.2	7	27	5.7	2.2
Boron	mg/kg	0.62	0.60	0.41	0.81	0.43	0.37	0.72	0.54	0.5	0.71	0.53	0.44
Available Potassium	mg/kg	549	575	416	690	392	222	521	520	350	210	191	209

Sodicity

Soil sodicity is measured by the percentage of exchangeable sodium compared to the total of exchangeable cations in the soil, and the percentage is abbreviated to the acronym ESP. A soil is considered to be sodic if the ESP value is above 6% (more than 6% of the exchangeable cations are sodium ions) and strongly sodic if the ESP is greater than 15%. As soils become more sodic, they lose some of the important physical properties that influence productivity. In particular, sodic soils are less permeable, less well aerated, prone to surface sealing, and have a narrower range of suitable moisture content for cultivation. At extreme levels of sodicity sodium ions may reach toxic levels for some plant species.

Because recycled water normally has an imbalance of sodium over other cations, there is a tendency for soils irrigated with recycled water to become sodic and strongly sodic over time. Maintaining the soil at a moderate to low level of sodicity is an integral part of protecting a recycled irrigation property for long-term use.

The soils on the Big Dam Hill Paddock are strongly sodic (19% at the soil surface to 44% in the subsoil). The level of sodicity here is surprisingly high, given that the recycled water has an SAR of 5.9. The high values indicate some other event in the history of the paddock that has contributed to the very strong sodicity. This level of sodium saturation will adversely affect soil permeability and it is possible that the sodium is high enough to be toxic to some pasture species.

The high sodicity of the Big Dam Hill paddock needs to be corrected with gypsum, and may require a number of applications to bring the sodicity down to an acceptable level

The soils on Paddock 9 (i.e. Paddock Below the House) are also sodic but not to the same extent as the Big Dam Hill Paddock. No remedial action is required here. The soils on the Back Hill Paddock (Paddocks 3 and 5) were not sodic.

Soil pH

Soil pH determines the availability of most plant nutrients as it affects their solubility. The conventional measure of this parameter is the pH value of 1:5 soil water mixture. The most desirable soil pH is close to the neutral value of 7 or just mildly acid (6.5). With extreme acidity when soil pH is below 5.0, a number of nutrients become unavailable including phosphorus, magnesium, and molybdenum. At high pH when soil pH becomes higher than 8.5, other nutrients such as zinc and manganese are adversely affected.

The recycled water is slightly alkaline with a pH of 7.8, and as such it has the potential to beneficially increase soil pH by minor amounts.. The values for surface soil pH were all slightly acid and within the highly desirable area for this parameter. There was little change with depth and no evidence of any undesirable trends.

Soil Nitrogen

Nitrogen is a key nutrient for plant vigour. Inadequate nitrogen will stunt and retard growth. Inadequate nitrogen will suppress water utilization by the pasture or crop. Excess nitrogen is likely to be an environmental hazard, as it is a quite mobile nutrient and if it isn't used by the crop or pasture, it can be present in surface runoff from the soil. Nitrogen in waterways causes algal blooms, deoxygenation and a range of other problems.

Soil nitrogen is difficult to accurately assess as it is constantly responding to soil temperature and moisture fluctuations. It is best monitored by examining the soil carbon nitrogen ratio in conjunction with soil nitrate value. The soil carbon nitrogen ratio will normally be somewhere between 9 and 14, with the lower values reflecting adequate supply of soil nitrogen for plant growth and the higher values reflecting a shortage of nitrogen and intense competition from soil micro flora for this nutrient. Where the carbon nitrogen ratio is less than 9, nitrogen is likely to be in excess and there is potential for nitrogen to migrate through the soil profile and potentially contaminate groundwater. However nitrate itself has to be present as well. The potential for groundwater contamination exists where low carbon nitrogen values co-exist with nitrate concentrations above 5 mg/kg.

Future pasture management will remove surplus nitrogen from the soil in silage and hay crops. This is described in more detail in Section 8 – Recommended Wastewater Management Plan.

Soil Phosphorus

Phosphorus is an important plant nutrient and needs to be present at a moderate level in order to avoid growth restrictions due to inadequate phosphate. Excessive amounts of phosphorus can however potentially be a pollutant of waterways in relatively small volumes, and the recycled effluent at GBS Exports does contain significant soluble phosphorus that could potentially find its way to surface waters.

Most Australian soils have inherently high phosphorus fixation and immobilisation properties, such that applied phosphate is adsorbed onto the surface of clay particles in the soil and will not migrate through the soil. Poowong soils are not particularly noted for their phosphate adsorption capacity and the values for Phosphorus Buffering Index (PBI) range from around 150 to 200. This is moderate to low for this parameter.

The values for plant available phosphorus (Olsen P) are high in the surface soil and elevated in the lower soil depths. An adequate level of soil phosphorus in the surface soil of these soils would be an Olsen P value of 15 to 20 mg/kg and an excessive level would be more than 30 mg/kg. All three surface soils where irrigation is in use have values well in excess of 30 mg/kg, with the highest being 129 mg/kg. The same high values persisted into the subsoil, with the value for the 20 to 40 cm sampling depth being 22 mg/kg, 17 mg/kg and 13 mg/kg respectively for the East Flats, the Top Hill and the West paddock. In comparison the unirrigated New North Paddock had a subsoil value (20 to 40 cm) of 3.4 mg/kg.

6.4.5 Conclusion

A different approach to the management and containment of phosphorus is required as a consequence of the saturation of the phosphorus adsorption sites in the surface soils. Phosphorus input to the soil/plant system will need to be matched by phosphorus removal in animal and plant products, so that there is zero or minimal further net accumulation of phosphorus within these soils. This can be achieved through a cropping program on the irrigated areas, whereby livestock are removed in late winter or early spring from those paddocks to be irrigated each season, and a silage crop is cut and removed from the property (refer Section 8).

7 Impact of Rendering Wastes on Wastewater Treatment Plant Performance and Effluent Reuse

7.1 Impact on Wastewater Treatment Performance

The addition of rendering wastes to the treatment plant is not expected to have any appreciable impact on the current or future treatment plant operation and performance, due to the low increase in overall flow of approximately 5% and in organic and nutrient loads of 2% to 6% (refer Table 4-1 and Table 4-2).

7.2 Impact on Effluent Reuse Performance

The addition of rendering wastes to the effluent reuse performance is not expected to have any appreciable impact on the future reuse facilities, due to the low increase in total flow, organic and phosphorus loads of 2% to 5%, and a significant (i.e. 33%) reduction in total nitrogen load.

8 Recommended Wastewater Management Upgrade Plan

This Section describes the recommended management plan for upgrading the current wastewater treatment plant and effluent reuse facilities and operations. In general terms the plant is to be upgraded to achieve Class C recycled water quality with enhanced nitrogen removal.

8.1 Wastewater Treatment

8.1.1 Anaerobic Lagoons

- Increase frequency of periodic removal of settled solids and floating crust (partial) to at least annually (e.g. February each year), based on sludge depth testing, to maximise the working volume of the lagoon. This will reduce short-circuiting and improve performance.
- Extend the screened wastewater pipeline to the first anaerobic lagoon to avoid further erosion and the embankment of the second anaerobic lagoon and remediate the embankment.
- Provide submerged discharge into the second anaerobic lagoon to minimise odour emissions
- Provide alarms on all pumps and lagoon level to detect faults (e.g. no flow, outages and high liquid level) and connect to the site PLC/SCADA system, to minimise risk of lagoons overflowing in the event of effluent pump failure
- Remove and maintain vegetation on the banks of the first (bottom) lagoon slashed to enable better access and inspection of the banks for leakage/spills and detection of snakes (safety issue)
- Measure freeboard on anaerobic lagoon 2 and increase if required to achieve >300 mm
- Reinstate the monitoring bore located near the watercourse below the lagoons and monitor bore water quality to assess integrity of lagoon liners and impact of any seepage on groundwater quality downstream.

8.1.2 Aerated Lagoon

The following modifications to the aerated lagoon facility are recommended to achieve improved biological oxidation of organic matter and nutrients and thereby reduce the in particular the nutrient loads on the effluent irrigation scheme.

- Increased aeration capacity to at least 33 kW and potentially the daily operating period (i.e. up to 18 hours/day)
- Undertake routine monitoring of the solids concentration and operating parameters in the lagoon (e.g. dissolved oxygen concentration)
- Provide alarms on the aerators, the sludge pump and lagoon level to detect faults (e.g. no flow, outages and high liquid level) and connect to the site PLC/SCADA system.
- Repair and or replace the plastic wave margin where it has deteriorated

8.1.3 Winter Storage

GBP propose to monitor inflow of effluent to the winter storages and monitor the effluent level in the storages to assess if adequate winter storage capacity is available or if more is required. The existing inflow totalizer is to be replaced and the flow recorded monthly together with the winter storage levels.

8.2 Effluent Reuse

8.2.1 Increase area irrigated

It is recommended that the existing irrigation infrastructure be extended to include the newly acquired northern paddock (Plot 8). This will increase the area available tor irrigated by approximately 23 ha up to 78 ha (42% increase) and will reduce the areal effluent volume and nutrient loadings on the overall farm proportionally, and also provide greater irrigation flexibility.

The estimated loadings on the increased future irrigated pasture are summarised in Table 8-1.

Table 8-1 Summary of Future Effluent Characteristics and Loadings Applied to Farm

Item	Units	Value	Comment
Effluent Irrigation Concentrations			
pH		7.8	
BOD	mg/L	30	
SS	mg/L	20	
Total N	mg/L	30	Decreased 35%
Total P	mg/L	20	
TDS	mg/L	660	
Ca	mg/L	17	
Mg	mg/L	10	
K	mg/L	34	
Na	mg/L	138	
Effluent Irrigation Annual Loads			
Flow	ML	123	
BOD	t/yr	3.7	
SS	t/yr	3.7	
Total N	t/yr	3.7	
Total P	t/yr	2.5	
TDS	t/yr	80	
Effluent Irrigation Unit loadings			
Area (existing developed)	ha	78	Increased 42%
Loadings			
Flow	ML/ha.yr	1.6	Decreased 26%
TN	kg N/ha.yr	47	Decreased 53%
TP	kg P/ha.yr	31	Decreased 30%

8.2.2 Increase phosphorus removal from irrigated areas

The management of the farm as a whole, and the irrigation in particular, needs to recognise the hazard associated with the high levels of phosphorus now in these soils. The management of the farm needs to be orientated to removing phosphorus from the soil through cropping, and minimising erosion risks. A cropping program needs to replace the present system of irrigating badly degraded pastures, with the crops being harvested and either sold, or fed to livestock in areas well removed from waterways.

8.2.3 Sodicity Management on the Top Hill Paddock (Paddocks 17 and 18, Plot 1)

The high sodicity of the Top Hill paddock needs to be corrected with gypsum, and may require a number of applications to bring the sodicity down to an acceptable level. In the first instance, gypsum needs to be broadcast on this area at the rate of 5 tonne/ha this autumn after the end of the irrigation season, accompanied by deep ripping to at least 40 cm depth.

8.2.4 Annual

Prior to the commencement of each irrigation season, two or three of the irrigation paddocks are to be identified as the core irrigation area for that coming irrigation season and they will then be irrigated to optimize the growth of the pasture. The recycled water irrigation loading applied is likely to be close to the calculated long term sustainable loading of 2.6 ML/ha.yr, potentially somewhat higher in dry years (e.g. up to 3 ML/ha.yr). These irrigation paddocks will be cut for silage early in the spring before irrigation commences, and the silage will be removed from the site. In addition to the silage cut, these paddocks will be cut for hay in mid summer and only grazed when irrigation is complete. The paddocks will be sown to short rotation pasture species in the previous autumn to prepare them for high growth rates and high productivity.

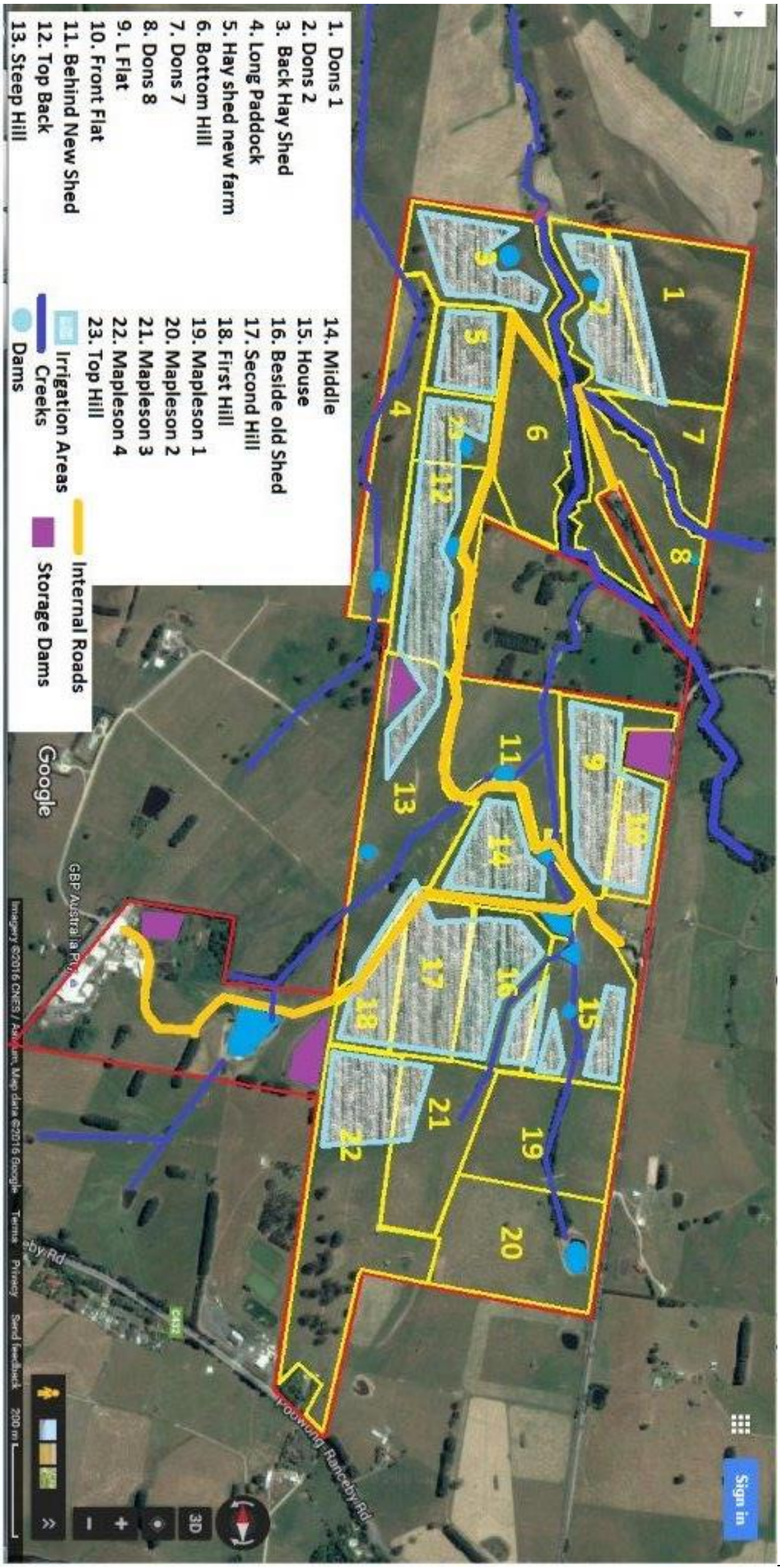
The paddocks to be used as a core irrigation area will be rotated around the farm, and will be resown to a perennial ryegrass pasture as a longer-term option as they are decommissioned from the core irrigation area. In wetter than average years the other irrigation a paddocks can be brought into service as well, to prevent any over-irrigation. The change of emphasis in management is to irrigate and control the growth in the paddocks for optimum pasture and crop productivity, rather than for the sole purpose of water disposal. This change will result in full utilisation of both the applied nitrogen and the applied phosphorus.

9 Attachments

Attachment A – Site Plan

Site Plan

General Layout, Winter Storage Locations, Irrigation Areas, Watercourses and Access Roads


1. Dons 1
2. Dons 2
3. Back Hay Shed
4. Long Paddock
5. Hay shed new farm
6. Bottom Hill
7. Dons 7
8. Dons 8
9. L Flat
10. Front Flat
11. Behind New Shed
12. Top Back
13. Steep Hill
14. Middle
15. House
16. Beside old Shed
17. Second Hill
18. First Hill
19. Mapleson 1
20. Mapleson 2
21. Mapleson 3
22. Mapleson 4
23. Top Hill
Irrigation Areas
Creeks
Dams
Internal Roads
Storage Dams
Google
Sign in
Poowong-Ranceby Rd

Attachment B – CEE WWTP Process Calculations

CEE

24-Feb-16 14:07

GBP Australia Pty Ltd
Poowong Export Abattoir - Wastewater Treatment
Design Criteria and Data

Current Operation		Value	Units	Reference/Comments	Future Operation		Value	Units
Production					**Production**			
Abattoir					**Abattoir**			
Cattle production		395	Head/d	Wiley - 2015 WAA	Cattle production		395	Head/d
Production days		240	days/yr	GBP			240	days/yr
	Summer	58%	% of total			Summer	58%	% of total
	Winter	43%	% of total			Winter	43%	% of total
Hot standard carcass weight		99	HSCW t/d				99	HSCW t/d
Rendering		Nil			**Rendering**			
					MAM		2133	kg MAM/hr
					Boning Bone		1146	kg/hr
					Blood		711	kg/hr
					Coagulated solids		792	kg/hr
					Total render		4071	kg/hr
Water Consumption					**Water Consumption**			
Abattoir					**Abattoir**			
Daily (average)		520	kL/d	Potable water meter readings 2010, 2015, 2016	Daily (average)		520	kL/d

Annual	125	ML/yr	Annual	125	ML/yr
Summer (October to March)	72	58%			
(Winter (April to September)	53	43%			
Wastewater flows			**Wastewater flows**		
Abattoir			**Abattoir**		
Wastewater flow as % of water use	93%		Wastewater flow as % of water use	93%	
Daily (average)	484	kL/d	Daily (average)	484	kL/d
Weekly	2418	kL/week	Weekly	2418	kL/week
Annual	116	ML/yr	Annual	116	ML/yr
Summer (October to March)	67	58%	Summer (October to March)	67	58%
(Winter (April to September)	49	43%	(Winter (April to September)	49	43%
Rendering	Nil		**Rendering**		
			Daily	27	kL/d
			Weekly	32	kL/week
			Annual	6.5	ML/yr
Abattoir + Rendering			**Abattoir + Rendering**		
Daily	484	kL/d	Daily	511	kL/d
Weekly	2418	kL/week	Weekly	2553	kL/week
Annual	116	ML/yr	Annual	123	ML/yr
Summer (October to March)	67	58%		71	58%
(Winter (April to September)	49	43%		52	43%
Influent loads to Screen			**Influent loads to Screen**		
Abattoir + Rendering			**Abattoir + Rendering**		
BOD total	1850	kg/d	BOD total	2074	kg/d
COD	4100	kg/d	COD	4600	kg/d
SS	2210	kg/d	SS	2324	kg/d

Total N	150	kg/d	
Total P	30	kg/d	
Influent concentrations to Screen		`	
BOD total	3820	mg/L	
COD	8470	mg/L	
SS	4570	mg/L	
Total N	310	mg/L	
Total P	63	mg/L	
Screen performance (% removals)			
Flow	1%		CEE estimate
BOD total	15%		CEE estimate
COD	15%		CEE estimate
SS	30%		CEE estimate
Total N	10%		CEE estimate
Total P	15%		CEE estimate
Screened WW concentrations			Monitoring 2015
BOD total	3250	mg/L	3250
COD	7200	mg/L	7200
SS	3200	mg/L	3200
Total N	275	mg/L	275
Total P	54	mg/L	54
Anaerobic lagoon 1 (AnL1)			
Surface area @TWL	644	m2	
Depth @ TWL	3.2		

Total N	162	kg/d
Total P	32	kg/d
Influent concentrations		`
BOD total	4062	mg/L
COD	9009	mg/L
SS	4552	mg/L
Total N	317	mg/L
Total P	63	mg/L
Screen performance (% removals)		
Flow	1%	
BOD total	15%	
COD	15%	
SS	30%	
Total N	10%	
Total P	15%	
Screened WW concentrations		As existing
BOD total	3453	mg/L
COD	7658	mg/L
SS	3186	mg/L
Total N	286	mg/L
Total P	53	mg/L
Anaerobic lagoon 1 (AnL1)		
Surface area @TWL	644	m2
Depth @ TWL	3.2	

Volume @TWL	1.0	ML	
Unmixed/Mixed	unmixed		
Organic loading	2.4	kg COD/m3.d	High loading
Hydraulic retention time (HRT) (Avg)	3.0	d	low, used primarily as solids settling basin
AnL1 performance (% removals)			
BOD total	54%		
COD	39%		
SS	66%		
Total N (TKN)	38%		
Total P	20%		
AnL1 WW discharge concentrations			Monitoring 2015
BOD	1,500	mg/L	1115
COD	4,400	mg/L	2900
SS	1,100	mg/L	705
Total N (TKN)	170	mg/L	155
Total P	43	mg/L	32
Anaerobic lagoon 2 (AnL2)			
Surface area @TWL	1806	m2	
Depth @ TWL	3.2		
Volume @TWL	1.1	ML	
Unmixed/Mixed	unmixed		
Organic loading	1.4	kg COD/m3.d	Medium loading
Hydraulic retention time (HRT) (Avg)	3.2	d	Medium

Volume @TWL	1.0	ML
Unmixed/Mixed	unmixed	
Organic loading	2.7	kg COD/m3.d
Hydraulic retention time (HRT) (Avg)	2.8	d
AnL1 performance (% removals)	As per existing	
BOD total	54%	
COD	39%	
SS	66%	
Total N (TKN)	38%	
Total P	20%	
AnL1 WW discharge concentrations		
BOD	1,595	mg/L
COD	4,681	mg/L
SS	1,093	mg/L
Total N (TKN)	171	mg/L
Total P	43	mg/L
Anaerobic lagoon 2 (AnL2)		
Surface area @TWL	1806	m2
Depth @ TWL	3.2	
Volume @TWL	1.1	ML
Unmixed/Mixed	unmixed	
Organic loading	1.5	kg COD/m3.d
Hydraulic retention time (HRT) (Avg)	3.1	d

AnL2 performance (% removals)				**AnL2 performance (% removals)**	As per existing	
BOD total	90%			BOD total	90%	
COD	88%			COD	88%	
SS	85%			SS	85%	
Total N (TKN)	6%			Total N (TKN)	6%	
Total P	6%			Total P	6%	
AnL2 WW discharge concentrations			Monitoring 2015	**AnL2 WW discharge concentrations**		
BOD	150	mg/L	150	BOD	159	mg/L
COD	535	mg/L	535	COD	569	mg/L
SS	160	mg/L	160	SS	159	mg/L
Total N (TKN)	160	mg/L	160	Total N (TKN)	161	mg/L
Total P	41	mg/L	41	Total P	40	mg/L
AnL1 & AnL2 overall performance (% removals)				**AnL1 & AnL2 overall performance (% removals)**		
BOD total	95%			BOD total	95%	
COD	93%			COD	93%	
SS	95%			SS	95%	
Total N (TKN)	42%			Total N (TKN)	44%	
Total P	24%			Total P	24%	
Aerated lagoon (AerL)				**Aerated lagoon (AerL)**		
Volume	1.1	ML		Volume	1.1	ML
Depth @ TWL	3.2			Depth @ TWL	3.2	
Surface area	720	m2		Surface area	720	m2
Hydraulic retention time (HRT) (Avg)	2.3	d		Hydraulic retention time (HRT) (Avg)	2.2	d
Organic loading	0.06	kg BOD/m3.d	Medium	Organic loading	0.07	kg BOD/m3.d
	0.23	kg COD/m3.d	Medium		0.26	kg COD/m3.d

Aeration			
number	2	No.	
power (each)	11	kW	
duty	13	hr/d	
Aerated lagoon (AerL) performance			
BOD	38%		
COD	44%		
SS	65%		
Total N	39%		
Total P	14%		
Aerated lagoon (AerL) discharge concentrations			Monitoring 2015
BOD	94	mg/L	94
COD	298	mg/L	298
SS	56	mg/L	56
Total N	98	mg/L	98
Total P	35	mg/L	35
TKN	98	mg/L	98
NOX	0.5	mg/L	0.5
Applied loads (AerL)			
Carbonaceous (BOD)	72	kg/d	1.30
Nitrification (TKN to NO3)	77	kg/d	4.57
Denitrification (NO3 to N2)	77	kg/d	-2.86
BOD & TKN loading peaking factor (hour/day)	2.0	Ratio	
Oxygen demand (day)			
Carbonaceous	94	kg/d	

Aeration			
number	3	No.	
power (each)	11	kW	
duty	13	hr/d	
Aerated lagoon (AerL) performance			
BOD	85%		
COD	85%		
SS	85%		
Total N	65%		more o2
Total P	14%		
Aerated lagoon (AerL) discharge concentrations			
BOD	24	mg/L	
COD	85	mg/L	
SS	24	mg/L	
Total N	56	mg/L	
Total P	35	mg/L	
TKN	3	mg/L	
NOX	53	mg/L	
Applied loads (AerL)			
Carbonaceous (BOD)	81	kg/d	
Nitrification (TKN to NO3)	81	kg/d	
Denitrification (NO3 to N2)	81	kg/d	
BOD & TKN loading peaking factor (hour/day)	2.0	Ratio	
Oxygen demand (day)			
Carbonaceous	105	kg/d	

Nitrification	351	kg/d	
Denitrification	(220)	kg/d	
Oxygen demand	Average hour		Peak hour
Aerator duty	13	hr/d	
100% nitrification/0% denitrification	34	kg/hr	68
100% nitrification/40% denitrification	27	kg/hr	55
Power required (high speed vertical surface aerators)	Average hour		Peak hour
100% nitrification/0% denitrification	34	kW	68
100% nitrification/40% denitrification	27	kW	55
Holding lagoon (HL)			
Volume	9.5	ML	
Surface area	3,956	m2	
Unmixed/Mixed	unmixed		
Hydraulic retention time (HRT) (Avg)	28	d	
Surface loading	81	kg BOD/ha.d	potential low odour issue
Holding lagoon (HL) performance			
BOD	62%		
COD	39%		
SS	71%		
Total N	45%		
Total P	9%		
Holding lagoon (HL) discharge concentrations			Monitoring 2015
BOD	27	mg/L	27
COD	180	mg/L	180
SS	16	mg/L	16
Total N	54	mg/L	

Nitrification	372	kg/d	
Denitrification	(233)	kg/d	
Oxygen demand (hour)			Peak hour
Aerator duty	13	hr/d	
100% nitrification/0% denitrification	37	kg/hr	73
100% nitrification/65% denitrification	25	kg/hr	50
Power required (high speed vertical surface aerators)			Peak hour
100% nitrification/0% denitrification	37	kW	73
100% nitrification/65% denitrification	25	kW	50
Holding lagoon (HL)			
Volume	9.5	ML	
Surface area	3,956	m2	
Unmixed/Mixed	unmixed		
Hydraulic retention time (HRT) (Avg)	26	d	
Surface loading	22	kg BOD/ha.d	
Holding lagoon (HL) performance	As per existing		
BOD	10%		
COD	10%		
SS	10%		
Total N	35%		
Total P	9%		
Holding lagoon (HL) discharge concentrations			
BOD	22	mg/L	
COD	77	mg/L	
SS	21	mg/L	
Total N	37	mg/L	

Total P	32	mg/L	32
TKN	49	mg/L	49
NOX	5	mg/L	
TDS	820	mg/L	820
Irrigation lagoon 1 (1L1)			
Volume	71	ML	
Surface area	25,000	m2	
Hydraulic retention time (HRT) (Avg)	292	d	
Organic loading	0.0003	kg COD/m3.d	very low
Surface loading	2.1	kg BOD/ha.d	very low
Irrigation lagoon 1 (1L1) performance			
BOD	-8%		
SS	-120%		
Total N	13%		
Total P	35%		
Irrigation lagoon 1 (1L1) concentrations			Monitoring 2012-2015
pH	7.8		7.8
BOD	29	mg/L	29
SS	35	mg/L	35
Total N	47	mg/L	48
Total P	21	mg/L	21
TKN	46	mg/L	46
NOX	1.4	mg/L	1.4
TDS	656	mg/L	656
Ca	17	mg/L	17
Mg	10	mg/L	10
K	34	mg/L	34

Total P	32	mg/L
TKN	3	mg/L
NOX	34	mg/L
TDS	820	mg/L
Irrigation lagoon 1 (1L1)		
Volume	71	ML
Surface area	25,000	m2
Hydraulic retention time (HRT) (Avg)	276	d
Organic loading	0.0003	kg COD/m3.d
Surface loading	2.3	kg BOD/ha.d
Irrigation lagoon 1 (1L1) performance		
BOD	-39%	
SS	-40%	
Total N	18%	
Total P	37%	
Irrigation lagoon 1 (1L1) concentrations		
pH	7.8	
BOD	30	mg/L
SS	30	mg/L
Total N	30	mg/L
Total P	20	mg/L
TKN	2	mg/L
NOX	28	mg/L
TDS	656	mg/L
Ca	17	mg/L
Mg	10	mg/L
K	34	mg/L

Na	138	mg/L	138	Na		mg/L
Irrigation lagoon 1 (1L1) annual loads				**Irrigation lagoon 1 (1L1) annual loads**		
Flow	116	ML		Flow	123	ML
BOD	3.4	t/yr		BOD	3.7	t/yr
SS	4.1	t/yr		SS	3.7	t/yr
Total N	5.5	t/yr		Total N	3.7	t/yr
Total P	2.4	t/yr		Total P	2.5	t/yr
TDS	76	t/yr		TDS	80	t/yr
Effluent Irrigation						
Area	55	ha			78	ha
Loadings						
Flow	2.1	ML/ha.yr			1.6	ML/ha.yr
TN	99	kg N/ha.yr			47	kg N/ha.yr
TP	44	kg P/ha.yr			31	kg P/ha.yr

References

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Ecowise Environmental 2007, GBP Exports Poowong Abattoir EPA Licence Renewal and land capability assessment, March 2007

ALS 2011,GBP Exports WAA - , March 2011

ALS 2011, Supplementary report to the GBP Exports WAA - Water Balance, March 2011

Attachment C – CEE Water Balances

GBP Poowong Export Abattoir
Effluent Reuse Water Budget

Average Rainfall Case
Existing flows

Using EPA crop factors

SUMMARY		Average year		90th %ile wet year										
- Wastewater inflow	ML/a	116		116										
- Water available	ML/a	118		122										
- Area required	ha	45		60										
- Irrigation rate	ML/ha.a	2.6		2.0										
- Volume stored (max)	ML	67		80										
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	**TOTAL**
CLIMATIC DATA														
- Mean evaporation	mm/mth	189	155	130	83	56	44	47	62	84	117	139	168	1271
- Lagoon evaporation	mm/mth	149	129	105	63	36	23	33	50	78	97	114	138	1012
- Mean rainfall	mm/mth	58	53	63	79	95	99	101	102	104	96	87	76	1013
- Effective rainfall	mm/mth	52	42	47	55	62	64	66	66	67	82	74	69	747
CROP DEMAND														
- Potential demand	mm/mth	132	109	91	50	28	22	19	31	50	82	97	118	
- Net irrigation demand	mm/mth	80	66	43	0	0	0	0	0	0	0	23	49	261
- Gross irrigation demand	mm/mth	80	66	43	0	0	0	0	0	0	0	23	49	261
Area needed to use flow	Hectares	14	17	26	0	0	0	0	0	0	0	49	23	
WATER USE														
- Wastewater Inflow	ML/mth	11.1	11.1	11.1	8.2	8.2	8.2	8.2	8.2	8.2	11.1	11.1	11.1	116
- Groundwater Inflow	ML/mth	0	0	0	0	0	0	0	0	0	0	0	0	0
- Net evap. from Storage	ML/mth	1.2	1.0	0.4	-0.6	-1.3	-1.5	-1.4	-1.0	-0.5	0.0	0.5	1.2	-1.9
- Available for irrigation	ML/mth	9.9	10.1	10.7	8.8	9.6	9.7	9.6	9.3	8.7	11.1	10.6	9.9	118
Area required	Hectares													45
- Used for irrigation	ML/mth	36	30	20	0	0	0	0	0	0	0	10	22	118
- Used for irrigation	ML/ha.a													2.6
STORAGE														
- Volume at start	ML	55	29	9	0	9	18	28	38	47	56	67	67	
- Volume at end	ML	29	9	0	9	18	28	38	47	56	67	67	55	
VARIABLES														
- Effective rainfall	%	90%	80%	75%	70%	65%	65%	65%	65%	65%	85%	85%	90%	
- Pan factor		0.79	0.83	0.81	0.76	0.64	0.52	0.70	0.80	0.93	0.83	0.82	0.82	
- Crop factor for	Pasture	0.70	0.70	0.70	0.60	0.50	0.50	0.40	0.50	0.60	0.70	0.70	0.70	
- Application efficiency		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	

Rainfall based on Nyora long term rainfall records (1974-2015)

Evaporation based on BOM Melbourne and Cranbourne long term evaporation data

GBP Poowong Export Abattoir
Effluent Reuse Water Budget

90th Percentile Wet Year Case
Existing flows

Using EPA crop factors

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	**TOTAL**
CLIMATIC DATA														
- Mean evaporation	mm/mth	189	155	130	83	56	44	47	62	84	117	139	168	1271
- Lagoon evaporation	mm/mth	149	129	105	63	36	23	33	50	78	97	114	138	1012
- Mean rainfall	mm/mth	68	62	74	93	112	116	119	120	122	113	102	90	1190
- Effective rainfall	mm/mth	61	50	55	65	73	75	77	78	79	96	87	81	877
CROP DEMAND														
- Potential demand	mm/mth	132	109	91	50	28	22	19	31	50	82	97	118	
- Net irrigation demand	mm/mth	71	59	35	0	0	0	0	0	0	0	0	37	202
- Gross irrigation demand	mm/mth	71	59	35	0	0	0	0	0	0	0	0	37	202
Area needed to use flow	Hectares	16	19	32	0	0	0	0	0	0	0	0	30	
WATER USE														
- Wastewater Inflow	ML/mth	11.1	11.1	11.1	8.2	8.2	8.2	8.2	8.2	8.2	11.1	11.1	11.1	116.1
- Groundwater Inflow	ML/mth	0	0	0	0	0	0	0	0	0	0	0	0	0
- Net evap. from Storage	ML/mth	1.0	0.8	0.2	-0.8	-1.7	-1.9	-1.7	-1.4	-0.9	-0.3	0.2	1.0	-5
- Available for irrigation	ML/mth	10	10	11	9	10	10	10	10	9	11	11	10	122
Area required	Hectares													60
- Used for irrigation	ML/mth	43	35	21	0	0	0	0	0	0	0	0	22	122
- Used for irrigation	ML/ha.a													2.0
STORAGE														
- Volume at start	ML	68	35	10	0	9	19	29	39	49	58	69	80	
- Volume at end	ML	35	10	0	9	19	29	39	49	58	69	80	68	
VARIABLES														
- Effective rainfall	%	90%	80%	75%	70%	65%	65%	65%	65%	65%	85%	85%	90%	
- Pan factor		0.79	0.83	0.81	0.76	0.64	0.52	0.70	0.80	0.93	0.83	0.82	0.82	
- Crop factor for	Pasture	0.70	0.70	0.70	0.60	0.50	0.50	0.40	0.50	0.60	0.70	0.70	0.70	
- Application efficiency		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
- Deficit before irrigation	mm	20												

Rainfall based on Nyora long term rainfall records (1974-2015)

Evaporation based on BOM Melbourne and Cranbourne long term evaporation data

lagoon part full

Appendix 2 – CEE Report of 25 April 2016 GBP Australia Pty Ltd Poowong Export Abattoir: Environmental Improvement Plan for Recycled Water Use on Farm

As attached.

GBP Australia Pty Ltd

Poowong Export Abattoir

Environmental Improvement Plan for Recycled Water Use on Farm

25 April 2016

GBP Australia Pty Ltd

Poowong Export Abattoir

Environmental Improvement Plan for Recycled Water Use on Farm

Prepared for:

GBP Australia Pty Ltd

Gardner Lane, Poowong VIC 3988

Prepared by:

CEE Pty Ltd

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Report Limitations

This report has been prepared in accordance with an agreement between *CEE* and the Organisation to whom this report is addressed. The services performed by *CEE* have been conducted in a manner consistent with the level of quality and skill generally exercised by members of its profession and consulting practices.

This report is prepared solely for the use of the person or organisation for which this report is addressed and in accordance with the terms of engagement for the commission. Any reliance of this report by third parties shall be at such party's sole risk. The report may not contain sufficient information for the purposes of other parties or for other uses. This report shall only be presented in full and shall not be used to support any other objectives than those set out in the report, except where written approval with comments are provided by *CEE*.

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	Wastewater treatment plant manager Farm manager Quality assurance officer
Responsible Persons	Wastewater treatment plant manager (operations and maintenance): Mr Nigel Smith & Mr Lorry Veeman Farm manager (operations and maintenance): Mr Dave Murphy Quality assurance officer (monitoring and reporting): Mr Bill Bato
Mailing Addresses	PO Box 5 Poowong VIC 3988

DOCUMENT QUALITY CONTROL

Version	Date	Description / Changes Made	Prepared by	Authorised by
1	24 Mar 2016	Draft for review by EPA	JLA/CEE	BS/PG
2	14 Apr 2016	Revised draft for EPA review	JLA/CEE	BS/PG
3	25 Apr 2016	To EPA	JLA/CEE	BS/PG

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File name:	EIP for Recycled Water Use on Farm
Name of Organisation:	GBP Australia Pty Ltd
Name of Project:	Poowong Abattoir

List of Contents

1 Introduction

This report describes the Environmental Improvement Plan (EIP) for the use of recycled water from the GBP Australia Pty Ltd Export Abattoir at 60 Gardner Lane, Poowong for use on the adjacent associated farm.

The report is set under the following main headings: (1) introduction; (2) existing abattoir and farm facilities and operation; (3) existing environmental conditions of farm; (4) recycled water flows, characteristics and loads; (5) EPA requirements; (6) environmental management action plan and timelines; (7) monitoring, auditing and review; (8) commitments.

This section summarises the background of the project.

1.1 Purpose of EIP

The purpose of the EIP is to provide a living document for driving continuous improvement of wastewater management at the site. The EIP enables the organisation to improve environmental performance through a comprehensive approach to environmental management. It includes an action plan with goals and timelines, together with provision for ongoing monitoring and reporting of environmental performance. The EIP is the company's public commitment to improve performance. Progress against the plan is regularly reviewed and reported to the public.

1.2 The Proponent

The proponent is GBP Australia Pty Ltd (the Owner)

1.3 Background

GBP Australia Pty Ltd own and operate an export abattoir located in Gardner Lane, Poowong. Wastewater generated is treated anaerobically and aerobically on-site prior to winter storage and effluent irrigation in summer on the associated farm.

The abattoir has a process capacity of 250 to 480 cattle per day, depending on carcass weight. The site abattoir operations include the following: holding pens, slaughter floor, offal processing, boning and packing rooms, paunch handling, and chilling and freezer rooms.

The owner proposes to install a rendering facility at the site and submitted an EPA Works Approval Application (WAA) (No. 1001995) on 31 July 2015. Subsequently, EPA have requested that additional information is required, including an Environmental Improvement Plan (EIP), to be supplied, which is the subject of this report.

2 Existing Abattoir and Farm Facilities and Operations

2.1 Outline of Site and Activities

Major components and activities of the 126 ha Poowong abattoir and associated farm site are:

- Export abattoir site (nominal 13 ha) located on the southwest of the site abutting Gardner Lane.
- Activities/facilities on the abattoir site include cattle yards, abattoir and associated water supply dam and wastewater treatment
- Farm site (nominal 113 ha) located to the east of the abattoir site and abutting Houlahan's Lane. The farm site includes about 30 ha of recently acquired land at the north end of the farm.
- Activities undertaken on the farm include recycled water storage and irrigation, and cattle grazing. An estimated 55 ha of the farm is currently developed for irrigation (including about 4 ha on adjacent Arnold's property). An additional 23 ha of the new northern land (paddocks 1, 2, 3 and 5) is considered suitable for irrigation development (i.e. total of 78 ha).

Figure 2-1 shows an aerial photograph of the abattoir and farm site indicating the major activities.

2.2 Abattoir

The abattoir has a process capacity of 250 to 480 cattle per day, depending on carcass weight. Annual production is variable, depending on supply and demand. The current average daily production is 395 cattle per day, based on the 2014/15 annual throughput of about 95,000 cattle and 240 production days per year.

The site abattoir operations include the following: holding pens, slaughter floor, offal processing, boning and packing rooms, paunch handling, and chilling and freezer rooms.

2.3 Wastewater Treatment Facilities and Operation

2.3.1 Overview

The existing wastewater treatment system was installed in 1993. It is based on technology developed by the CSIRO and designed by John Green of Australian Meat Technology. The system is designed to remove solids for composting, and biologically remove some nutrients to improve the water quality for irrigation.

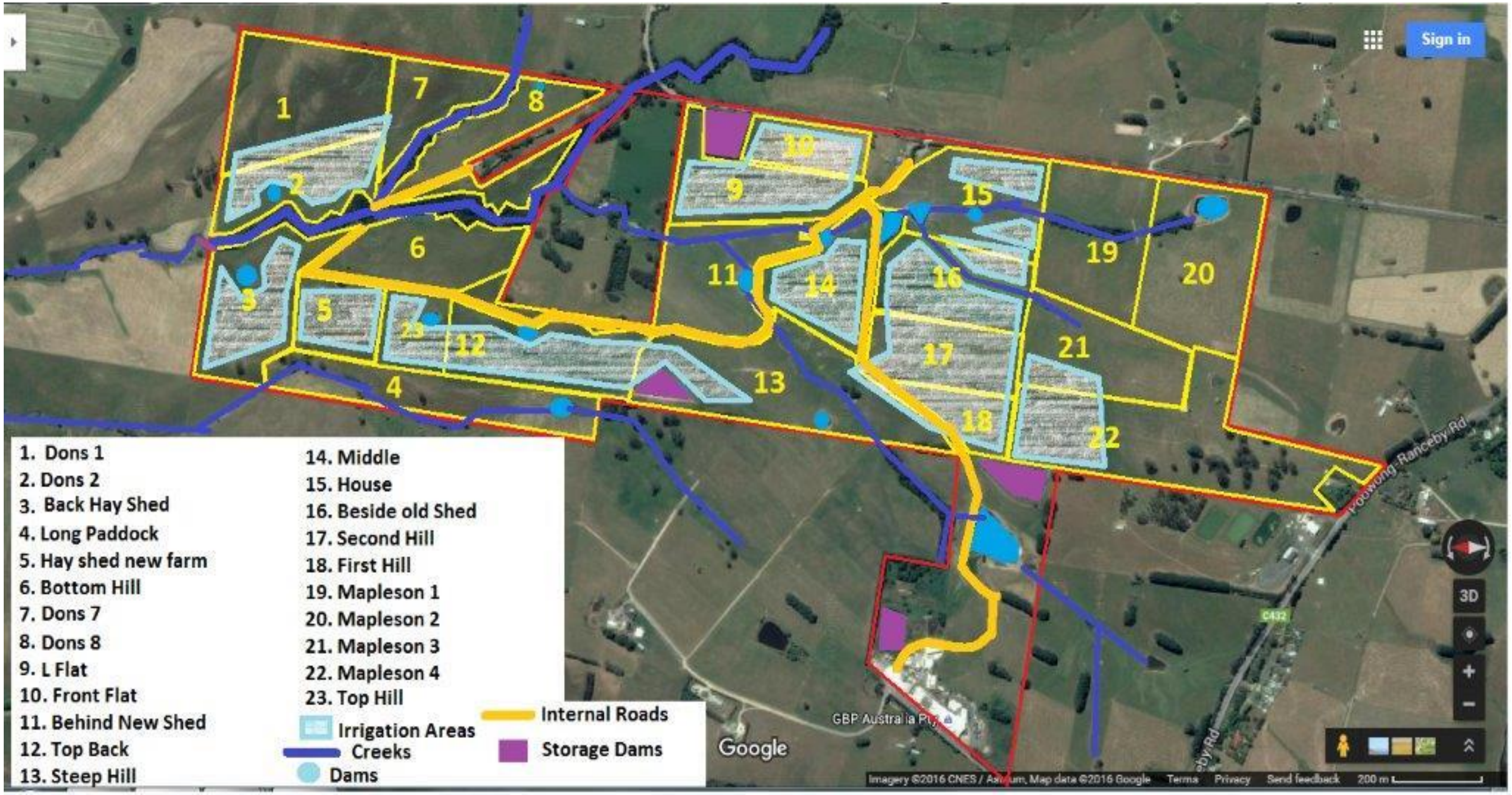


Figure 2-1 Site Plan of Poowong Abattoir and Farm

2.3.2 Major Process Steps and Facilities

- Coarse screen to remove trash and large solids
- Flow attenuation tank
- Two screw presses (duty/standby) to remove paunch manure and fine solids for composting
- Two anaerobic lagoons (in series) to remove organics and stabilise settled solids
- Mechanically aerated lagoon, operated as sequencing batch reactor to remove organics and some nitrogen
- Effluent holding lagoon prior to storage and use on the associated farm or used as cattle stockyard washwater.

Figure 2**-**2 shows a simplified process flow sheet of the wastewater treatment and recycled water system.

2.3.3 Assessment of Existing Wastewater Treatment Facilities and Performance

A detailed assessment of the existing wastewater treatment plant facilities, processes and performance was undertaken as a requirement of the Section 22 submission to EPA (CEE April 2016, ' Poowong Exports Abattoir- Wastewater Management, Existing Conditions assessment and Master Plan').

Table 2-1 summarises of the results of the associated wastewater monitoring undertaken as part of the assessment, together with historical results for the primary irrigation lagoon (winter storage).

Table 2-1 Summary of Wastewater Monitoring for Wastewater Treatment Plant (2012 to Dec 2015)

Wastewater Stream / Characteristic		Abattoir waste	Screened effluent	Anaerobic lagoon 1 effluent	Anaerobic lagoon 2 effluent	Aerated lagoon effluent	Holding lagoon effluent	Irrigation lagoon 1
BOD tot.	mg/L	3820	3250	1,500	150	94	27	29
BOD filt.	mg/L		555	560	75	43	36	
COD	mg/L	8470	7200	4,400	535	298	180	
SS	mg/L	4570	3200	1,100	160	56	16	35
TKN	mg/L					98	49	46
NOX	mg/L					0.5	5	1.4
Total N	mg/L	310	275	170	160	98	54	47
Total P	mg/L	63	54	43	41	35	32	21
pH								7.8
TDS	mg/L						820	660
Na	mg/L							138
K	mg/L							34
Ca	mg/L							17
Mg	mg/L							10

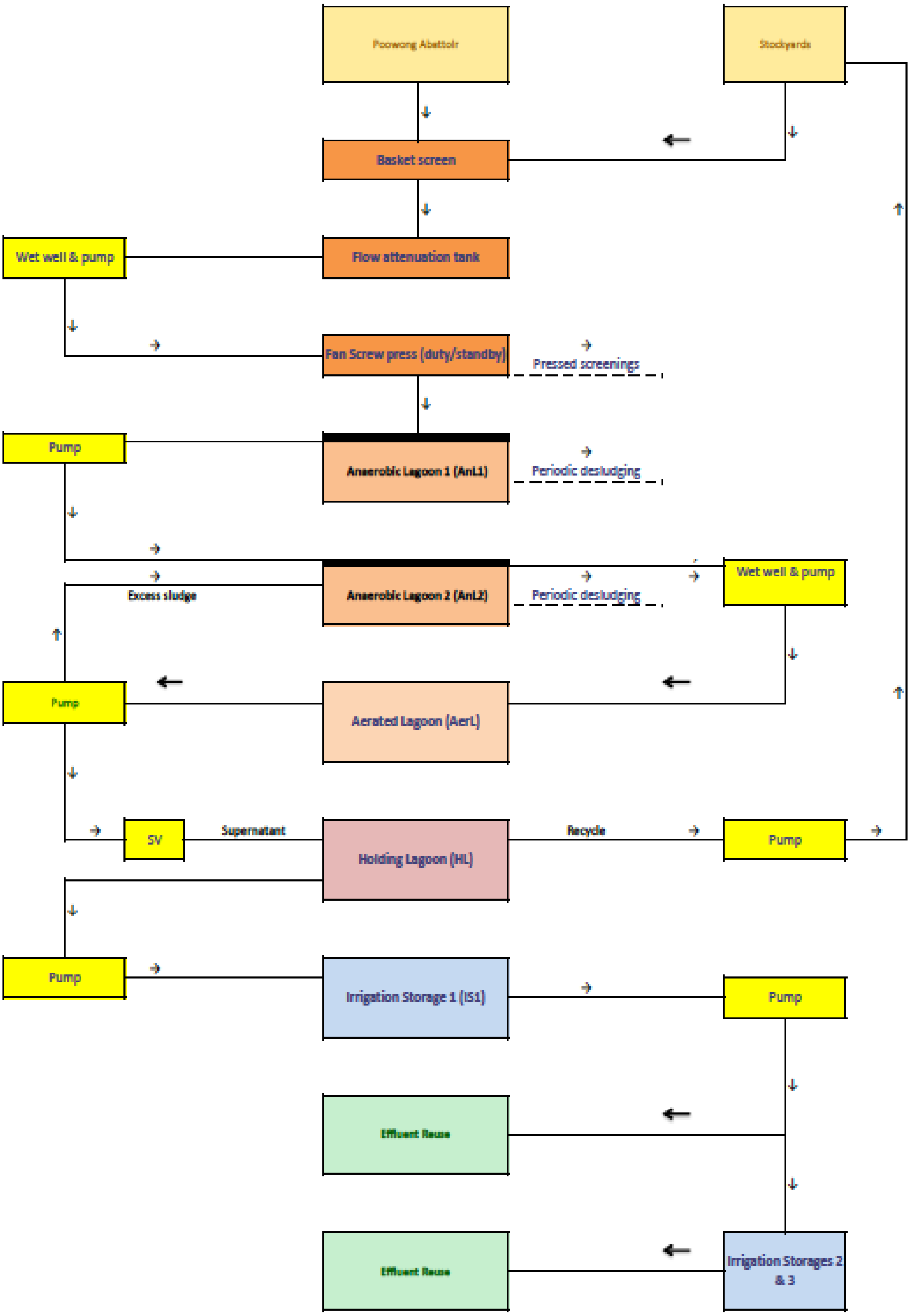


Figure 2-2 Wastewater Treatment and Reuse Process Flow Sheet

2.4 Recycled Water Storage and Irrigation Facilities and Operation

2.4.1 Overview

Recycled water from the abattoir has been used on the associated farming property for approximately 40 years.

The primary function of the farming operation is to sustainably use recycled water produced by the abattoir wastewater treatment plant that cannot be economically used in some other part of the plant.

A secondary function of the farm is to act as a temporary holding and refattening property as an adjunct to the abattoir operation, with high stock numbers being depastured at the property from time to time.

2.4.2 Farm Site Description

Figure 2-1 shows a plan of the Poowong abattoir farm, indicating the location of winter storages, irrigation areas, watercourses and internal access roads.

Major Facilities

- Total winter storage capacity of 74 ha (estimated range 63 ML to 87 ML), including 5 ML in holding lagoon, based on 300 mm minimum freeboard
- Seven existing irrigation paddocks with total irrigable area of 55 ha.
- As noted above, an additional 23 ha of land located at the North end of the farm is considered suitable for irrigation. This land was recently purchased but has not yet been developed for irrigation.
- Run-off collection dam (nominal capacity 0.5 ML)
- 150 mm dia rising main header with a series of in-ground hydrant points
- Two hard hose irrigators (travelling gun irrigators) can be coupled to the hydrants

Table 2-2 summarise the estimated capacity of each recycled water storage, together with the estimated minimum and maximum working volume, based on the likely range in water depth.

The volume of each lagoon was then estimated using CEE lagoon volume model, which uses the average length and width of the base, internal bank slope, depth to liquid surface and freeboard. The leading surface dimensions (i.e. length and width) were measured using walker travel wheel and confirmed using Google Earth. The depth and internal bank slopes based on previous reports submitted to EPA (ALS 2011 – Works Approval Application, Ecowise Environmental 2007 – EPA Licence Renewal and Land Capability Assessment), advice from GBP operator, the external height of lagoon embankments, and on visual inspection during drawn down state.

Table 2-2 Summary of Recycled Water Storage Capacities

Item	Estimated Capacity, ML	Estimated Capacity Range, ML	Comment
Winter storage 1	32	25 to 36	Top dam (South end)
Winter storage 2	9	7 to 10	West side
Winter storage 3	29	26 to 36	East side
Holding lagoon	5	5	50% available for storage
Total storage capacity	74 ML	63 ML – 87 ML	

~~rs~~.

Figure 2-3 and Figure 2-4 show photographs of the farm recycled water storages and irrigation paddocks.

Table 2-3 summarises the recycled water irrigation areas. The area of each irrigation plot (paddock) was determined using computer mapping of the site with allowance for appropriate buffer distances to watercourses and sensitive receptors.

Figure 2-3 and Figure 2-4 show photographs of the farm recycled water storages and irrigation paddocks.

Table 2-3 Summary of Recycled Water Irrigation Areas

Plot Number	Paddock Number	Area, ha	Paddock names
Existing irrigation development			
1	14, 16, 17, and 18	25	Middle, Beside old shed, Second hill and First hill
2	12 and 23	8	Top back and Top hill
3	9 and 10	6	L flat and Front flat
4	Part 21 and 22	4	Mapleston 3 and 4 (Arnolds)
5	15	5	House
6	11	3	Behind new shed
7	13	4	Steep hill
Total existing area		**55 ha**	
Proposed new irrigation			
8	1 (part), 2, 3 & 5	23 ha	Dons 1 and 2, Back hay shed and Hay shed new farm
Total existing and potential irrigation area		**78 ha**	

	Holding Lagoon Inlet bottom right and Outlet centre left
	Winter Storage 1 at southern end of farm (looking west to abattoir)
	Winter Storage 2 on west side of farm (looking south)

Figure 2-3 Photographs of Recycled Water Storages

	Plot 1 (paddock 18 with paddock 17 in background) at southern end of farm. View from top dam looking east
	Plot 4 (paddock 22 – Arnold's Farm) View looking south from top dam
	Plot 1 (Paddock 17 with paddock 14 in background) at southern end of farm View looking northeast

	Plot 2 (Paddock 2) View north
	Plot 8 (Paddock 5 with paddock 3 in background). New North paddocks not currently irrigated. Proposed additional irrigation area View north
	Plots 6 and 3 (Paddock11 with paddocks 9 and 10 in background) View south east from centre of farm Catch dam in centre right Plot 3 irrigated below house on east boundary (centre left)

Figure 2-4 Photographs of Farm Irrigation Paddocks

Current Operation

Effluent from the abattoir wastewater treatment plant is pumped to the main winter storage (IST1) located on the southern boundary of the farm and then as required pumped to two other storages to the north.

Irrigation is generally undertaken from October to March using the two travelling irrigators. Irrigation is rotated around the paddocks based on irrigation requirements by regularly changing the hydrants connected, which generally have multiple run alignments. Each hydrant services a number of possible irrigation runs (up to 300 m long) and some of the runs overlap close to the hydrant point.

On the eastern side of the farm (adjacent to Houlahan's Lane) the land consists of several large gently sloping north facing paddocks. On the western side of the farm a ridgeline follows the line of Gardner Lane.

Cattle Grazing

A with-holding period of at least 7 days is applied between the end of irrigating recycled water and the commencement of cattle grazing. This with-holding period.exceeds the 5 day period referred to in the *Agriculture Victoria AG1089 publication: Reclaimed Water - Use in Cattle Production*, and the lesser holding period of at least 4 hours noted in the *EPA VIC 464.2 Guidelines Section #6.2 Table 2.*

GBP's abattoir is a registered Export Plant and is controlled under Federal DAFF Export Meat requirements, which limits processing of animal for slaughter under rigorous with-holding periods for Export Slaughter Intervals (ESI), which exceed any of the periods noted above.

3 Existing Environmental Conditions of Farm

This section describes the existing environment of the Farm in terms of: topography and drainage, soils, groundwater, land-use, vegetation, meteorology, and land capability assessment.

3.1 Topography and Drainage

On the eastern side of the farm (adjacent to Houlahan's Lane) the land consists of several large gently sloping north facing paddocks. On the western side of the farm a ridgeline follows the line of Gardner Lane.

Natural drainage on the site is to the north and northeast (Pheasant Creek and Lang Lang River).

3.2 Soils

3.2.1 General

Soil maps of the region list the soil type for Poowong and the greater region as part of the Strzelecki Association. Inspection of the farm and associated soil testing indicates that the soils are similar over most of the property and are yellow brown gradational soils developed on weathered Cretaceous sandstones and mudstones. The soils are moderately deep and merge to weathered rock at about 1.5 m on the gentler slopes, but only persist to about 1.2 metres on steeper parts of the property.

3.2.2 Soils Assessment

Soil Sampling Procedure

Soil samples were collected from three depths along four different transects (refer Figure 3-1 and CEE April 2016, ' Poowong Exports Abattoir- Wastewater Management, Existing Conditions assessment and Master Plan').

Three transects were selected within the existing irrigation area of the farm and were in the Top Hill paddock, the West paddock, the East Flats. These areas have been irrigated regularly with recycled water for some years. The fourth site was at the north end of the farm in one of the New North paddocks where there has been no history of irrigation. Thus the fourth site is a good indication of soil conditions prior to the current regime of irrigation with recycled water.

Soil data

The soil analytical data is provided in the following Table. Interpretation of the data for each of the key analytes of salinity, sodicity, pH, nitrogen and phosphorus is undertaken below.

Figure 3-1 Soil Sampling Transects

Sample ID		Below the House			Big Dam Hill			Back Hill			Hay Paddock		
Sample Name	Units	PABS 1	PABS 2	PABS 3	PABS 4	PABS 5	PABS 6	PABS 7	PABS 8	PABS 9	PABS 10	PABS 11	PABS 12
Irrigation		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
Sample Depth From		0-10 cm	10-20 cm	20-40 cm	0-10 cm	10-20 cm	20-40 cm	0-10 cm	10-20 cm	20-40 cm	0-10 cm	10-20 cm	20-40 cm
Crop		Pasture	Pasture	Pasture	Pasture	Pasture	Pasture	Pasture	Pasture	Pasture	Pasture	Pasture	Pasture
pH (1:5 Water)		5.8	5.8	6.0	6.3	6.9	6.5	5.7	5.7	5.7	5.5	5.7	5.8
pH (1:5 CaCl2)		4.7	4.8	4.7	5.9	5.7	5	4.9	4.6	4.5	4.6	4.6	4.5
Elect. Conductivity	dS/m	0.13	0.15	0.07	0.36	0.19	0.12	0.11	0.07	0.04	0.07	0.05	0.02
Phosphorus (Colwell)	mg/kg	284	204	45	493	179	35	152	97	31	35	13	7
Phosphorus (Olsen)	mg/kg	83	83	22	129	59	17	47	28	13	13	5.4	3.4
Total Phosphorus	mg/kg	1215	836	295	1845	741	230	942	645	278	605	389	231
Phosphorus Buffer Index		183	190	161	173	168	228	180	162	198	170	154	156
Calcium (Amm-acet.)	meq/100g	5.0	5.2	3.3	8.1	5.0	2.0	9.0	7.3	5.3	10.0	8.9	7.2
Potassium (Amm-acet.)	meq/100g	2.2	2.1	1.6	3.5	1.4	0.3	2.5	2.1	1.9	2.0	1.8	2.0
Magnesium (Amm-acet.)	meq/100g	1.4	1.4	1.1	1.7	1.0	0.57	1.3	1.2	0.9	0.44	0.49	0.54
Sodium (Amm-acet.)	meq/100g	0.81	0.94	0.86	3.2	2.3	2.3	0.37	0.36	0.39	0.3	0.22	0.24
Calcium/Magnesium Ratio		3.6	3.8	3.1	4.7	5.0	3.5	6.7	6.1	5.9	23	18	13
Aluminium	meq/100g	0.25	0.32	0.63	0.03	0.04	0.53	0.2	0.51	1.34	0.43	0.55	0.96
Cation Exch. Cap.	meq/100g	9.4	9.6	6.7	16	9.7	5.2	13	11	8.5	13	11	10
Sodium % of Cations (ESP)	%	8.6	9.8	12.8	19.2	23.7	44.2	2.8	3.3	4.6	2.4	1.9	2.4
Ammonium nitrogen	mg/kg	6.0	4.0	<1	2.0	1.0	<1	14.0	2.0	<1	4.0	2.0	7.0
Nitrate nitrogen	mg/kg	36	47	8	72	27	11	25	20	8.0	12	9.0	4.0
Total nitrogen	%	0.42	0.32	0.14	0.47	0.27	0.13	0.53	0.33	0.15	0.5	0.31	0.15
Organic carbon	%	3.0	2.4	1.1	5.2	2.2	1.3	4.2	2.9	1.5	3.6	2.6	1.0
Carbon nitrogen ratio		7.2	7.6	7.9	11.1	8.1	9.6	7.8	8.8	10.0	7.3	8.4	6.5
Sulphur	mg/kg	24	21	6.1	27	12	7.7	12	7.8	5.9	6.8	2.9	1.9
Chloride	mg/kg	28	28	19	85	63	70	23	9.2	7	27	5.7	2.2
Boron	mg/kg	0.62	0.60	0.41	0.81	0.43	0.37	0.72	0.54	0.5	0.71	0.53	0.44
Available Potassium	mg/kg	549	575	416	690	392	222	521	520	350	210	191	209

Salinity

Soil salinity is commonly measured as the electrical conductivity (E.C.) of a 1:5 soil water suspension and the conductivity gives a direct measurement of the concentration of free salts in the soil. The measurement covers all salts in the soil, not just sodium chloride. Values of less than 0.3 dS/m indicate low and harmless salt content. Values above 0.3 dS/m up to around 0.6 dS/m indicate a mild level of salinity. Values above 0.6 dS/m indicate that toxic levels of salt may be present and potentially restricting plant growth.

With exception of the surface soil sample in the Big Dam Hill paddock, all values obtained were less than 0.3 dS/m. The surface soil sample (o to 10 cm) in the Big Dam Hill paddock had an electrical conductivity of 0.36 dS/m indicating that there is some minor salinity here, but there is no increase with depth, and this mild salinity is most likely due to impeded drainage in the topsoil (see below). Overall the soils have either none or very little residual or induced salinity.

Sodicity

Soil sodicity is measured by the percentage of exchangeable sodium compared to the total of exchangeable cations in the soil, and the percentage is abbreviated to the acronym ESP. A soil is considered to be sodic if the ESP value is above 6% (more than 6% of the exchangeable cations are sodium ions) and strongly sodic if the ESP is greater than 15%. As soils become more sodic, they lose some of the important physical properties that influence productivity. In particular, sodic soils are less permeable, less well aerated, prone to surface sealing, and have a narrower range of suitable moisture content for cultivation. At extreme levels of sodicity sodium ions may reach toxic levels for some plant species.

Because recycled water normally has an imbalance of sodium over other cations, there is a tendency for soils irrigated with recycled water to become sodic and strongly sodic over time. Maintaining the soil at a moderate to low level of sodicity is an integral part of protecting a recycled irrigation property for long-term use.

The soils on the Big Dam Hill Paddock are strongly sodic (19% at the soil surface to 44% in the subsoil). The level of sodicity here is surprisingly high, given that the recycled water has an SAR of 5.9. The high values indicate some other event in the history of the paddock that has contributed to the very strong sodicity. This level of sodium saturation will adversely affect soil permeability and it is possible that the sodium is high enough to be toxic to some pasture species.

The high sodicity of the Big Dam Hill (paddocks 17 and 18) need to be corrected with gypsum, and may require a number of applications to bring the sodicity down to an acceptable level

The soils on Paddock 10 (i.e. Front flat paddock, Below the House) are also sodic but not to the same extent as the Big Dam Hill Paddock. No remedial action is required here. The soils on the Back Hill Paddock (paddocks 3 and 5) were not sodic.

Soil pH

Soil pH determines the availability of most plant nutrients as it affects their solubility. The conventional measure of this parameter is the pH value of 1:5 soil water mixture. The most desirable soil pH is close to the neutral value of 7 or just mildly acid (6.5).
With extreme acidity when soil pH is below 5.0, a number of nutrients become unavailable including phosphorus, magnesium, and molybdenum. At high pH when soil pH becomes higher than 8.5, other nutrients such as zinc and manganese are adversely affected.

The recycled water is slightly alkaline with a pH of 7.8, and as such it has the potential to beneficially increase soil pH by minor amounts.. The values for surface soil pH were all slightly acid and within the highly desirable area for this parameter. There was little change with depth and no evidence of any undesirable trends.

Soil Nitrogen

Nitrogen is a key nutrient for plant vigour. Inadequate nitrogen will stunt and retard growth. Inadequate nitrogen will suppress water utilization by the pasture or crop. Excess nitrogen is likely to be an environmental hazard, as it is a quite mobile nutrient and if it isn't used by the crop or pasture, it can be present in surface runoff from the soil. Nitrogen in waterways causes algal blooms, deoxygenation and a range of other problems.

Soil nitrogen is difficult to accurately assess as it is constantly responding to soil temperature and moisture fluctuations. It is best monitored by examining the soil carbon nitrogen ratio in conjunction with soil nitrate value. The soil carbon nitrogen ratio will normally be somewhere between 9 and 14, with the lower values reflecting adequate supply of soil nitrogen for plant growth and the higher values reflecting a shortage of nitrogen and intense competition from soil micro flora for this nutrient.

Where the carbon nitrogen ratio is less than 9, nitrogen is likely to be in excess and there is potential for nitrogen to migrate through the soil profile and potentially contaminate groundwater. However nitrate itself has to be present as well. The potential for groundwater contamination exists where low carbon nitrogen values co-exist with nitrate concentrations above 5 mg/kg.

Future pasture management will remove surplus nitrogen from the soil in silage and hay crops.

Soil Phosphorus

Phosphorus is an important plant nutrient and needs to be present at a moderate level in order to avoid growth restrictions due to inadequate phosphate. Excessive amounts of phosphorus can however potentially be a pollutant of waterways in relatively small volumes, and the recycled effluent at GBS Exports does contain significant soluble phosphorus that could potentially find its way to surface waters.

Most Australian soils have inherently high phosphorus fixation and immobilisation properties, such that applied phosphate is adsorbed onto the surface of clay particles in the soil and will not migrate through the soil. Poowong soils are not particularly noted for their phosphate adsorption capacity and the values for Phosphorus Buffering Index (PBI) range from around 150 to 200. This is moderate to low for this parameter.

The values for plant available phosphorus (Olsen P) are high in the surface soil and elevated in the lower soil depths. An adequate level of soil phosphorus in the surface soil of these soils would be an Olsen P value of 15 to 20 mg/kg and an excessive level would be more than 30 mg/kg. All three surface soils where irrigation is in use have values well in excess of 30 mg/kg, with the highest being 129 mg/kg. The same high values persisted into the subsoil, with the value for the 20 to 40 cm sampling depth being 22 mg/kg, 17 mg/kg and 13 mg/kg respectively for the East Flats, the Top Hill and the West paddock. In comparison the unirrigated New North Paddock had a subsoil value (20 to 40 cm) of 3.4 mg/kg.

Conclusion

A different approach to the management and containment of phosphorus is required as a consequence of the saturation of the phosphorus adsorption sites in the surface soils. Phosphorus input to the soil/plant system will need to be matched by phosphorus removal in animal and plant products, so that there is zero or minimal further net accumulation of phosphorus within these soils. This can be achieved through a cropping program on the irrigated areas, whereby livestock are removed in late winter or early spring from those paddocks to be irrigated each season, and a silage crop is cut and removed from the property (refer Section 6).

3.3 Groundwater

No groundwater data is currently available for the farm.

3.4 Landuse

Landuse is historically for stock grazing, with occasional harvesting of grasses for the production of hay.

At the south-eastern point of the property there is a dairy property. At the north and west sides are grazing properties. A public sealed road borders the eastern side.

3.5 Vegetation

Most of the farm is pasture. There are several isolated large trees scattered around the property. Naturally forming surface water runoff collection ponds are present in the lower paddocks and are bordered with water plants and rushes.

The farm has fair quality pastures, which are dominated by couch grass, bent grass, soft brome, paspalum, wild radish and Prince of Wales feather. Where ryegrass and other improved species are present, they appear to be of only moderate vigour and perhaps are older cultivars of ryegrass not suited to irrigation. There is considerable potential for improving pastures and restoring a vigorous pasture sward.

3.6 Meteorology

Local climatic conditions influence the recycled water strategies. Aspects of climate of particular importance include rainfall, evaporation, temperature and wind. Seasonal variations in annual rainfall and evaporation rates control the potential application rates for recycled water onto land.

A summary of the annual rainfall and evaporation values adopted for the Poowong area is given in Table 3-1 and on
Figure 3-2.

Table 3-1 Monthly and Annual Rainfall and Evaporation for Poowong Area

	RAINFALL, mm/month		EVAPORATION, mm/day
Period	**Mean**	**90%ile**	**Mean**
Jan	58	68	189
Feb	53	62	155
Mar	63	74	130
Apr	79	93	83
May	95	112	56
Jun	99	116	44
Jul	101	119	47
Aug	102	120	62
Sep	104	122	84
Oct	96	113	117
Nov	87	102	139
Dec	76	90	168
Annual	**1010**	**1190**	**1270**

Long-term regional rainfall and evaporation data was reviewed. Rainfall data was based on the average of monthly average values for Nyora (Bureau of Meteorology (BOM) station at Nyora Post Office No. 86281 (years 1970-2015), located 8 km west of Poowong).

Evaporation data was based on average monthly values for BOM stations at Cranbourne (No. 86375) (years 1990-2014) and Melbourne (No. 86071) (years 1955-2014).

Mean monthly rainfall values for the region varies significantly with the season ranging from a low of 53 mm in February up to 104 mm in September.

The mean monthly evaporation also shows a marked seasonality, with the highest evaporation occurring during summer varying from a peak of 189 mm in January down to 44 mm in June.

On average, annual evaporation exceeds annual rainfall by about 260 mm and exceeds the monthly rainfall for 7 months per year.

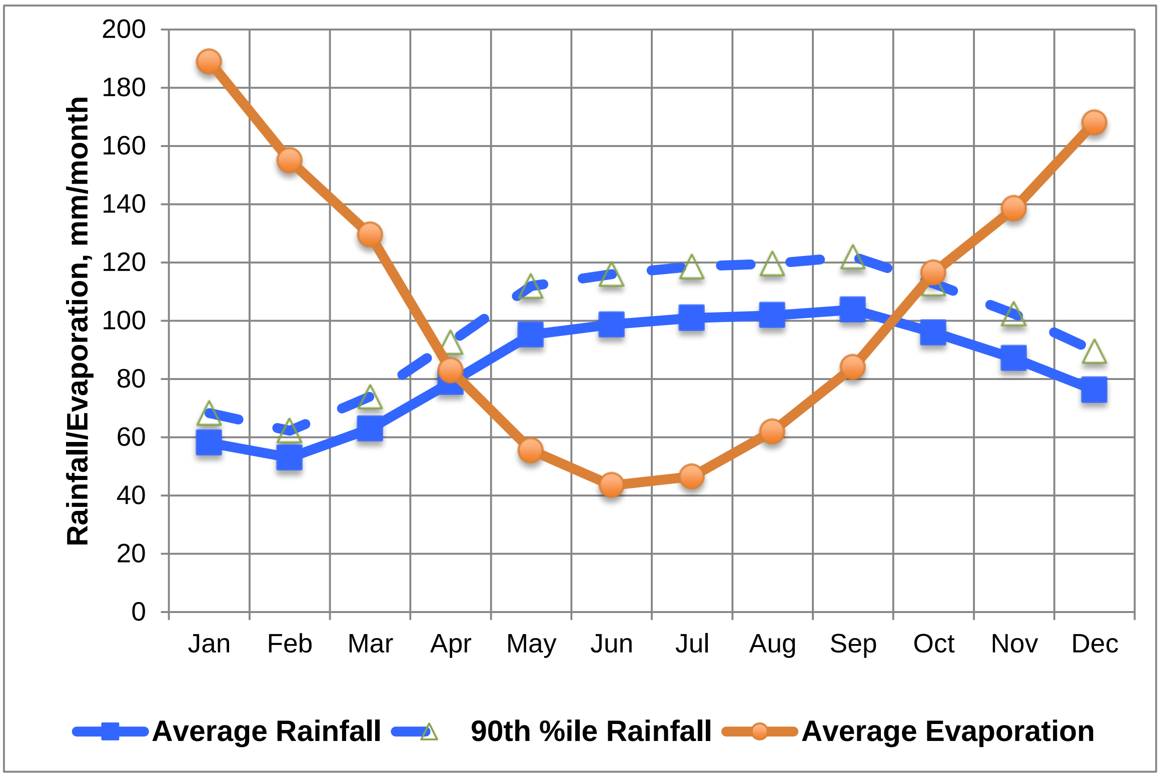


Figure 3-2 Monthly Rainfall and Evaporation for Poowong Area

3.7 Land Capability Assessment

The quantity and quality of recycled water used for irrigation can have a major impact on surface water (i.e. run-off), soil properties and groundwater, as such irrigation must be managed to ensure that it is applied in a sustainable manner. The common limitations to sustainable irrigation with recycled water include: (a) hydraulic loading (i.e. annual unit quantity applied, ML/ha.yr), (b) nutrient loads (i.e. TN and TP annual loads, kg/ha.yr) and (c) salinity/sodicity load on the soil. Limitations may also occur due undesirable changes in soil pH.

3.7.1 Effluent Application Rates and Water Balance

The volume of water required for irrigation depends on the soil type, drainage, proposed plants/crops, evaporation and annual rainfall. The demand for recycled water at the farm is seasonal and occurs generally in the warmer months from the end of October to early April, although the irrigation season can extend or shorten depending on actual rainfall. Due to slow plant growth during the low temperature winter months, there is very little demand by plants during that period.

Sustainable effluent application rates, irrigation area and winter storage requirements were predicted using the CEE Water Budget Model. This model is based on Victorian EPA Guidelines (EPA Publication #168).

Attachment B shows the CEE water balance spreadsheets for average and 90th percentile wet year cases for the existing situation and operations.

The estimated average irrigation demand for pasture (average effluent application rate) was calculated to be 2.6 ML/ha.yr. This is for an average rainfall season. For the 90th percentile wet year, this irrigation demand is down to 2.0 ML/ha.yr. Experience in the region indicates that average water application rates of 2.5 to 3.0 ML/ha.yr are typical for irrigated pasture.

4 Recycled Water Flows, Characteristics and Loads

This section describes the present and projected future recycled water flows and loadings to be irrigated on the farm.

4.1 Recycled Water Volume

The estimated current annual wastewater flow is 116 ML/yr (i.e. average daily for of 484 kL per production day) and is predicted to increase 6 % to 123 ML/yr with the addition of wastewater from the proposed rendering plant of 27 kL/d.

The abattoir wastewater flows are based on the average daily potable water consumption water meter readings of 520 kL/d for production days and on an adopted ratio of wastewater flow to water use of 93% (Reference: Peter Gilbertson 2016 water balance).

Table 4-1 summarises the estimated current and projected future wastewater flows.

Table 4-1 Estimated Current and Projected Future Wastewater Flows

Item	Units	Current Abattoir 2015	Proposed Rendering	Future Abattoir & Rendering	% Increase
Daily	kL/d	484	27	511	6%
Weekly	kL/week	2,420	135	2555	
Annual	ML/yr	116	7	123	

4.2 Recycled Water Quality

Recycled water is pumped to the farm from the abattoir wastewater treatment plant (i.e. from the holding lagoon to the primary winter storage).

Historically the quality of the recycled water in the winter storage has generally met Class C recycled water quality. Table 4-2 summarises the historical water quality in the primary winter storage (i.e. last 3 years, period Oct 2012 to Dec 2015, 14 samples).

The future recycled water quality is designed to meet Class C recycled water quality following implementation of the rendering facility and the wastewater treatment master plan upgrade (refer CEE report, April 2016).

Table 4-2 Predicted Future and Historical Recycled Water Quality in the Primary Winter Storage on the Farm

Characteristic	Median (50th percentile) Predicted future after upgrade	Median (50th percentile) Historical (2012-2015)	90th percentile*	EPA Class C limits (median)
Suspended solids (mg/L)	30	36	77	< 30
BOD (mg/L)	20	20	46	< 20
pH (pH units)	Range 7.0 to 8.0	Range 7.3 to 8.0		6 to 9
TKN (mg/L)	2	44	80	
NOX N (mg/L)	28	0.3	4.0	
Total nitrogen N (mg/L)	30	44	81	
Total P (mg/L)	20	19	30	
E coli (orgs/100 mL)	<1000			< 1000
TDS (mg/L)	610	610	870	
Sodium Na (mg/L)	150	150	182	
Potassium K (mg/L	33	33	42	
Calcium Ca (mg/L)	16	16	20	
Magnesium Mg (mg/L)	10	10	11	

Recycled Water Loads Applied .

Table 4-3 summarises the current and projected future annual recycled water flows and nutrient loads applied to the farm.

Table 4-3 Summary of Current and Projected Future Recycled Water Loadings Applied to Farm

Parameter	Units	Current Operation	Future Operation	Comment
Annual effluent loads				
Flow	ML/yr	116	123	6% increase
BOD	t/yr	2.3	2.5	
SS	t/yr	4.2	3.7	
Total N	t/yr	5.1	3.7	32% decrease
Total P	t/yr	2.2	2.5	
TDS	t/yr	71	75	

5 EPA Requirements

Requirements for use of recycled water are detailed in EPA publication 464.2, 'Use of Recycled Water - Guidelines for Environmental Management', June 2003. Relevant requirements for this project are detailed below.

5.1 Recycled water quality

EPA requirements for the use of the various classes of recycled water quality (e.g. Class C) are detailed on Table 1 (refer page 20 of EPA publication 464.2) (refer below).

Table 1. Classes of recycled water and corresponding standards for biological treatment and pathogen reduction

Class	*Water quality objectives - medians unless specified* [1,2,]	*Treatment processes* [a]	*Range of uses– uses include all lower class uses*
A	Indicative objectives • < 10 *E.coli* org/100 mL • Turbidity < 2 NTU[4] • < 10 / 5 mg/L BOD / SS • pH 6 – 9[5] • 1 mg/L Cl_2 residual (or equivalent disinfection)[6]	Tertiary and pathogen reduction[7] with sufficient log reductions to achieve: <10 *E.coli* per 100 mL; <1 helminth per litre; < 1 protozoa per 50 litres; & < 1 virus per 50 litres.	Urban (non-potable): with uncontrolled public access Agricultural: eg human food crops consumed raw Industrial: open systems with worker exposure potential
B	• <100 *E.coli* org/100 mL • pH 6 – 9[5] • < 20 / 30 mg/L BOD / SS[8]	Secondary and pathogen (including helminth reduction for cattle grazing) reduction[7]	Agricultural: eg dairy cattle grazing Industrial: eg washdown water
C	• <1000 *E.coli* org/100 mL • pH 6 – 9[5] • < 20 / 30 mg/L BOD / SS[8]	Secondary and pathogen reduction[7] (including helminth reduction for cattle grazing use schemes)	Urban (non-potable) with controlled public access Agricultural: eg human food crops cooked/processed, grazing/fodder for livestock Industrial: systems with no potential worker exposure
D	• <10000 *E.coli* org/100 mL • pH 6 – 9[5] • < 20 / 30 mg/L BOD / SS[8]	Secondary	Agricultural: non-food crops including instant turf, woodlots, flowers

Notes to Table 1

1. Medians to be determined over a 12-month period. Refer table 6 for Notification / reclassification limits.
2. Refer also to Chapter 6 and 7, and Waste Water Irrigation Guideline (EPA Victoria, 1991 Publication 168) for additional guidance on water quality criteria and controls for salts, nutrients and toxicants.
3. Refer section 4.4 for further description of water quality objectives for Class A recycled water.
4. Turbidity limit is a 24-hour median value measured pre-disinfection. The maximum value is five NTU.
5. pH range is 90th percentile. A higher upper pH limit for lagoon-based systems with algal growth may be appropriate, provided it will not be detrimental to receiving soils and disinfection efficacy is maintained.
6. Chlorine residual limit of greater than one milligram per litre after 30 minutes (or equivalent pathogen reduction level) is suggested where there is a significant risk of human contact or where recycled water will be within distribution systems for prolonged periods. A chlorine residual of less than one milligram per litre applies at the point of use.
7. Guidance on pathogen reduction measures and required pre-treatment levels for individual disinfection processes are described in *GEM: Disinfection of Recycled Water* (EPA Victoria, 2003 Publication 730.1). Helminth reduction is either detention in a pondage system for greater than or equal to 30 days, or by an NRE and EPA Victoria approved disinfection system (for example, sand or membrane filtration).
8. Where Class C or D is via treatment lagoons, although design limits of 20 milligrams per litre BOD and 30 milligrams per litre SS apply, only BOD is used for ongoing confirmation of plant performance. A correlation between process performance and BOD / filtered BOD should be established and in the event of an algal bloom, the filtered BOD should be less than 20 milligrams per litre.

a Where schemes pose a significant risk of direct off-site movement of recycled water, nutrient reductions to nominally five milligrams per litre total nitrogen and 0.5 milligrams per litre total phosphorous will be required.

5.2 Buffer distances

5.2.1 To surface waters

The suggested EPA buffer distances (i.e. recommended guides) from the edge of the wetted area to surface waters using class C recycled water are (refer EPA publication 464.2, sect 7.1.2 p 40):

- Flood/high pressure spray 100 m
- Low pressure spray 50 m
- Trickle or subsurface irrigation 30 m

Decreased buffer distances may be appropriate if:

- The surface waters are seasonal (i.e. ephemeral) or a drainage channel;
- Best practice measures are implemented to prevent contaminated runoff leaving site; and
- The site is particularly favourable such as an elevated or well-vegetated area between the use site and the surface water.

Increased buffer distance may be appropriate if:

- the surface water is highly sensitive;
- the surface water is used for potable water supplies; or
- the site is unfavourable (e.g. steep and/or impermeable soils).

5.2.2 To sensitive receptors

The suggested EPA buffer distances (i.e. recommended guides) from the boundary of the irrigation area (i.e. edge of the wetted area) to the nearest sensitive development (e.g. residential areas, public parks, schools and shops) for spray irrigation applications are (refer EPA publication 464.2, sect 7.1.2 p 41):

- Class C recycled water quality – at least 100 m

These buffer distances may need to be increased if high pressure spraying is conducted.

The buffer distances may be reduced if suggested best practice measures are implemented to reduce spray drift, including:

- tree screens;
- anemometer switching systems;
- restricted watering times; and
- use of irrigation systems that prevent fine mist generation (e.g. low-rise sprinklers, small throw or microsprinklers, and part circle sprinklers).

5.3 Controlled Public Access

Controlled public access is required with the use of Class C recycled water with respect to hours of application and withholding period (4 hours or until dry).

6 Environmental Management Action Plan and Timelines

This section identifies potential environmental, public health and other relevant issues and their risks of treating, storing and recycling water on the farm, and describes the Environmental Management Actions, which will be adopted in the design and operation of the wastewater treatment plant and the recycled water scheme to ensure it is sustainable and that potential environmental and public health "side effects" are minimised.

More detailed description of the design and management of the wastewater treatment, recycled water storage and reuse system is provided in the wastewater management plan for the abattoir (CEE, April 2016).

6.1 Wastewater Treatment Plant Upgrade

In general terms the plant is to be upgraded to achieve Class C recycled water quality with enhanced nitrogen removal. The following actions are proposed to be undertaken in 2016 (Refer commitment 1 in Section 8).

6.1.1 Anaerobic Lagoons

The following modifications to the anaerobic lagoon facilities are proposed to achieve improved performance, reduced odour emissions and risks, and increased monitoring:

- Increase frequency of periodic removal of settled solids and floating crust (partial) to at least annually (based on sludge depth testing) to maximise the working volume of the lagoon. This will reduce short-circuiting and improve performance.
- Extend the screened wastewater pipeline to the first anaerobic lagoon to avoid further erosion and the embankment of the second anaerobic lagoon and remediate the embankment.
- Provide submerged discharge into the second anaerobic lagoon to minimise odour emissions
- Provide alarms on all pumps and lagoon level to detect faults (e.g. no flow, outages and high liquid level) and connect to the site PLC/SCADA system, to minimise risk of lagoons overflowing in the event of effluent pump failure
- Remove and maintain vegetation on the banks of the first (bottom) lagoon slashed to enable better access and inspection of the banks for leakage/spills and detection of snakes (safety issue)
- Measure freeboard on anaerobic lagoon 2 and increase if required to achieve >300 mm
- Reinstate the monitoring bore located near the watercourse below the lagoons and monitor bore water quality to assess integrity of lagoon liners and impact of any seepage on groundwater quality downstream.

6.1.2 Aerated Lagoon

The following modifications to the aerated lagoon facility are proposed to achieve improved biological oxidation of organic matter and nutrients and thereby reduce the in particular the nutrient loads on the effluent irrigation scheme.

- Increased aeration capacity to at least 33 kW and potentially the daily operating period (i.e. up to 18 hours/day)
- Undertake routine monitoring of the solids concentration and operating parameters in the lagoon (e.g. dissolved oxygen concentration)
- Provide alarms on the aerators, the sludge pump and lagoon level to detect faults (e.g. no flow, outages and high liquid level) and connect to the site PLC/SCADA system.
- Repair and or replace the plastic wave margin where it has deteriorated

6.1.3 Winter Storages

There is insufficient effluent monitoring data available to date to assess if the E.coli levels are less than 1000 org/100 mL (ie meet Class C requirements). However based on the extent of treatment processes provided it is expected that this limit will be met in the winter storage. Effluent monitoring will be undertaken to establish the E.coli level achieved. Effluent disinfection will then be undertaken if required to achieve compliance. (ie 1 mg/L chlorine residual after 30 minutes or equivalent disinfection).

The CEE water budget model predicts that a recycled water storage volume of 67 ML is required for an average rainfall season and up to 80 ML for the 90th percentile wet year case. This compares with the estimated existing winter storage capacity of 74 ML (estimated range 63 ML to 87 ML).

As such the water balance model predicts that there may be an effluent storage volume shortfall in wet years at full production. However, the CEE water balance is considered conservative due in particular to the conservative evaporation rates adopted (i.e. average of Cranbourne and Melbourne evaporation data) and that monthly rainfall and evaporation data is adopted rather than daily.

Further, past performance during recent wet years shows sufficient storage was available and no discharge to watercourse occurred.

It is also noted that during wet years production is generally lower (i.e. reduced wastewater flow) due to lack of stock.

GBP propose to monitor inflow of effluent to the winter storages and monitor the effluent level in the storages to assess the situation. The inflow totalizer will be replaced and the flow recorded monthly together with the winter storage levels up to the next EIP review. The effluent volume stored will be regularly checked against the predicted volume estimated using the CEE water balance. This monitoring and comparison will be used to establish if additional storage is required and also provide an early indication if the storages are reaching capacity. GBP will provide additional storage if monitoring shows it is required.

6.2 Farm Management Upgrade Plan

6.2.1 Objectives of Overall Farm Plan

The objectives of the proposed management of the farm and recycled water system are:

- Achieve a higher level of productivity overall on the property
- Produce a substantial quantity of good quality hay each year which reduces the need to purchase as much fodder as has occurred in the past
- Achieve an effective phosphorus balance.

6.2.2 Pasture Improvement

These objectives are to be achieved by undertaking a pasture improvement program through:

- oversowing on a rotational basis around the farm
- by harvesting and removing silage from the irrigation paddocks before the start of each irrigation season, and
- then following up with a hay cut on the irrigated paddocks in mid to late summer.

An agricultural consultant is to be engaged to provide ongoing advice and supervision to assist in meeting these objectives (Refer commitment 3 in section 8).

6.2.3 Changes in Farm Management

The following changes in the farm operation are to be undertaken to make all this work effectively, including:

- irrigating a core set of paddocks each year to the optimum for pasture productivity rather than spreading the irrigation water over all the available area
- removing stock from some areas of the farm at critical times, without compromising the ability of the farm to hold stock on good quality feed for short periods of time.

Refer Commitment 3 in Section 8.

Specific actions are detailed below.

6.2.4 Increase area irrigated

The existing irrigation infrastructure is to be extended to include the newly acquired northern paddock (Plot 8, Paddocks 1 (part), 2, 3 and 5). This will increase the area available tor irrigated by approximately 23 ha up to 78 ha (42% increase) and will reduce the areal effluent volume and nutrient loadings on the overall farm proportionally, and also provide greater irrigation flexibility (Refer Commitment 2 section 8).

The estimated loadings on the increased future irrigated pasture are summarised in Table 6.1

The following comments are made on the current recycled water loadings applied to the farm:

- The current annual recycled water volume applied of 2.1 ML/ha.yr is less than the predicted average value for long-term sustainable effluent irrigation of 2.6 ML/ha.yr (i.e. 20 % margin of safety) and aligns well with the 90th percentile wet year loading.
- The current annual total nitrogen (TN) load applied of 93 kg TN/ha.yr is considered moderately high, and while this value is less than the annual crop demand for highly vigorous pastures/crops (e.g. oaten hay cereal crop of 160 kg TN/ha.yr, and perennial rye grass or tall fescue of 180 kg TN/ha.yr), the management of the pastures needs to be such that nitrogen inputs from recycled water are balanced by nitrogen removal in crop and animal products.
- The annual total phosphorus (TP) load applied of 40 kg TP/ha.yr is considered high and exceeds the crop demand of most crops/pasture (exception lucerne). Phosphorus removal through vigorous crop and pasture growth is required as part of future management.
- The average effluent TDS concentration of 610 mg/L is considered low to medium and is not likely to present a hazard in this high rainfall environment.

Table 6-1 Summary of Future Effluent Characteristics and Loadings Applied to Farm

Item	Units	Value	Comment
Effluent Irrigation Concentrations			
pH		7.8	
BOD	mg/L	30	
SS	mg/L	20	
Total N	mg/L	30	Decreased 35%
Total P	mg/L	20	
TDS	mg/L	660	
Ca	mg/L	17	
Mg	mg/L	10	
K	mg/L	34	
Na	mg/L	138	
Effluent Irrigation Annual Loads			
Flow	ML	123	
BOD	t/yr	3.7	
SS	t/yr	3.7	
Total N	t/yr	3.7	
Total P	t/yr	2.5	
TDS	t/yr	80	
Effluent Irrigation Unit loadings			
Area (existing developed)	ha	78	Increased 42%
Loadings			
Flow	ML/ha.yr	1.6	Decreased 26%
TN	kg N/ha.yr	47	Decreased 53%
TP	kg P/ha.yr	31	Decreased 30%

6.2.5 Increase phosphorus removal from irrigated areas

The management of the farm as a whole, and the irrigation in particular, is to be changed to address the hazard associated with the high levels of phosphorus now present in some of the soils. This will be achieved by orientating the management of the farm to remove phosphorus from the soil through cropping, and minimising erosion risks.

A cropping program is to be undertaken to replace the present system of irrigating partially degraded pastures, with the crops being harvested and either sold, or fed to livestock in areas well removed from waterways.

6.2.6 Sodicity Management on the Top Hill Paddock (Plot 1, Paddocks 17 and 18)

The high sodicity of the Top Hill paddock is to be corrected with gypsum, and may require a number of applications to bring the sodicity down to an acceptable level. In the first instance, gypsum is to be broadcast on this area at the rate of 5 tonne/ha this autumn after the end of the irrigation season, accompanied by deep ripping to at least 40 cm depth (Refer commitment 5 in section 8).

6.2.7 Annual

Prior to the commencement of each irrigation season, two or three of the irrigation paddocks are to be identified as the core irrigation area for that coming irrigation season and they will then be irrigated to optimize the growth of the pasture. The recycled water irrigation loading applied is likely to be close to the calculated long term sustainable loading of 2.6 ML/ha.yr, potentially somewhat higher in dry years (e.g. up to 3 ML/ha.yr). These irrigation paddocks will be cut for silage early in the spring before irrigation commences, and the silage will be removed from the site. In addition to the silage cut, these paddocks will be cut for hay in mid summer and only grazed when irrigation is complete. The paddocks will be sown to short rotation pasture species in the previous autumn to prepare them for high growth rates and high productivity.

The paddocks to be used as a core irrigation area will be rotated around the farm, and will be resown to a perennial ryegrass pasture as a longer-term option as they are decommissioned from the core irrigation area. In wetter than average years the other irrigation a paddocks can be brought into service as well, to prevent any over-irrigation. The change of emphasis in management is to irrigate and control the growth in the paddocks for optimum pasture and crop productivity, rather than for the sole purpose of water disposal. This change will result in full utilisation of both the applied nitrogen and the applied phosphorus.

6.3 Recycled Water Management

The overall objective of the recycled water scheme is to protect and enhance environmental quality, protect public health, make effective use of resources and maintain economic and social development of the area.

All recycled water used on the farm will be sourced from the abattoir wastewater treatment plant, which provides secondary treated wastewater that will meet Class C - Recycled Water Quality (ref EPA Use of Recycled Water Guidelines, June 2003).

Based on Class C classification, the recycled water is suitable for agriculture enterprises (e.g. grazing/fodder for animals).

The recycled water quality is to be monitored at the primary winter storage near the irrigation pump shed, as described in Section 7.

6.3.1 Recycled Water Loading

Irrigation application rates will be undertaken in accordance with EPA guidelines and subject to a number of restrictions as discussed below.

This will be achieved by:

- Increasing the area irrigated to 78 ha (i.e. increase of 23 ha, 42 % increase)
- Reducing the long-term application rate to an average of 1.6 ML/ha.yr, based on applying up to 123 ML/yr. This aerial application rate represents a reduction of 24% from the present rate of 1.9 ML/ha.yr and provides a 40% margin of safety on the calculated long term sustainable recycled water application rate for the Poowong area of 2.6 ML/ha.yr, and is less than the calculated 90th percentile wet year loading.
- Applying recycled water to maintain vigorous healthy pasture and crops.
- Providing a rain gauge that will automatically switch off the irrigation pumps if a manually pre-set rainfall event is exceeded.
- Soil moisture levels will be monitored as necessary to provide supplementary data to assist in providing the desired recycled water application rate. Soil moisture content should not exceed 80%. Full reliance on soil moisture on the farm is not considered practical.

6.3.2 Nutrient Loadings

Nutrient loadings applied are to be reduced to ensure environmental sustainability is achieved by ensuring that: *Nutrient Applied in Irrigation = Nutrient removed by grazing & crop harvesting + Nutrient absorbed by soil*.

This will be achieved by:

- Reducing the annual nitrogen load applied due to greater nitrogen removal in the wastewater treatment plant (i.e. total nitrogen concentration reduced from 44 mg/L to 30 mg/L)
- Increasing the area irrigated to 78 ha (i.e. 42 % increase).

The above two changes will result in the long-term deficient in applied nutrients compared with plant demand, as follows:

- The average total nitrogen aerial loading is to halve from 93 kg N/ha.yr to 47 kg N/ha.yr. This compares with the annual crop demand for highly vigorous pastures/crops of 160 – 180 kg TN/ha.yr (e.g. oaten hay cereal crop and perennial rye grass).

- The average total phosphorus aerial loading is to reduce to 32 kg P/ha.yr (22% reduction). This compares with the annual crop demand for highly vigorous pastures/crops of 50 - 80 kg TN/ha.yr (e.g. oaten hay cereal crop and perennial rye grass).

6.3.3 Organic matter loading

Overloading of organic matter (OM) through recycled water irrigation is not expected to occur, due to the relatively low BOD loading of about 32 kg BOD/ha.yr, based on an average BOD_5 concentration of 20 mg/L and the average recycled water application rate of 1.6 ML/ha.yr.

The estimated BOD loading is well below the suggested level of 1500 kg (OM)/week that can be applied to maintain 5% OM in the soil, and can be considered to be acceptable. As such it is considered unlikely that clogging of pores or favouring of anaerobic microbiological populations in the soil will occur.

6.4 Soils

6.4.1 Soil management

Conservative soil management practices are proposed to promote a friable, well-structured soil in the rootzone.

Both nitrogen and phosphorus loads applied will be maintained at less than the crop/plant demand at the proposed recycled water application rates (i.e. in deficit) and as such most of the nutrients applied in the recycled water should be utilised by the growing biomass.

Note that the nutrient balance assessment has not considered the potential for the soil to absorb nutrients. Providing irrigation is applied appropriately to prevent groundwater recharge, the soil will potentially provide an additional absorptive ‘buffer’ for any nutrients not taken up by plants and removed by biomass production.

An irrigation scheduling program will be implemented on the farm to ensure the hydraulic capacity of the soils is not exceeded.

6.4.2 Soil monitoring

Refer Section 7.4

The ongoing soil monitoring program will be utilised to fine tune recycled water application rates and other agronomic practices on the farm.

6.5 Buffer Distance Requirements

The following buffer distances shall apply for the irrigation of Class C recycled Water on the farm with respect to water courses and sensitive receptors (refer commitment 6 in Section 8).

6.5.1 Water Courses

Irrigation of the farm with Class C recycled water with medium to high pressure sprays is to be undertaken at least 50 m away (i.e. edge of the wetted area) from water courses (all ephemeral) (Refer Attachment A – Site Plans).

6.5.2 Sensitive Receptors

Irrigation of the farm with Class C recycled water with medium to high pressure sprays is to be undertaken at least 30 m away from public roads and relevant property boundaries (Refer Attachment A – Site Plans).

6.6 Surface water

6.6.1 General

The watercourses through the Farm are ephemeral and drain through a series of dams. No quantitative water quality data are available for these watercourses; however, it can be assumed that water quality will be influenced by sediment, nutrient and faecal loads associated with the existing grazing and cropping regimes both from the outside catchment and from the farm, and by the treatment provided in the dams within the farm.

6.6.2 Potential Risks

Recycled water use on the farm has the potential to increase the risk of surface run-off entering waterways (stream and dams), resulting in potential impacts on surface water quality and erosion.

The recycled water system is to be designed and managed to protect the surface water beneficial uses through ensuring that there are no discharges of recycled water to surface waters from the recycled water storage dams or the irrigation areas.

6.6.3 Surface water management

The following are to be undertaken to mitigate potential impacts of recycled water use on surface waters:

- management of irrigation, appropriate recycled water use to ensure minimal run-off, including efficient application, appropriate irrigation scheduling, excess run-off capture and reuse;
- maintaining a vigorous health turf and vegetation;
- providing a minimum buffer distance of 50 m between irrigated areas and water courses (Refer Attachment A – Site Plans).

- providing a rain gauge that will automatically switch off the irrigation pumps if a manually pre-set rainfall event is exceeded.
- installing an anemometer at an approved location and fitted with a manually adjustable wind speed and direction switch to automatically stop irrigation when wind speed exceeds a pre-set wind speed and/or the wind is blowing in a particular direction. An initial cut-off wind speed setting of 10 km/h is considered appropriate to establish the effects of spray drift and this may be lifted based on experience.
- soil moisture levels will be monitored as necessary to provide supplementary data to assist in providing the desired recycled water application rate. Soil moisture content should not exceed 80%. Full reliance on soil moisture on the farm is not considered practical.

6.7 Groundwater

6.7.1 Risk assessment

Recycled water storage and use on the farm has the potential pass through the rootzone of irrigated vegetation and leach through the soil, resulting in potential impacts on groundwater.

6.7.2 Groundwater management

The risk of adverse impacts on groundwater is considered low for the following reasons:

- Recycled irrigation application rates applied will be 40% less than the long-term crop demand
- Moderately deep soils up to 1.5 m deep
- Likely significant depth to standing water table with undulating terrain
- No issues apparent with the recycled water storages, which are 20 to 40 years old. There is no visual sign of seepage (e.g. green patches downslope of the embankments).

6.7.3 Groundwater monitoring

Groundwater will be monitored at two locations to assess impact of recycled water use on the farm. The existing borehole at the southern end of the farm located downstream of the wastewater treatment lagoons will be monitored, subject to site confirmation, and a new borehole will be provided in the centre of the farm downstream of the southern irrigation plots (Refer Attachment A – Site Plans).

The groundwater monitoring program is detailed in Section 7.5.

6.8 Noise emission

Noise emissions from irrigation operation are assessed as not being an issue. The irrigation pump produces minor noise and is located well away from sensitive receptors.

6.9 Occupational Health and Safety

The design and operation of the recycled water storage and irrigation systems will take into account potential OHS risks associated with handling and exposure to recycled water.

The main OHS issues relate to the exposure of the farm operators and other people visiting the farm, to any residual pathogens in the recycled water.

The following measures will be undertaken to manage the risks:

- Effluent will be treated to achieve a median effluent thermotolerant coliform count (E. coli) of <1000 org/100 mL and testing undertaken to verify by measuring microbiological quality;
- Approved warning signs/symbols will be located at entrances to the farm (Refer Attachment A – Site Plans).
- On-site workers will be immunised against water-borne illnesses.
- On-site workers will be provided with appropriate protective equipment to minimise inhalation and skin contact with recycled water aerosols.

6.10 Operational Procedures

Operating manuals and procedures are to be updated and/or prepared for the wastewater treatment plant and for the farm and associated recycled water application.

The operating manuals are to be reviewed as part of the 3 yearly EIP review.

6.11 Operator Training

The operators will be provided with an appropriate level of competence and relevant training in:

- Operation and maintenance of storage and reuse (e.g. irrigation) equipment
- Risk awareness (environmental, public health, OH&S, agriculture)
- Knowledge of this EIP and other relevant EPA and OH&S guidelines, and standards and regulations relevant to recycled water use and irrigation such as "Guidelines for Environmental Management – use of recycled water, EPA 464.2, June 2003
- OH&S and safe working practices, including personal hygiene for working with recycled water
- Emergency response equipment and procedures
- Notification procedures (i.e. EPA contacts) during an emergency
- Monitoring, recording and compliance reporting requirements.

6.12 Public Health and Amenity

6.12.1 General

The main public health issue is the potential for any residual pathogens in the recycled water being transported, in the form of atmospheric aerosols, from the spray irrigation on the farm to areas frequented by the public (e.g. public road).

The design and operation of the irrigation system takes into account potential public health and amenity issues, generally by minimising the possibility of off-site transport of aerosols produced by irrigation through operational safeguards and buffer distances (refer Section 6.5).

6.12.2 Misting of Irrigators

During irrigation no visible spray drift will be allowed to cross the property boundary. Initially irrigation will not occur when the wind speed exceeds 10 km/hr, however, the wind speed cut-off will be reviewed in the first EIP review.

6.12.3 Signage

Permanent warning signs are currently being installed at each entrance to the farm, around each winter storage dam and at strategic locations around the farm, advising of the use of recycled water (Refer Attachment A – Site Plans).

The warning signs shall be compliant with AS1319 and marked with the words "RECYCLED WATER IN USE', 'RECYCLED WATER USED ON THIS PROPERTY', or RECYCLED WATER DO NOT DRINK'.
An example of a typical sign is given below.

It is proposed that the recycled water outlets (e.g. irrigation hydrants) have warning plates attached.

6.13 Air Emissions

There is potential for aerosols from irrigation with sprays to drift to sensitive receptors.

The objective is to manage, control and minimise spray drift and to separate the sources of spray from residences and other sensitive receptors.

This will be achieved by:

- Providing adequate buffer distance between the recycled water use areas and sensitive e land uses (e.g. residences (100 m) and public roads (50 m)).

6.14 Contingency Plans

The following measures will be undertaken to improve system reliability:

- System isolation (i.e. shut-off) for noncompliant events and emergencies (e.g., unacceptable recycled water quality, system failures, transfer pipeline bursts, overflows or spills)

6.15 Incident Action and Reporting

EPA will be immediately notified of issues with non-compliant recycled water.

An emergency plan will be prepared, which will include:

- Preparedness/Readiness plan
- Emergency response procedures
- Emergency notification procedures
- Procedures for minor (non-notifiable) incidents
- Algal bloom response procedure

If there is a leak or burst of recycled water temporary signs will be provided which notify that the area is closed off.

All emergency or incident reports (noncompliance with the objectives) will be submitted in writing to EPA as soon as practicable.

Complaints will be recorded in a complaints register. The register for each record will include:

- Name, address and contact details of the complainant
- Time and date of incident
- Nature of the problem or complaint
- Outcome of the resulting investigation
- Solutions to the problem
- Organisations and people involved
- Feedback to complainant.

The records of complaints will be maintained for a period of five years and will be made available to EPA on request for auditing purposes.

6.15.1 Algal bloom response procedure

An algae bloom can have numerous impacts upon water quality. Whilst most of these impacts are aesthetic, some Blue-Green Algae produce toxins and other substances, which can cause illness in humans and may be lethal to fish and stock. No human deaths have been attributed to algal toxicity. There is little evidence that irrigation and plant production is affected, other than through blocked filters and sprinklers.

The National Alert Level Framework will be used to provide a sensible and cautious algal management framework. The following levels have been developed:

Level 1 (500-2000 cells / mL)

Used to identify early stages of a bloom. Taste and odour may be detectable. Routine monitoring of cell count through laboratory testing and identification.

Level 2 (2000 – 15000 cells/mL)

An established bloom. Toxicity testing of the bloom is important. There is a need for public notification through press releases and signage etc.

Level 3 (greater than 15000 cells/mL)

is reserved for toxic blooms of significant size.

The following algae bloom response procedure for managing algal blooms in the recycled water storage dams shall include:

1. Regular inspection of the dams for indication of algae.
2. Once visual appearance of algae in the storage is detected, monthly analysis will commence of the dam contents for algae species.
3. When an algae bloom is established (e.g. concentration of algae exceeds 5000 cell/mL), farm operations and maintenance personnel shall be advised of the situation and place warning signs at reuse sites, stating that an algae bloom is present and that it may cause sickness in humans and animals, and that contact may cause skin and eye irritation.
4. When algal bloom reaches Level 3 (i.e. algae concentration exceeds 15000 cell/mL), EPA and all relevant Authorities, and Estate operations and maintenance personnel shall be notified of the situation.
5. The discharge of algae in the recycled water will be controlled using a submerged offtake at least 600 mm below the surface.
6. Procedures to control the algae bloom may involve: mixing, aeration and addition of chemicals
7. Rubber gloves will be used to avoid contact with the water,

7 Monitoring, Auditing and Review

7.1 General

The proposed monitoring program is designed to indicate performance of the wastewater treatment plant and the sustainability of the recycled water scheme. Regular monitoring will provide recycled water quality, soils and groundwater (refer commitment 7 in Section 8).

Records of all monitoring results and analyses to demonstrate compliance with the Guidelines will be kept for at least ten years.

Records of all inspection and maintenance programs will be kept on site.

7.2 Recycled Water Quality and Quantity Monitoring

Potable water flows used in the abattoir operations are to be monitored (flow totaliser to be read and recorded monthly) at the outlet from the filtration plant in the maintenance area.

Recycled water flows used for irrigation on the farm are to be monitored (flow totaliser to be read and recorded monthly) at the outlet from the irrigation pump on the main winter storage dam.

Table 7-1 details the monitoring program for Class C recycled water quality used on the farm (i.e. outlet from main winter storage).

All samples of recycled water obtained will be preserved and analysed in accordance with ‘A Guide to the Sampling and Analysis of Water, Wastewaters, Soils and Wastes (EPA Victoria, 1991 Publication 168). All testing is to be conducted by a NATA certified laboratory, according to their specified sampling procedures.

7.3 Irrigation Operation Log

An irrigation operation log shall be established and maintained. The log shall record on a daily basis the following:

- volume of recycled water irrigated (ex totaliser)
- paddocks irrigated
- location of runs
- number of runs
- summary of conditions (e.g. rainfall, sunny/cloudy, wing direction and speed).

Table 7-1 Recycled Water Monitoring Program

Parameter	Units	Frequency
Flow (kL/d)		monthly
Storage volume (ML)		Monthly
pH	pH units	Quarterly
Biochemical Oxygen Demand (mg/L)		Quarterly
Suspended Solids (mg/L)		Quarterly
TKN as N	mg/L	Quarterly
NOX as N	mg/L	Quarterly
Total nitrogen as N	mg/L	Quarterly
Total phosphorus as P	mg/L	Quarterly
Conductivity	uS/cm	Quarterly
TDS	mg/L	Quarterly
Sodium Na	mg/L	Quarterly
Potassium K	mg/L	Quarterly
Calcium Ca	mg/L	Quarterly
Magnesium Mg	mg/L	Quarterly
Sodium adsorption ratio (SAR)		Quarterly
E coli	Org/100 mL	Quarterly

7.4 Soil Monitoring

Four soil sampling sites have been established on the farm (refer Section 6.4.2) to be both a representative of plots of the farm that has been irrigated (i.e. Below the House, Big Dam Hill and Back Hill) and a representative area of the farm that has not been irrigated to date (Hay Paddock).

Three composite soil samples are to be collected at each of site: 0 to 0.1 m depth, 10 to 20 mm depth, and 20 to 40 mm depth. Each composite soil sample shall consist of 4 grab samples taken from within each representative area.

The 12 composite soil samples are to be laboratory tested as set out in Table 7-2.

Soil monitoring is to be undertaken annually for the first two years and then every 3 years if the results do not detect any negative impacts.

7.4.1 Soil salinity alarm trigger

An alarm trigger is deemed to have occurred if a continuous upward trend in soil salinity occurs over 3 consecutive years in the representative soil samples from the irrigation area and an increase in excess of 60% above the benchmark level has occurred over the 3 year period.

Triggering of an alarm condition indicates that soil salinity may have become an issue and that a detailed assessment is required to be undertaken.

Table 7-2 Soil Monitoring Program

Parameter	Units	Frequency
pH (1:5 Water)	pH units	Annually for first 2 years, then every 3 years if no negative impacts
Salinity (EC 1:5)	dS/m	
Phosphorus (Colwell)	mg/kg	
Phosphorus (Olsen)	mg/kg	
Total phosphorus as P	mg/kg	
Phosphorus Buffer Index (PBI)		
Ammonium nitrogen as N	mg/kg	
Nitrate nitrogen as N	mg/kg	
Total nitrogen as N	%	
Organic carbon	%	
Carbon nitrogen ratio		
Sulphur	mg/kg	
Sodium (Amm-acet.)	meq/100g	
Potassium (Amm-acet.)	meq/100g	
Calcium (Amm-acet.)	meq/100g	
Magnesium (Amm-acet.)	meq/100g	
Calcium/Magnesium Ratio	mg/L	
Cation Exch. Cap	mg/L	
Sodium % of Cations (ESP)	mg/L	
Chloride	% NaCl	
Boron	mg/kg	
Available Potassium	mg/kg	
Clay dispersion (Emerson)		

7.5 Groundwater Monitoring

Groundwater will be monitored at two locations to assess impact of recycled water use on the farm. The existing borehole at the southern end of the farm located downstream of the wastewater treatment lagoons will be monitored, subject to site confirmation, and a new borehole will be provided in the centre of the farm downstream of the southern irrigation plots.

Table 7-3 details groundwater monitoring program for each bore. The results of the parameters, and the frequency at which they are collected, will be reviewed in the first EIP review.

7.5.1 Groundwater sampling

Groundwater sampling will be conducted in accordance with:

- AN/NZS 5667.1.1998: Guidelines on the design of sampling programs, sampling techniques and preservation and handling of sample.
- AN/NZS 5667.11.1998: Guidance on sampling groundwater.
- Victorian EPA Publication 669, 2000: Groundwater sampling guidelines.

Table 7-3 Groundwater Monitoring Program

Parameter	Frequency
Standing water level (m)	Annually at end of irrigation season
pH	
Conductivity (uS/cm)	
Redox (mV)	
TDS (mg/L)	
Biochemical Oxygen Demand (mg/L)	
Ammonia Nitrogen (mg/L)	
Nitrate Nitrogen (mg/L)	
Nitrite Nitrogen (mg/L)	
Total Nitrogen (mg/L)	
Total Phosphorus (mg/L)	
Sodium (mg/L)	
Potassium (mg/L)	
Calcium (mg/L)	
Magnesium (mg/L)	
Sulphate (mg/L)	
Chloride (mg/L)	
Sodium adsorption ratio	
Alkalinity (mg/L as HCO3)	
Thermotolerant Coliforms (no/100 mL)	
Metals (mg/L, ug/L)	

7.5.2 Groundwater salinity alarm trigger

An alarm trigger will be deemed to have occurred if a continuous upward trend in groundwater salinity occurs over 3 consecutive years any of the bores located in or downstream of the irrigation area and an increase in excess of 60% above the benchmark level has occurred over the 3 year period.

Triggering of an alarm condition indicates that groundwater salinity may have become an issue and that a detailed assessment is required to be undertaken.

The EIP review will include an assessment of groundwater monitoring results and identification of impacts on beneficial uses, together with mitigation actions if required.

7.6 Audit and Reporting

An annual audit and report on the performance of the recycle water scheme showing compliance with the EIP, is to be prepared and submitted to EPA.

The annual report will include:

- all monitoring data specified in this EIP
- annual performance statement including comparison of measured storage volume and water balance model prediction.

The audit program for the scheme will comply with the principles in ISO 14010's Guidelines for Environmental Auditing.

The EIP will be reviewed every 3 years (refer commitment 8 in section 8).

8 Commitments

The following commitments are made to protect the environment and minimise adverse effects from operation of the recycled water scheme on the farm:

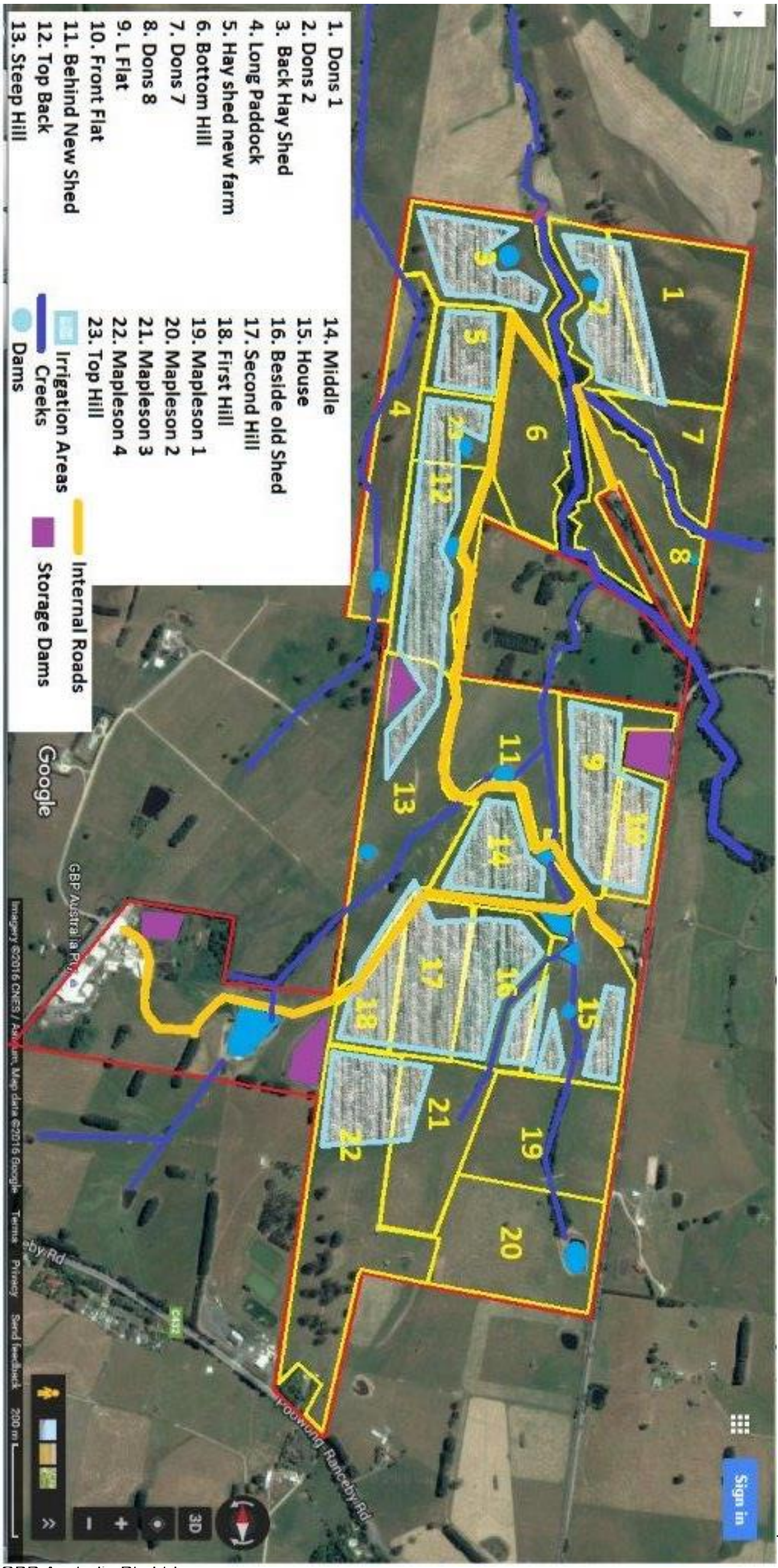
No.	Commitment description	Timeline	How
1	Upgrade the abattoir wastewater treatment plant to achieve Class C recycled water quality (including chlorination if required) and to improved performance, reduced odour emissions and risks	Dec 2016	Refer all commitments in Section 6.1 and Wastewater Management Plan (CEE 2016)
2	Increase area irrigated by approximately 23 ha up to 78 ha (Plot 8 - Northern hay paddock)	Dec 2016	Extend effluent supply pipeline to new hydrants
3	Improve pasture to achieve a higher level of productivity overall on the property	April 2016 to June 2019	Refer Sections 62.2 and 6.2.3 and An Agricultural Consultant is to be engaged to provide ongoing advice and supervision of pasture improvement plan as per EIP
4	Increase phosphorus removal from irrigation areas to achieve an effective phosphorus balance	April 2016 to June 2019	Engage Agricultural Consultant to provide ongoing advice and supervision as per EIP (refer section 6.2.2)
5	Add gypsum to top hill paddock to address and correct high sodicity issue	Sept 2016	Engage Agricultural Consultant to provide ongoing advice and supervision as per EIP (refer section 6.2.6)
6	Adhere to buffer distances between irrigation areas, water courses and sensitive receptors	Current	Limit areas irrigated to designated zones (refer section 6)
7	Undertake all monitoring as detailed in the EIP	Ongoing to next EIP review	Refer EIP Section 7
8	Review EIP at least once every three years	Sep 2019	Review EIP and auditing in June 2019 (refer section 7)
9	Provide and maintain fences and warning signs	June 2016	Install warning signs (note purchased) (refer section 6.12)
10	Operate and maintain the recycled water storages in accordance with regulatory requirements	Current	Monitor effluent level and ensure freeboard of at least 300 mm
11	Recommission the existing bore at bottom hill below wastewater treatment plant and install a second monitoring bore to monitoring groundwater in centre of farm	Sept 2016 to Mar 2017	Engage contractor to recommission existing bore and install new bore (refer section 6.7)
12	Providing rain gauge that automatically switches off the irrigation pumps if a manually pre-set rainfall event is exceeded.	Sep 2016	Engage contractor to provide, install and commission (refer section 6.6)
13	Install an anemometer at an approved location and fitted with a manually adjustable wind speed and direction switch to automatically stop irrigation when wind speed exceeds a present wind speed and/or the wind is blowing in a particular direction.	Dec 2016	Engage contractor to provide, install and commission (refer section 6.6)

No.	Commitment description	Timeline	How
14	Notify EPA prior to emergency overflow events from recycled water storages	Current	Monitor effluent flows and storage levels monthly
15	Immunise on-site workers against water-borne illnesses.	Sept 2016	Workers to visit doctor (refer section 6.11)
16	Provide on-site workers with appropriate protective equipment to minimise inhalation and skin contact with recycled water aerosols.	Current	Provide and maintain relevant equipment doctor (refer section 6.11)
17	Provide measures to ensure workers do not consume food and drink while working directly with recycled water.	Current	Induction of workers doctor (refer section 6.11)
18	Samples of recycled water are to be obtained, preserved and analysed in accordance with A Guide to the Sampling and Analysis of Water, Wastewaters, Soils and Wastes (EPA Victoria, 1991 Publication 168).	Current	As per guidelines (refer section 7)
19	EPA is to be immediately notified of issues with non-compliant water.	Current	Review all monitoring data by quality manager
20	Prepare operating manuals and procedures for the wastewater treatment plant and the farm, including recycled water application. Update with EIP review	December 2016	Engage contractor to assist in preparation (refer section 6.10)
21	Prepare and maintain irrigation operation log	December 2016	Engage contractor to assist in preparation (refer section 7)
22	Emergency or incident reports (noncompliance with the objectives) will be submitted in writing to the appropriate regulatory agency as soon as practicable.	Current	As per requirements
23	Records of all monitoring results and analyses to demonstrate compliance with the Guidelines to be kept for at least ten years.	Current	All data is kept onsite in Quality managers office (refer section 7.6)
24	Records of all inspection and maintenance programs will be kept on site.	Current	All data is kept onsite in Quality managers office (refer section 7.6)
25	Provide an undertaking that the audit program for the scheme will comply with the principles in ISO 14010's Guidelines for Environmental Auditing.	Jun 2017	As per guidelines (refer section 7.6)
26	An appropriately qualified independent auditor or internal expert will undertake annual audits	Jun 2017	Appoint qualified contractor to undertake annual audit at end of each irrigation season (refer section 7.6)

Attachment A – Site Plans

Site Plan

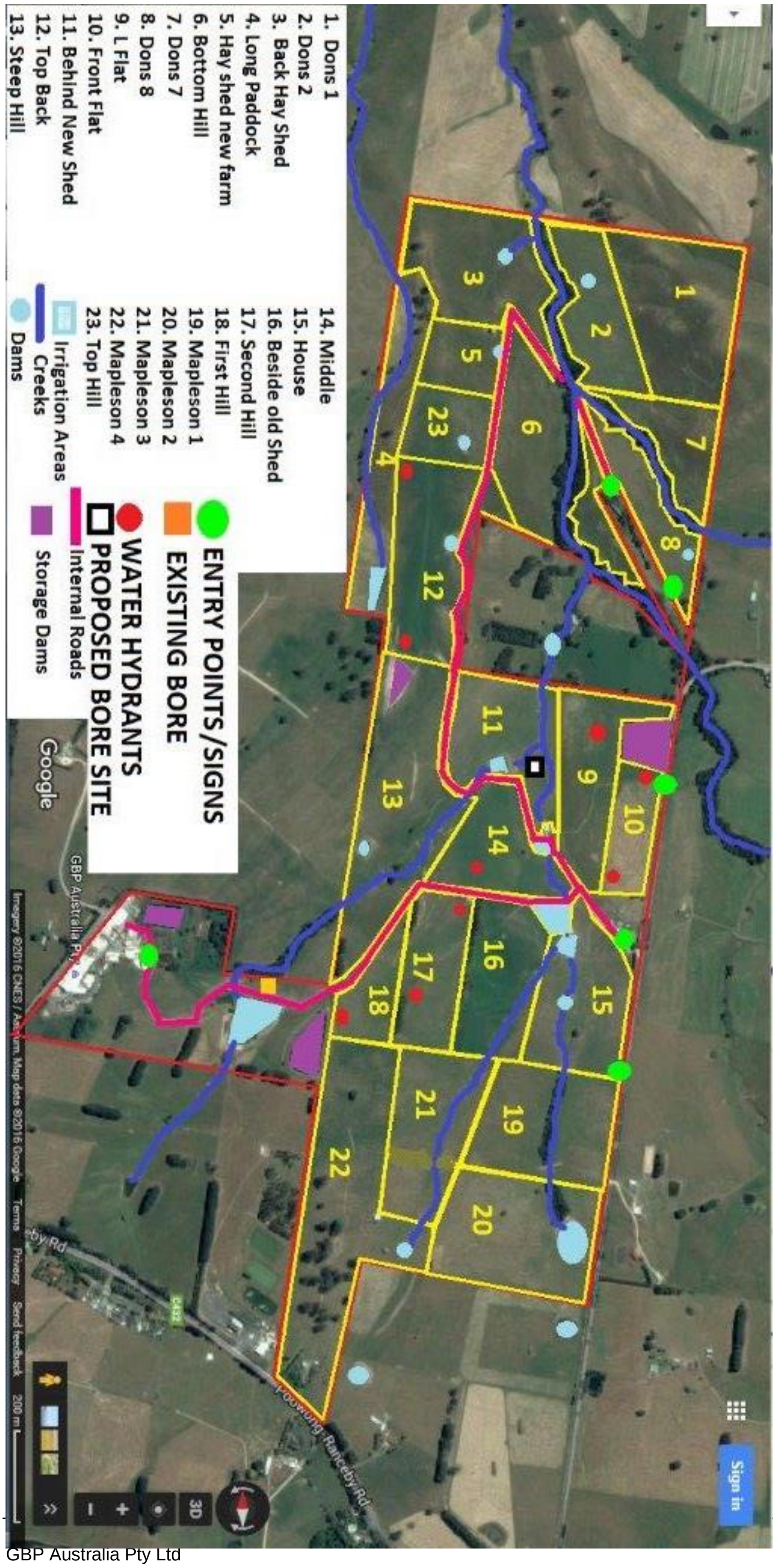
General Layout, Winter Storage Locations, Irrigation Areas, Watercourses and Access Roads



1. Dons 1
2. Dons 2
3. Back Hay Shed
4. Long Paddock
5. Hay shed new farm
6. Bottom Hill
7. Dons 7
8. Dons 8
9. L Flat
10. Front Flat
11. Behind New Shed
12. Top Back
13. Steep Hill
14. Middle
15. House
16. Beside old Shed
17. Second Hill
18. First Hill
19. Mapleson 1
20. Mapleson 2
21. Mapleson 3
22. Mapleson 4
23. Top Hill
Irrigation Areas
Creeks
Dams
Internal Roads
Storage Dams
Google
Poowong-Ranceby Rd
Sign in

Site Plan

Entry Points and Warning Sign Locations, Boreholes and Irrigation Hydrant Locations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18. First Hill
19. Mapleson 1
20. Mapleson 2
21. Mapleson 3
22. Mapleson 4
23. Top Hill
Irrigation Areas
Creeks
Dams
ENTRY POINTS/SIGNS
EXISTING BORE
WATER HYDRANTS
PROPOSED BORE SITE
Internal Roads
Storage Dams
Google
Poowong-Ranceby Rd
Sign in

Attachment B – CEE Water Balances

GBP Poowong Export Abattoir
Effluent Reuse Water Budget

Average Rainfall Case
Existing flows

Using EPA crop factors

SUMMARY		Average year	90th %ile wet year
- Wastewater inflow	ML/a	116	116
- Water available	ML/a	118	122
- Area required	ha	45	60
- Irrigation rate	ML/ha.a	2.6	2.0
- Volume stored (max)	ML	67	80

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
CLIMATIC DATA														
- Mean evaporation	mm/mth	189	155	130	83	56	44	47	62	84	117	139	168	1271
- Lagoon evaporation	mm/mth	149	129	105	63	36	23	33	50	78	97	114	138	1012
- Mean rainfall	mm/mth	58	53	63	79	95	99	101	102	104	96	87	76	1013
- Effective rainfall	mm/mth	52	42	47	55	62	64	66	66	67	82	74	69	747
CROP DEMAND														
- Potential demand	mm/mth	132	109	91	50	28	22	19	31	50	82	97	118	
- Net irrigation demand	mm/mth	80	66	43	0	0	0	0	0	0	0	23	49	261
- Gross irrigation demand	mm/mth	80	66	43	0	0	0	0	0	0	0	23	49	261
Area needed to use flow	Hectares	14	17	26	0	0	0	0	0	0	0	49	23	
WATER USE														
- Wastewater Inflow	ML/mth	11.1	11.1	11.1	8.2	8.2	8.2	8.2	8.2	8.2	11.1	11.1	11.1	116
- Groundwater Inflow	ML/mth	0	0	0	0	0	0	0	0	0	0	0	0	0
- Net evap. from Storage	ML/mth	1.2	1.0	0.4	-0.6	-1.3	-1.5	-1.4	-1.0	-0.5	0.0	0.5	1.2	-1.9
- Available for irrigation	ML/mth	9.9	10.1	10.7	8.8	9.6	9.7	9.6	9.3	8.7	11.1	10.6	9.9	118
Area required	Hectares													45
- Used for irrigation	ML/mth	36	30	20	0	0	0	0	0	0	0	10	22	118
- Used for irrigation	ML/ha.a													2.6
STORAGE														
- Volume at start	ML	55	29	9	0	9	18	28	38	47	56	67	67	
- Volume at end	ML	29	9	0	9	18	28	38	47	56	67	67	55	
VARIABLES														
- Effective rainfall	%	90%	80%	75%	70%	65%	65%	65%	65%	65%	85%	85%	90%	
- Pan factor		0.79	0.83	0.81	0.76	0.64	0.52	0.70	0.80	0.93	0.83	0.82	0.82	
- Crop factor for	Pasture	0.70	0.70	0.70	0.60	0.50	0.50	0.40	0.50	0.60	0.70	0.70	0.70	
- Application efficiency		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	

Rainfall based on Nyora long term rainfall records (1974-2015)

Evaporation based on BOM Melbourne and Cranbourne long term evaporation data

GBP Poowong Export Abattoir
Effluent Reuse Water Budget

90th Percentile Wet Year Case
Existing flows

Using EPA crop factors

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
CLIMATIC DATA														
- Mean evaporation	mm/mth	189	155	130	83	56	44	47	62	84	117	139	168	1271
- Lagoon evaporation	mm/mth	149	129	105	63	36	23	33	50	78	97	114	138	1012
- Mean rainfall	mm/mth	68	62	74	93	112	116	119	120	122	113	102	90	1190
- Effective rainfall	mm/mth	61	50	55	65	73	75	77	78	79	96	87	81	877
CROP DEMAND														
- Potential demand	mm/mth	132	109	91	50	28	22	19	31	50	82	97	118	
- Net irrigation demand	mm/mth	71	59	35	0	0	0	0	0	0	0	0	37	202
- Gross irrigation demand	mm/mth	71	59	35	0	0	0	0	0	0	0	0	37	202
Area needed to use flow	Hectares	16	19	32	0	0	0	0	0	0	0	0	30	
WATER USE														
- Wastewater Inflow	ML/mth	11.1	11.1	11.1	8.2	8.2	8.2	8.2	8.2	8.2	11.1	11.1	11.1	116.1
- Groundwater Inflow	ML/mth	0	0	0	0	0	0	0	0	0	0	0	0	0
- Net evap. from Storage	ML/mth	1.0	0.8	0.2	-0.8	-1.7	-1.9	-1.7	-1.4	-0.9	-0.3	0.2	1.0	-5
- Available for irrigation	ML/mth	10	10	11	9	10	10	10	10	9	11	11	10	122
Area required	Hectares													60
- Used for irrigation	ML/mth	43	35	21	0	0	0	0	0	0	0	0	22	122
- Used for irrigation	ML/ha.a													2.0
STORAGE														
- Volume at start	ML	68	35	10	0	9	19	29	39	49	58	69	80	
- Volume at end	ML	35	10	0	9	19	29	39	49	58	69	80	68	
VARIABLES														
- Effective rainfall	%	90%	80%	75%	70%	65%	65%	65%	65%	65%	85%	85%	90%	
- Pan factor		0.79	0.83	0.81	0.76	0.64	0.52	0.70	0.80	0.93	0.83	0.82	0.82	
- Crop factor for	Pasture	0.70	0.70	0.70	0.60	0.50	0.50	0.40	0.50	0.60	0.70	0.70	0.70	
- Application efficiency		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
- Deficit before irrigation	mm	20												

Rainfall based on Nyora long term rainfall records (1974-2015)

Evaporation based on BOM Melbourne and Cranbourne long term evaporation data

lagoon part full

Appendix 3 – Community Liaison Committee: Engagement report, April 2016.

As attached.

Initial Community Liaison Committee Meeting

Minutes

Date: Tuesday 5th April 2016
Time: 10:05am
Location: 60 Gardner Lane, Poowong

Meeting Called By	GBP Australia Pty Ltd
Type of Meeting	Planning to facilitate meeting with GBP Products Pty Ltd and representatives of the Poowong Community
Facilitator	Nick Murphy
Note Taker	Maleana Whitelaw
Timekeeper	Maleana Whitelaw
Attendees	**Representing Poowong Community** - Heather Gregg, Matt Gray & Lynne Rogers, **Representing South Gippsland Shire Council** -Bryan Sword & Lorraine Brunt, **Representing GBP Australia Pty Ltd** - Ben Siegel, Nick Murphy, Megan Scarffe & Maleana Whitelaw
Apologies	John Mandermaker – Poowong Community Wendy Tao - EPA
Non Attendees	EPA representative – Quinton Cooke Please note, members of the EPA will be consistently invited to all Community Liaison Committee Meetings as well as minutes of all meeting will be forwarded on to the EPA.

Once again we would like to thank everyone who attended today's meeting. GBP Australia Pty Ltd are really looking forward to creating some strong ties with the new committee and establishing a solid communication design that will elevate present and future community concerns.

AGENDA TOPICS

Discussion 1.	What is the reason for this committee?
GBP Australia Pty Ltd at the request of the EPA have established this committee to address any community concerns in regards to GBP Australia's proposed and future development. The committee is made up of local council representatives, community members and GBP Australia Pty Ltd representatives.	
Conclusions	
Heather Gregg John Mandermaker Matthew Grey Lynn Rogers Have been invited to the meetings. They are all involved in the Poowong community and have a lot of access to community members. Lorraine Brunt and Bryan Sword were also invited on behalf of the local council. Nick Murphy (GBP Australia Pty Ltd) has taken the responsibility of Chairperson. In agreement Ben Siegel (Director of GBP Australia Pty Ltd) has taken a back seat approach to the committee to allow community members feel free to express concerns.	

Discussion 2.	How will the meeting results be communicated?	
Following the footsteps of Burra foods community committee, a quarterly newsletter will be created, reporting agenda topics, concerns, actions and proposed ideas. Lorraine Brunt suggested a Facebook page, however it was decided not a go ahead as full control over the page cannot be established and GBP Australia's in-house practises may be exposed to our competitors.		
Conclusions		
Quarterly Newsletter – Available at Post office Meeting minutes – emailed day of or after meeting to all on committee		
Action Items	Person Responsible	Deadline
Quarterly Newsletter	TBA	TBA
Minutes of Meeting to be emailed	Maleana Whitelaw	6/04/2016
Special Notes		

Discussion 3.	Is the committee permanent or a short term thing?
Everyone was in agreement, the committee will become a permanent fixture	

Discussion 4.	Terms of Reference
Terms of Reference is the scope and limitations of an activity or area of knowledge. This enables the whole committee to understand limitations, i.e. a community member comes up to a committee member with a complaint to be raised at the next meeting. Complaint being GBP Australia Pty Ltd aren't paying enough for cattle. This is not a committee matter. However a	

complaint comes through about a bad consistent smell coming from GBP Australia's work site is a matter for the committee meetings.		
Conclusions		
Bryan Sword is to email Nick Murphy some reference material in regards to Terms of Reference.		
Action Items	Person Responsible	Deadline
Create Terms of Reference	Nick Murphy	Next meeting
Special Notes		

Discussion 5.	Is the committee going to be a decisive committee or informative	
Informative committee		
Conclusions		
Although the community have been invited to the committee meeting decisions regarding GBP Australia Pty Ltd will remain solely GBP Australia's. There are a number of governing bodies that GBP Australia Pty Ltd answer to and are governed by. The committee will be a community based advisory committee, maintaining open communication between GBP Australia and the Poowong community. Allowing residents to voice opinion and or concern over relative matters.		
Action Items	Person Responsible	Deadline
N/A	N/A	N/A
Special Notes		

Discussion 6.	Is the EPA going to be involved?	
The EPA have been formally invited to attend the committee meetings, however Wendy Tao was unable to make today's meeting and Quinton Cooke never replied to GBP Australia's request. GBP Australia Pty Ltd will continue to invite and encourage the EPA to attend the committee meetings seeing that it was the EPA's recommendation we create this committee. However GBP Australia cannot be held liable for the EPA's absence and will maintain an open communication with the EPA by emailing all meeting minutes to the EPA.		
Conclusions		
The EPA are always welcome to attend		
Action Items	Person Responsible	Deadline
Continuously invite EPA to committee meetings	Nick Murphy	On Going
Email meeting minutes to EPA	Maleana Whitelaw	On Going
Special Notes		

Discussion 7.	Most concern from the Community is EPA related
Matt Gray raised the concern that most community members he has spoken to are concerned with the environmental impact GBP Australia has. That is why Matt asked if the EPA were going to be involved or not.	
Conclusions	

Although the EPA will always be encouraged and welcomed to the committee meetings, GBP Australia cannot speak on their behalf. However all EPA lists all compliance requirements specific to GBP Australia Pty Ltd which anyone can obtain by going on their website.		
Action Items	Person Responsible	Deadline
EPA website to be listed in Newsletter	TBA	TBA
Special Notes		

Discussion 8.	Clear Objectives		
So all Community Liaison Committee members understand how to raise agenda topics in future Clear Objectives need to be established.			
Conclusions			
-Member of Poowong community raises concern with Committee member -Committee member to define is concern is within Terms of Reference -Concern is within Terms of Reference -Committee member is to email GBP Australia at gbpclc@gbpproducts.com.au the concern no later than 2 weeks prior to the next scheduled meeting (this enable GBP Australia to answer the concern correctly and informatively			
Action Items		Person Responsible	Deadline
Committee members are to emailed process of raising concerns to GBP Australia.		Maleana Whitelaw	6/04/2016
Special Notes			

Discussion 9.	Notice of Community Liaison Committee Members		
The community are not aware of the committee's purpose and why it has been established			
Conclusions			
So the community are aware of the new Community Liaison Committee a notice will be posted advising of committee members and how they can communicate their concerns to GBP Australia through the committee			
Action Items		Person Responsible	Deadline
Notice to be posted in Local community outlets		Maleana Whitelaw	Next meeting
Special Notes			

Conclusion

GBP Australia Pty Ltd have been operation for many years. The progression of our company is beneficial to the company without a doubt, but it is also beneficial to the surrounding communities by providing employment and local trade.

GBP Australia Pty Ltd are committed to providing a safe and stable working environment for their 170+ employees. Growth and development cements our employee's future and the business generated from GBP Products Pty Ltd will continue to assist the local trade and businesses in Poowong itself.

However being a large company can attract speculation and concern from the local community. Although today was a meet, greet and introduction to the way future meetings will be held, the general senses of the committee was "we are here today on an advisory role". To help GBP Australia create a strong communication path between the community and the company. There will always be fiction over fact rumours and it will be the committee's goal to squash fictional rumour's and start communicating genuine community concerns, answers and actions taken by GBP Australia.

The quarterly newsletter will be tailored to the community's love of animals and address delicate subjects with caution and compassion. It will enable community members to read about previous meetings actions taking place and future development.

www.wiley.com.au