PRECISE ENVIRONMENTAL
Consulting Environmental Scientists

ONSITE WASTEWATER MANAGEMENT REPORT

6200 – 6206 Cunningham Highway,
Kalbar, Queensland

Kalfresh Pty Ltd

Version 4.1, February 2022

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1 INTRODUCTION

Precise Environmental (PE) was commissioned by Kalfresh Pty Ltd (the client) to prepare an Onsite Wastewater Management Report (OWMR) for the Scenic Rim Agricultural Industrial Precinct (SRAIP) project at 6200 – 6206 Cunningham Highway, Kalbar, Queensland (the site). The site occupies six allotments as currently detailed below:

- Lot 1 RP216694
- Lot 2 SP192221
- Lot 3 SP192221
- Lot 4 SP192221
- Lot 2 RP44024
- Lot 2 RP20974.

The site location is shown in Attachment A, Figures 1a and 1b (SmartMaps) and Figure 2.

Kalfresh Pty Ltd is an integrated company which supply and distribute vegetables to major supermarkets such as Coles and Woolworths. It is understood that Kalfresh propose to expand their current processing precinct in Kalbar, to create the Scenic Rim Agricultural Industrial Precinct (SRAIP). The SRAIP will comprise primary rural activities and secondary rural industry activities in close proximity to each other with associated transport links, and will act as a hub for all facades of the food production industry.

The proposed expansion will trigger environmentally relevant activity (ERA) 63 for sewage treatment under the Environmental Protection Act 1994. Sewage treatment works with a peak design capacity of 21 equivalent persons (EP) or more are considered by the Queensland Government to be ERA 63 due to the potential to cause environmental harm.

This report has been prepared to accompany an application to the Department of Environment and Science (DES) for an ERA 63.

1.1 Background

PE understands from review of the Interim Advice Statement by I Cubed Consulting (2019) and the scope of work for a draft impact assessment report by the Coordinator General (2019) that the SRAIP aims to create a formal hub for fresh and frozen food production in a highly-productive agricultural region 84 km south-west of the Brisbane CBD. The proposed Rural Enterprise Precinct will enable Australian food businesses to base themselves where the raw ingredients are grown, allowing fresh food to be delivered to customers faster, reducing food miles, improving operational efficiencies, and responding to market demand for trusted, value-add food and beverage products. High value cropping land will be maintained on land surrounding the site to the east, north and south. The development site will span across 39.2 ha of land fronting the Cunningham Highway at Kalbar in the Scenic Rim Local Government Area.

The parent parcels of the proposed SRAIP land are currently utilised for cropping purposes and an isolated rural industrial development exists within three (3) lots that supports the current rural production and processing industries of Kalfresh's existing operations. The land is relatively flat falling gently away from the Cunningham Highway before rising sharply to the rear of the property, being intersected by an overland flow path which is subject to periodic flooding events, none of which have affected the current operation or built infrastructure onsite.

The development area is mostly clear of native vegetation, with some scattered vegetation found to the rear of the area. Services available to the site and the current operations by Kalfresh are electricity and telecommunications. Sewerage is treated onsite with disposal to land. Stormwater drains towards the overland flow path northwest of the existing site facilities.

The proposed land use for the precinct will be refined in consultation with market experts and scoping of potential operators. Under the proposed planning arrangements for the project (and more broadly across the entire site - refer Appendix A, Figure 2), The six existing allotments will be reconfigured under a two phase plan to better manage land within the SRAIP.

Phase one will include the retention of Lot 1 RP216694 and Lot 2 SP192221 (allotments comprising the existing production facilities. The balance (Lot 2 RP20974, Lot 2 RP44024, Lot 3 SP192221 and Lot 4 SP192221) of the site will be reconfigured into proposed Lot 30, Lot 40, Lot 50, Lot 60 and an access easement described as Lot 70.

Phase two will include the subdivision of Lot 1 RP216694, Lot 2 SP192221 (existing), Lot 30 and Lot 40 (proposed) into eighteen allotments which will form the SRAIP. Proposed Lot 50 and Lot 60 are not associated with the SRAIP and are not discussed further in this report.

The phase one and phase two lot reconfigurations are presented in Appendix A, Figure 7 and Figure 8.

1.2 Objectives

The objectives of this report are to:

- Describe the most practical options for on-site sewage treatment with irrigation to land
- Outline management commitments to undertaking sewage treatment works
- Describe a system for the management and use of recycled water (effluent)
- Provide details of the sewage treatment plant and irrigation system to be supplied by others
- Provide the documentation to accompany a development application to the Department of Environment and Science (DES) to obtain development approval for undertaking ERA 63 sewage treatment works.

1.3 Scope of work

To meet the above mentioned objectives, the following scope of work was undertaken:

- A desktop review of the characteristics of the site and surrounding environment through published information including geology sheets, soil maps and notes, registered groundwater bores, environmental values specified under the *Environmental Protection (Water) Policy 1999*, and other environmental datasets available through Queensland Globe and MinesOnlineMaps
- A desktop review of the local land uses and catchment sensitivity
- A site inspection to observe the physical characteristics of the site and surrounding environment, and to complete soil characterisation within the proposed irrigation area (IA) through sampling / observation and laboratory analysis
- Modelling using the model for effluent disposal using land irrigation (MEDLI) to size an IA and wet weather storage tank (WWST) for the sustainable re-use of effluent on the site - the input data was based on estimated sewage flow, effluent quality and soil conditions
- Identification of built or environmental features (existing and proposed) which may limit the sustainability of onsite sewage management
- Provision of suitable options for the sustainable treatment and re-use of wastewater
- Provision of recommendations regarding the wastewater treatment process
- Preparation of this onsite wastewater management report.

The investigation was undertaken with reference to the following guidance documents:

- AS/NZS 1547:2000. On-site Domestic-Wastewater Management
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ 2000)
- Environmental Protection Regulation (Qld Gov 2019)
- Guidelines for Sewerage Systems - Use of Reclaimed Water (ARMCANZ, ANZECC & NHMRC 2000)
- Planning Guidelines for Water Supply & Sewerage (DERM 2010)
- Public Health Regulation 2005 (QPC 2010)
- Queensland Plumbing and Wastewater Code Version 1 (Qld Gov 2019)
- Queensland Water Recycling Guidelines (EPA 2005)
- Water Quality Guidelines for Recycled Water Schemes (NR&W 2008).

1.4 Limitations

The findings of this report are based on the objectives and scope of work outlined above. PE performed the services in a manner consistent with the normal level of care and expertise exercised by members of the environmental assessment profession. No warranties or guarantees, express or implied, are made. Subject to the scope of work, PE's assessment is limited strictly to identifying typical environmental conditions associated with the subject property, and does not include evaluation of any other issues.

This report does not comment on any regulatory obligations based on the findings, for which a legal opinion should be sought. This report relates only to the objectives and scope of work stated, and does not relate to any other works undertaken for the client. The report and conclusions are based on the information obtained at the time of the assessment. Changes to the surface and subsurface conditions may occur subsequent to the investigation described herein, through natural processes or through the intentional or accidental addition of contaminants, and these conditions may change with space and time.

The results of this assessment are based upon site inspection and fieldwork conducted by PE personnel and information provided by the client and site management. All conclusions regarding the property area are the professional opinions of the PE personnel involved with the project, subject to the qualifications made above. While normal assessments of data reliability have been made, PE assumes no responsibility or liability for errors in any data obtained from regulatory agencies, information from sources outside of PE, or developments resulting from situations outside the scope of this project.

2 SITE CHARACTERISTICS AND SURROUNDING ENVIRONMENT

2.1 Site and allotment detail

Site and allotment details are provided in Table 1.

Table 1. Site and allotment detail.

Aspect	Detail					
Local Government:	Scenic Rim Regional Council (SRRC)					
Zoning:	Rural					
Address:	6200 – 6206 Cunningham Highway, Kalbar, Queensland					
Real property description:	Lot 1 RP216694	Lot 2 SP192221	Lot 3 SP192221	Lot 4 SP192221	Lot 2 RP44024	Lot 2 RP20974
Area in hectares (ha)	0.624	2.876	48.93	61.16	75.277	59.744
Current land use and site structures:	The primary use of the site is farmland for growing and processing vegetables and low-intensity cattle grazing. The main structures located along Cunningham Highway operate as a distribution centre to wash, sort and process vegetables for bulk sale.					
New land use:	The site is proposed to expand operations to other local growers forming a mini commercial sub-division. The site use will remain the same, but the volume of production and distribution will increase.					
Surrounding land uses:	Rural land use, farmland and cattle grazing. A quarry is located to the northwest.					
Former contaminating land uses (identified during site inspection):	Former cattle dip located in Lot 2 RP20974 approximately 50 m east of the proposed Irrigation Area (IA). Former service station located in Lot 2 SP192221 - canopy, bowser, fill points and underground storage tanks (USTs) remain in-situ. DES was notified of these activities on 13 February 2020.					

2.2 Site characteristics

A summary of the site characteristics is provided in Table 2. Site photographs are attached in Appendix B.

Table 2. Site characteristics within the proposed IA.

Aspect	Detail
Site elevation	Google Earth reports the IA at elevation at ~ 90 - 99 m AHD.
Presence of fill:	Not identified.
Slope (%):	Gently inclined (~6 %).
Slope configuration:	Linear planar to linear divergent.
Slope aspect:	Variable.
Vegetation:	Short grass.
Exposure:	High sun and wind exposure.
Presence of shelter belts:	Nil.
Erosion potential:	Low.

2.3 Soil characteristics

A site inspection was conducted on 21 October 2019 which included the sampling of soils within the proposed IA, and dispatch of the samples to the DES Chemistry Centre which holds NATA accreditation. Observed soil characteristics are provided in Table 3 and laboratory results are discussed further in Section 3.4.

Table 3. Soil characteristics in the proposed IA.

Aspect	Detail	
Soil profiles	Two boreholes were constructed by PE using a hand auger to a maximum depth of 0.9 m. Encountered soil profiles were as follows:	
	BH1 0.0 – 0.1 (Natural) Silty Sand, fine to medium grained sand, grey brown, moist. 0.1 – 0.6 Clayey Gravelly Sand, fine to medium sized angular gravel, fine to medium grained sand, yellow brown, moist. 0.6 – Borehole terminated in extremely weathered granite.	BH2 0.0 – 0.6 (Natural) Light to Medium Clay, grey with orange mottles, moist. 0.6 – 0.9 Clayey Sand, fine to medium grained sand, yellow brown, moist. 0.9 – Borehole terminated extremely weathered rock.

2.4 Geology and hydrology

Geology details for the site and surrounds are provided in Table 4.

Table 4. Regional geology.

Aspect	Detail
Acid sulfate soil	There is no acid sulfate soil mapping associated with this site.
Geology	The geology across the site is mapped as 1:500,000 as Quaternary: Flood plains, river terraces (Geological Survey of Queensland, Moreton Geology 1978). Local soil mapping 1:25,000 shows the site classified as Bromelton (eroded phase) with soils comprising dark clay loam or light clay with neutral or alkaline structured clay subsoil (Qld Department of Primary Industries 1979).

Hydrology characteristics are detailed in Table 5. Mapping is provided in Appendix B.

Table 5. Hydrology details for the site and surrounding area.

Aspect	Detail
Direction of stormwater drainage:	Stormwater is expected to follow the natural contour of the gullies flowing southwest from the irrigation area. Stormwater is then expected to flow northeast toward Warrill Creek.
Flooding	The area to the southeast of the proposed irrigation area is designated as a high flood hazard. The proposed IA is not mapped in a flood hazard area.
Onsite surface waters	Numerous gullies which are expected to flow seasonally or in a heavy rain event – which flows to Warrill Creek 1.6 m northeast. There are also a number of dams located in the northern portion of the site. The closest dams to the IA are 15 m north and 200 m southeast. Additional information regarding waterway details are provided in waterway investigation report prepared by Fishology Consulting (FC 2020).

Aspect	Detail
Onsite groundwater wells / bores:	A registered sub artesian bore (RN138334) exists on the site and historically used for agricultural purposes. There are five unregistered operational bores within the bounds of Lot 2 SP192221 which are located a minimum distance of: • 600 m from digestate irrigation area • 175 m from bioenergy facility • 525 m from digestate storage area. There is one unregistered bore within the bounds of Lot 3 SP192221 which is non-operational. During the site inspection PE collected a sample from a production bore known as 'little bore wash shed'. The bore is shown in Appendix A, Figure 3. The laboratory results are attached in Appendix D. A summary of the results are as follows: Characteristics (Source: Bore Cleaning Services): • Total depth – 16.3 m • Screen depth – 9 to 15 m • Water level – 10 m. Field results: • pH – 7.72 units • Electrical conductivity – 1.158 mS/cm • Turbidity – 0.07 NTU Key laboratory results: • Total dissolved solids – 750 mg/L • Hardness – 464 mg/L • Total nitrogen – 7,300 µg/L • Total phosphorus – 160 µg/L.

Registered groundwater bores in the locale (Queensland Globe)

Nearest bores to proposed IA with relevant information	RN138334 – within Lot 2 (900 m south of IA)	RN14310270 – 980 m east of the IA	RN124727 – 1.2 km southeast of IA
Status	Existing	Existing	Existing
Use / past use	Water supply	Sub-artesian monitoring	Water supply
Borehole depth (m)	141.7 m	17.3 m	518.0 m
Screen depth (m)	129.5 – 141.7 m	14.9 – 15.9 m	No data
Soil profiles	Varying clay gravel profiles from 0.0 – 15.8 m. The underlying material comprised granite, basalt and shale to the total drill depth.	0.0 – 12.1 m clay; underlain by gravel to 15.8 m. Basal from 15.8 – 17.3 m.	0.0 – 15.0 m clay; 15.0 – 36.0 sandstone and tuff. 36.0 – 518.0 m mixture of basalt, coal, sandstone and shale.
Water bearing zone / upper aquifer depth	134.7 m	12.1 m	36.0 m
SWL (m)	17.7 m	2.5 m	10.0 m

Aspect	Detail		
Upper aquifer status	Confined in basalt	The pressure head indicates this is a confined / semi-confined aquifer.	Semi-confined.
Quality detail provided on bore card	EC 1800 µS/cm (saline)	No data	Described as 'Potable' in aquifer section

SWL = standing water level

EC = electrical conductivity

2.5 Sensitive environments / environmental values

The closest sensitive environments to the site as mapped by various regulatory authorities and government agencies are detailed in Table 6. An overlay of the environmental receptors is provided in Appendix A, Figure 4 and sensitive environment maps are provided in Appendix C.

Table 6. Closest sensitive environment details.

Sensitive environment mapping	Approximate distance from Irrigation Area
Queensland Globe waterway mapping	
Watercourse:	Warrill Creek – 1.2 km southeast of the IA. An ephemeral gully runs through the centre of the site and flows northeast to Warrill Creek. At its closest point the gully is mapped 100 m west of the IA. Closest Dam – 75 m northwest of the IA.
Fish habitat and marine parks	None mapped within a 5 km radius of the IA.
Wetland protection area:	None mapped within a 5 km radius of the IA.
Remnant vegetation:	Category B remnant vegetation – 185 m north of the IA.
Matters of state environmental significance (MSES):	185 m north of the IA – MSES regulated vegetation – essential habitat 1.6 km southwest of the IA – MSES regulated vegetation – endangered or of concern 165 m west of the IA (ephemeral gully) – MSES regulated vegetation defined watercourse 1.2 km southeast of the IA (Warrill Creek) – MSES regulated vegetation defined watercourse
Queensland waterways for waterway barrier works	Low priority waterway mapped 180 m west of the IA Medium priority waterway mapped 225 m west of the IA.
Groundwater dependant ecosystem	The ephemeral gully and Warrill Creek are mapped as moderate confidence alluvial aquifers with near permanent connection between surface water and groundwater.
Mines Online Maps (DNRM 2017)	
Mining lease permit	~ 17.9 km northeast of the site.
National Parks	Moogerah Peaks National Park ~ 5.1 km southeast of the site. Main Range National Park ~ 13.7 km west of the site.
World Heritage Area (WHA)	Main Range National Park ~ 13.7 km west of the site.
Native Title	~ 1 km south of the IA.
Environmental Protection (Water) Policy 2009 (EPP) waterway mapping	

Sensitive environment mapping	Approximate distance from Irrigation Area
The section of Warrill Creek is mapped as lowland freshwaters. DES has published guidelines values for the protection of Bremer River in the Environmental Protection (Water) Policy 2009	
Environmental values (EVs) for groundwater in the Bremer River catchment	Aquatic ecosystem, irrigation, farm supply/use, stock and drinking water.
EVs for middle Warrill Creek – lowland freshwater	Aquatic ecosystem, irrigation, farm supply/use, stock water, human consumer, primary/secondary/visual recreation, drinking water and cultural/spiritual values.
Water quality guidelines and water quality objectives (WQOs) suited to the identified EVs	WQOs within the EPP 2009 stipulate the following WQOs for Warrill Creek – lowland freshwater: • Turbidity: <5 NTU • Total suspended solids: <6 mg/L • Chlorophyll a: <5 µg/L • Total nitrogen: <500 µg/L • Oxidised N: <60 µg/L • Ammonia: <20 µg/L • Organic N: <420 µg/L • Total phosphorus: <50 µg/L • Filterable reactive phosphorus: <20 µg/L • Dissolved oxygen: 85 – 110% saturation • pH: 6.5 – 8.0 units • Conductivity: <500 µS/cm.

The key receptors that could potentially be affected are as follows:

- Air quality has the potential to be degraded
- Surface waters (dams and creeks) have the potential to be impacted by effluent runoff and infiltration
- Groundwater has the potential to be impacted by effluent runoff and infiltration
- MSES vegetation could be impacted by effluent runoff
- Nearby wetlands could be impacted by effluent runoff and infiltration
- People and wildlife have the potential to impacted by excessive noise generating activities
- Land contamination can occur as a result of improper application of effluent and inappropriate management of wastes.

Environmental objectives and performance outcomes to mitigate the risks have been addressed with reference to the Queensland Government Environmental Protection Regulation (2019), Schedule 5, Part 3, Table 1, and is provided in Appendix D. Section 3 provides design input parameters (i.e. via MEDLI modelling and risk assessment) to mitigate impacts to receptors

2.6 Local meteorology

A summary of the rainfall and evaporation data for Kalbar (which has been utilised in the MEDLI model) (latitude 27.95°S, longitude 152.62°E) for the period 1 January 1889 to 31 December 2018 (130 years). This data is referenced in Table 7.

Table 7. Annual rainfall and evaporation summary (MEDLI).

Annual Totals	5 percentile	50 percentile	95 percentile
Rainfall mm/year	503	867	1,219
Pan Evap mm/year	1,483	1,633	1,804

Average rainfall from the Bureau of Meteorology (BOM) for Amberley AMO (Weather station 40004) from 1941 10 October 2019 are detailed in Table 8.

Table 8. Mean monthly rainfall and temperature summary (BOM).

MONTHLY	J	F	M	A	M	J	J	A	S	O	N	D
Rainfall (mm)	115.4	119.9	85.7	54.2	52.4	46.8	37.2	28.3	33.1	73.4	80.9	119.3
Ave max. temp (°C)	31.2	30.5	29.4	27.2	24.1	21.6	21.3	22.9	25.7	27.8	29.6	30.8
Ave min. temp (°C)	19.6	19.5	17.8	14.0	10.0	7.1	5.3	6.2	9.5	13.3	16.3	18.4

3 HYDRAULIC LOADING AND SIZING OF SEWAGE MANAGEMENT INFRASTRUCTURE

3.1 Water supply and water reduction strategy

PE understands the client has secured a water allocation from the administering authority for the release of water from Moogerah Dam. The allocated release will be drawn from a pump station along Warril Creek ~ 1.5 m northeast of the SRAIP area. The water will be stored in a dam shown in Appendix A, Figure 5, and pumped from the storage dam to a potable water treatment system proposed Lot 17.

Operational groundwater wells at the site will remain in use for the SRAIP and will primarily used for crop processing (e.g. vegetable harvesting, processing and the like).

Whilst not confirmed at the time this report was prepared, the proposed industrial lots may (additionally to the above described methods) harvest rainwater from the building roof catchment area.

A letter prepared by RPS Group (dated 22 June 2022) confirms there is an annual water supply of at least 371 ML available for the SRAIP project which is sufficient to accommodate standard industrial demand for water across all lots within the SRAIP whilst providing for additional demand associated with known tenants / land uses within the precinct. Potable water supplied via tanker imports are therefore unlikely to be required for the project.

PE recommends the installation of full water-reduction fixtures (where possible) which include the combined use of reduced flush 6/3 litre toilets, waterless urinals, shower-flow restrictors, aerator faucets, and flow/pressure control valves on water-use outlets. Timed flow tapware incorporating 6-star 5.6 litre per minute rated (3 – 6 second time flow) is recommended.

3.2 Design flows and associated requirements

The estimated daily sewage design flows are provided below in Table 9. The flows for the rural precinct were based on the maximum predicted number of staff at the site predicted by the client with a daily flow rate allowance per person determined with reference to AS/NZS 1547:2012 Table H4 for rural factories / shopping centres.

Table 9. Estimated sewage generation from the rural enterprise precinct upgrade.

Site use	Persons/day	Sewage generation rate (L/day)		Calculated sewage generation (L/day)	
		Minimum	Maximum	Minimum	Maximum
Maximum occupancy	800	25	50	20,000	40,000
Total	-	-	-	-	**40,000**

A sewage design flow of 40,000 L/day has been used for the design of the sewage treatment system and irrigation area. Hydraulic loading may vary (daily flows to be monitored once the site is operational), and any increase in loading will require a system upgrade and an amendment to the future ERA 63 approval conditions. If the development is to be staged, a smaller sewage treatment facility may be initially installed and increased in capacity as the site becomes populated. It is noted that process water (i.e. waste water generated from washing of root vegetables) and waste water (i.e. digestate generated from the proposed anaerobic digestor) is not permitted to enter the sewage treatment system.

3.3 Preliminary irrigation area sizing

Calculation of the IA was initially assessed using AS/NZS 1547:2012 using a design irrigation rate (DIR) based on the observed site soil conditions, and the estimated hydraulic loading for the site.

The formula used is as follows:

Ai = Qd ÷ DIR

Where

Ai = minimum irrigation area required (m^2)

Qd = litres of sewage generated per day

DIR = design irrigation rate in mm/day

Estimated IA sizing:

Ai = 40,000 L/day ÷ 2 mm/day

= **20,000 m^2.**

A minimum irrigation area of 20,000 m^2 is required to sustainably irrigate 40,000 L/day with a DIR of 2 mm/day (i.e. indicative of Category 6 soils – medium to heavy clay, with consideration of the identified bedrock and proposed soil amelioration program).

Standard conditions DES impose for sizing of an irrigation area is based on rainfall volume and a nominated maximum irrigation rate (see standard condition D3 in Table 19). For this site the applicable irrigation area is 1,000 m^2 per m^3 of treated effluent where rainfall is > 1,000 mm/year and a maximum irrigation rate of 1 mm/day. The total irrigation area required under this scenario is 40,000 m^2.

Whilst there is significant area available within the bounds of the site to meet this requirement, a custom irrigation area size has been determined via MEDLI modelling. Refer to Section 3.5 which notes that PE has modelled using a 20,000 m^2 area which must be made available as a minimum area based on the design flow allowance in Section 3.2.

3.4 MEDLI modelling

The mass balance modelling program recommended by DES for ERA 63 applications is MEDLI. The MEDLI modelling program is a computer-based mathematical model that was developed jointly by the Queensland Department of Primary Industries (DPI) and the Cooperative Research Centre for Waste Management and Pollution Control.

MEDLI replicates the operation of a treated effluent irrigation scheme over an extended period of time. MEDLI simulates the natural processes that take place daily, by performing material balance calculations using the volume of incoming sewage, the constituents (nitrogen, phosphorus, dissolved salts, etc.), details of the sewage treatment / management system, and climatic data for the particular location.

Ideally, the application rate of any component (hydraulic loading, salts, nitrogen or phosphorus) of irrigated effluent should not exceed:

- The rate at which it is taken up by the plants and removed from the site
- Safe storage in the soil
- Allowable losses into the environment.

Soil analysis results which allow for customisation of MEDLI are provided below in Table 10. Laboratory certificates are provided in Appendix E.

Table 10. Soil laboratory results.

Physical / chemical characteristics:	**Parameter**	**BH1 0.0 – 0.25 m**	**BH2 0.0 – 0.6 m**	**BH3 0.3 – 0.6 m**
	pH (units)	6.36	6.23	7.87
	EC (µS/cm)	40	50	300
	Nitrate nitrogen (mg/kg)	5	2	11
	Phosphorus (mg/kg)	131	5	16
	Organic carbon (%)	0.833	1.4	0.688
	Air dry moisture content (%)	4.1	8.3	3.7
	Cation exchange capacity (cmol/kg)	-	-	-
	Coarse sand (%)	32.3	8.4	11.0
	Fine sand (%)	37.1	16.8	35.8
	Silt (%)	21.9	15.4	9.5
	Clay (%)	14.0	57.9	45.1
	Field capacity moisture (%)	35.7	48.1	40.7
	Permanent wilting point (%)	13.2	25.1	19.9

Customisation of the soil parameters component of MEDLI was completed using components of the soil analysis results above to form a user defined 'Kalbar low permeability red brown earth'. The climatic data was sourced online using SILO from Englesberg Village (Kalbar) weather station (40104), and multiple preliminary runs were used with an irrigation area ranging from 20,000 m^2 to 30,000 m^2. An IA of 20,000 m^2 was chosen plus modelling of the following:

- Zero flow run – all factors are entered, though effluent volumes to be irrigated on a daily basis are set to zero so that the natural effects of the climate on the crop and water entering deep drainage can be determined
- Peak flow run – a peak flow of 40 kL was set each day, and does not account for lower daily flows

Soil input parameters for both scenarios are provided in Table 11 and other MEDLI input parameters for each scenario are provided in Table 12. The default MEDLI input values used in the absence of specific soil data were derived from the range of values from Table 3.11 of the MEDLI user manual (DSITI 2016). These values were selected based on those which most closely represented the soil texture information provided in Table 3.

Table 11. Soil input parameters.

Soil input	**Layer 1**	**Layer 2**	**Layer 3**	**Layer 4**
Soil type	Kalbar low permeability red brown earth			
Soil layer thickness (mm)	100	500	600	300
Air dry (%v/v)	8.3	0.1	0.1	0.1
Lower storage limit (%v/v)	25.1	20.1	25.6	26.2
Drained upper limit (%v/v)	44	32	33.9	32.2

Soil input	Layer 1	Layer 2	Layer 3	Layer 4
Available water capacity (mm)	18.9	59.5	49.8	18.3
Saturated water content (%v/v)	45	43.5	44.8	42.3
Bulk density (g/cm^3)	1.38	1.47	1.44	1.49
Porosity (%v/v)	47.92	44.53	45.66	43.77
Saturated hydraulic conductivity (mm/hr)	20	10	2	0.5

Table 12. MEDLI input.

Parameter	Input	
	Zero run	2 ha
Effluent characteristics		
Daily volume (kL)	0	40
Run period	1 January 1889 to 31 December 2018	
Nitrogen concentration (mg/L)	60	
Phosphorus concentration (mg/L)	10	
EC (µS/cm)	1,600	
WWST		
WWST capacity (kL)	200 (5 days x 40 kL/day)	
WWST characteristics	Closed pond (i.e. no evaporation or rainfall input) with full draw-down depth	
IA		
Size of IA	2 ha	
Soil	As per Table 11	
Crop	Lucerne (winter active) pasture	
Irrigation method		
Irrigation system	Fixed sprinkler	
Irrigation trigger (maximum)	Once daily to fixed depth of 5 mm A maximum nominal pump rate of 1 ML/day has been set based on the advice of DES – without this setting, the model will not irrigate water unless a complete irrigation event can occur. Rather, by setting this purposely high maximum, irrigation will trigger regardless of whether the fixed depth of 5 mm can be reached.	
Ammonia volatilisation	20% (default setting)	

Table 13 below summaries the model output for each of the scenarios. MEDLI output files are attached in Appendix F.

Table 13. Staged MEDLI results.

Parameter	Zero run	20,000 m²
Effluent re-use		
Reuse (%)	-	100
Over-topping (kL/year)	-	0
Water balance		
Irrigated effluent (mm/day)	-	5
Irrigated effluent (mm/year)	-	730.48
Rainfall volume (mm/year)	863.80	
Transpiration (mm/year)	325.49	935.55
Irrigation runoff (mm/year)	-	0
Deep drainage (mm/year)	27.77	163.76
Deep drainage less zero run (mm/year)	-	135.99
Crop performance		
Annual yield (kg/ha/year)	4,478.37	23,697.39
Average monthly plant cover	0.36	0.71
Average crop deaths (no/year)	1.64	0.04
Average monthly water stress	0.28	0.08
No. days without crop per year	58.31	0.19
Average annual nitrogen deficiency	0.57	0.29
Nutrient balance		
Average annual effluent nitrogen added (kg/ha/year)	0	438.29
Average annual soil nitrogen removed by plant uptake (kg/ha/year)	39.05	476.03
Average annual soil nitrogen leached (kg/ha/year)	3.08E-03	0.62
Average nitrate-N concentration of deep drainage (mg/L)	0.01	0.38
Maximum annual nitrate-N concentration of deep drainage (mg/L)	0.06	14.84
Average annual effluent phosphorus added (kg/ha/year)	0	73.05
Average annual soil phosphorus removed by plant uptake (kg/ha/year)	3.8	70.88
Average annual soil phosphorus leached (kg/ha/year)	4.70E-03	0.07
Average phosphate-P concentration of deep drainage (mg/L)	0.02	0.04
Maximum annual phosphorus-P concentration of deep drainage (mg/L)	0.07	0.08
P storage life (years)	-	59.62
Salt balance		
Salinity of infiltrated water (µS/cm)	-	794.11

Parameter	Zero run	20,000 m²
Average annual salt added & leached at steady state (kg/ha/year)	-	7,629.66
Relative crop yield expected due to salinity (%)	-	100

3.5 MEDLI modelling summary and assessment of risk

The modelling indicates a re-use rate of 100 % with no overtopping year round based on the design input data. Nitrogen uptake was greater compared to the amount added, and phosphorus uptake was only slightly lower than that added. The modelled salt application does not appear to be affecting crop yield.

The modelled volume of deep drainage is 163.76 mm/year, minus the deep drainage for a zero run scenario 27.77 mm/year then the deep drainage is equal to 135.99 mm/year. DES typically accept a deep drainage value <200 mm/year to minimise risk to groundwater users. Given the nearest groundwater bore (unregistered) is 785 m from the proposed IA, the risk to groundwater users at the site is low.

4 ONSITE SEWAGE DESIGN

4.1 Sewage characteristics summary

A summary of the sewage characteristic potential is provided below in Table 14.

Table 14. Sewage summary characteristics potential.

Aspect	Detail	
Flow / STP peak design capacity	40 kL/day.	
WWST capacity	200 kL	
Potential Influent quality range	Parameter	Typical concentrations if site well managed and limited concentrated kitchen liquid waste enters the system.
	Total nitrogen	100 – 150 mg/L
	Total phosphorus	10 – 25 mg/L
	BOD_5	150 – 500 mg/L
	Total suspended solids	150 – 450 mg/L

It is noted that the above constituent concentrations may vary from time to time which should be considered by the supplier of the wastewater treatment system. It has been determined also that a shallow water supply bore on the site has a baseline total nitrogen concentration of 7.3 mg/L which will further influence the wastewater nutrient concentration. Sampling of influent should be conducted (see Section 5.2.1) to ensure that the water quality specifications in Table 15 can be achieved for Class B effluent in addition to the release limits in the EA for this site (a performance guarantee provided to ensure the system is capable of variable conditions).

4.2 Sewage treatment

PE recommends that all sewage be treated to Class B standard for the proposed development. Water quality specifications for Class B quality effluent are provided in Table 15 taken from the Queensland Water Recycling Guidelines (EPA 2005) and the Public Health Regulation 2005 (Qld). It is recognised that the EPA (2005) is now superseded by Water Quality Guidelines for Recycled Water Schemes (NR&W 2008), however this remains the best source for effluent class criteria.

Table 15. Water quality specifications for Class B effluent.

Parameter	Criteria
E. coli	< 100 cfu/100 mL (median)
BOD_5	20 mg/L (median)
Turbidity	-
Suspended solids	≤30 mg/L (median)
TDS / EC	≤1,000 mg/L (median) / ≤ 1,600 µS/cm (median)
pH	6 – 8.5

All Class B water shall be directed from the STP into the WWST prior to irrigation (refer Diagram A).

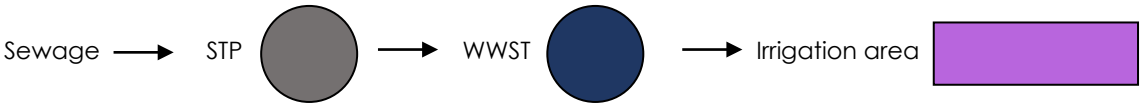


Diagram A. Flow process schematic.

4.3 Soil amelioration

Soil amelioration will be undertaken prior to planting the pasture crop and installation of the irrigation system to make the soil suitable for the establishment of pasture and for sustainable effluent irrigation. This process will require detailed input from an agronomist familiar with the site soils and proposed pasture crop to ensure the viability of the irrigation system as a whole.

Gypsum should be added at a rate to be determined by an agronomist (typically 1-2 kg/m2) and incorporated into the soil with a rotary hoe or tine following deep ripping to improve the soil structure. The gypsum will improve the quality of the soil, making it better suited for effluent irrigation. This in turn will improve conditions for crop establishment and longevity. In addition, it is recommended that organic material be added to the soil and good quality imported topsoil (where required) to further improve the soil texture.

The proposed irrigation area will be established with lucerne pasture in advance of the irrigation area being operational. In conjunction with input from an agronomist, PE can assist with the soil amelioration process and provide certification that the area is suitable for digestate irrigation once the pasture is established.

4.4 Lucerne pasture

Source (extract): https://www.agric.wa.gov.au/pasture-establishment/lucerne-plant-and-its-establishment

Lucerne general characteristics:

- Provides a high quality feed for livestock
- Is a deep-rooted, temperate, perennial pasture legume which is suited to the region
- Will reduce groundwater recharge
- Will improve soil fertility and structure
- Will reduce weed burden and manage herbicide resistance for cropping
- Has a high water demand
- Has the ability to respond quickly to significant summer rainfall (>10 millimetres) but requires 20 - 25 mm to produce substantial growth
- Produces between 4-8 tonnes of dry matter per hectare per year (DM/ha/yr)
- Has good drought tolerance and is well suited to irregular rainfall patterns
- Grows in areas receiving as little as 325 mm annual rainfall but also provides good summer production in areas up to 700 mm rainfall
- Produces high quality green feed. It has high energy — digestibility of 65 - 72% with a metabolisable energy of 8 - 11 megajoules per kilogram (MJ/kg) DM — and high protein (12-24%)

- The quality of feed remains relatively constant throughout the year while it is active. Lucerne is also a source of calcium, magnesium, phosphorus and vitamins A and D
- Can be grown as a pasture phase, removed and followed by a crop phase or it can be over sown with crops (pasture cropped)
- Fixes between 10 and 20 kg/ha of nitrogen for every tonne of dry matter produced, increasing soil nitrogen levels for subsequent crops
- Once established, it can help manage herbicide resistant weeds with its competitiveness and tolerance of some broad-spectrum herbicides.
- Effective weed management will increase the legume component and nitrogen accumulation from a lucerne based pasture
- The principles for integrating lucerne into broadacre dryland farming systems are described in the Department of Agriculture and Food, Western Australia's (DAFWA) Bulletin 4785 - Lucerne Guidelines for Western Australia.

Lucerne's limitations

- The cost, and slow rate (6-12 months) of establishment
- Low winter production (typically)
- Requirement for rotational grazing for long-term persistence
- Greater monitoring for insects and susceptibility to being over-grazed
- Variable out-of-season production
- The pasture phase needs to be at least three years to overcome the high upfront costs of establishment
- Can be difficult/costly to remove if going into a crop phase
- Can reduce crop yields in the year following the lucerne phase due to a dry soil.

Soil-climate adaptation

- Rainfall: >325 mm
- Drought tolerance: very high
- Frost tolerance: moderate to high
- Soil type: grows well on a wide range of well drained soils including deep loams, deep yellow and brown sands, loamy sands over clay or gravel, deep sandy duplex soils and uniform clays. It is not suited to deep pale sands and shallow soils (hence requirement for soil amelioration)
- Soil fertility requirements: moderate to high
- Soil pH (CaCl2): 4.8 to 8.0 in the top 30 centimetres (cm) — note optimum pH >5.5
- Aluminium tolerance: low
- Waterlogging tolerance: low
- Salt tolerance: moderately low (if not waterlogged).

5 SERVICE, MAINTENANCE AND MONITORING

5.1 Service and maintenance

A summary of the general service, maintenance and operational requirements of the core components of the sewage treatment system are provided in Table 16. The table is not exhaustive, and the manufacturer of the sewage treatment system should be consulted for any additional requirements.

Table 16. Servicing, maintenance and operational requirements.

Component	Requirements
All components	Alarms: Provide alarms including a visual strobe light and telemetry capabilities in case of system failure.
	Backup power: Backup power should be provided in the event of power failure. All plant must be configured to enable the use of a portable generator for temporary power supply during power failure, and a backup generator is to be available (on site or for hire) in case of power failure.
	Noise: All components should be maintained to avoid nuisance noise to any nearby sensitive receptors (e.g. patrons, staff and nearby residents).
	Odour: All components must be maintained to avoid nuisance odour.
	Signage: All components must have warning signs displayed in prominent locations in English and any other language applicable to the sub-community using the site (e.g. non English speaking) stating RECYCLED WATER – DO NOT DRINK. All signage must comply with AS 1319 – 1994 Safety Signs for the Occupational Environment.
	Access: Fencing can be erected around the areas of all components to restrict access by unauthorised personnel where applicable.
	Supplier: A reliable manufacturer / supplier must be engaged for the construction, installation and maintenance of all components of the sewage treatment system, and must provide a suitable level of detail to demonstrate past performance of similar site systems currently operating in the field (i.e. Queensland). Due to the potential for the wastewater to be moderate to high strength, the supplier must provide a performance guarantee to ensure the system is capable of variable conditions (e.g. quantity and quality). The supplier should be able to provide costing on all servicing, maintenance and warranty requirements for the system. All servicing / maintenance records will need to be made available by the supplier / manufacturer in the event that this information is requested.
	Design: All components are to be fully enclosed to prevent odours and any openings (e.g. overflow points) and are to be suitably screened to restrict mosquito ingress.
	Construction: All components are to be suitable for the environment, and secured (where required) to minimise the potential for vandalism or entry of unauthorised personnel.
	Certification: Certification is to be provided ensuring that cross-connections have not occurred within the system.
	Records: All servicing and maintenance documents/records must be kept for at least five years.
STP	Disinfection: Utilise an automatic disinfection dosing system suitable for Class B effluent
	General: Other maintenance requirements should be undertaken in accordance with manufacturer specifications.

Component	Requirements
	Flow equalisation: An upfront flow equalisation tank should be installed to ensure that sewage flows entering the STP do not exceed the peak design capacity of the STP. The flow equalisation tank is a standard component of an STP (a separate standalone tank or incorporated into the STP itself) to cater for variable daily flows. The purpose is to ensure the flow into the STP does not excess the peak design capacity of the STP and at the same to provide a mechanism for storage of surplus wastewater and to regulate flow. The volume and layout will be dependant to some extent on the selected supplier. It may be appropriate to incorporate a flow equalisation tank of at least 100 kL capacity in consultation with the applicant and other project stakeholders.
	Flow meter: A flow meter is to be installed at the STP inlet.
WWST	Rainfall: When rainfall prevents the irrigation of effluent, the effluent will be stored in the WWST.
	Pump out: The WWST must be pumped out in the event of excessive rain (when the WWST reaches 80% capacity), which prevents the irrigation of effluent for extended periods.
	Flow meter: A flow meter is to be installed at the WWST outlet.
	Alarm: The WWST must be fitted with a high level alarm capable of providing sufficient time to engage a licensed contractor to pump out the tank prior to any overflows occurring (to trigger at 80% capacity)
	Pumps: A circulation pump shall be installed within the WWST to mitigate stratification and uneven chlorine distribution (where applicable)
Irrigation area	Irrigation: Effluent will be irrigated across the designated area via coarse droplet irrigation methods that do not produce aerosols.
	Distribution: Effluent must be evenly distributed within the designated irrigation area (see Appendix A, Figure 5). Figure 6 shows examples of sprinkler options which may vary subject to client preferences and site risks.
	Size: The irrigation area must be a minimum of 20,000 m^2.
	Crop: The irrigation area must be planted with lucerne pasture.
	Harvesting: The irrigation area must be regularly harvested or directly consumed as fodder.
	Construction: The irrigation area must be constructed to ensure there is no ponding and/or run-off and ensure there is no spray drift or excessive deep drainage to groundwater. The irrigation system is to be monitored dally for the first week of operation. Weekly inspections to be undertaken thereafter to confirm no ponding, runoff and spray drift occurring. The irrigation consultant and/or STP operator must be responsible for these inspections and all observations and corrective measures documented accordingly.
	Sprinklers: Effluent rated sprinklers must be fixed in place and produce heavy droplets with low trajectory angle nozzles where required.
	Construction: Pipelines and fittings shall be in provided and fitted in accordance with AS/NZS 1547:2000 On-site domestic-wastewater management and AS/NZS 3500 Plumbing and Drainage (specifically Part 2. Sanitary plumbing and drainage). Pipeline and fittings associated with the effluent irrigation system must be distinctively and permanently colour coded deep purple or lilac in accordance with AS/NZS 3500.1:2003, Section 9 and AZ/NZS 1345 – Identification of the contents of pipes, conduits and ducts.
	Release pipes: Lockable valves or removable handles shall be fitted to any release pipes situated in public access areas (not likely to be applicable).

Component	Requirements
	Irrigation scheduling: Undertake irrigation daily at no greater than 5 mm – to be automatically determined using soil moisture meters or alternative measures considered appropriate by the STP operator. All irrigation pumps and flow meters to be calibrated to ensure the design irrigation rates are not exceeded and can be scaled back if impacts are identified. The irrigation area can be fenced, and irrigation can occur anytime of the day.
Collection and distribution system	Pump stations: Any pump stations must be fitted with stand-by pumps and pump failure alarms as well as high level alarms to warn of imminent pump station overflow - all alarms and pumps must be able to operate without mains power (backup power available to prevent overflow). The locations of any pumping stations and overflow points are to be prepared and updated as required for the life of the system.
	Concentrated waste: The collection system must not receive concentrated liquids from other site facilities (as applicable).
Other	Chemical storage: Storage and handling of chemicals to meet appropriate standards including Australian Standard AS1940-2004 *The Storage and Handling of Flammable and Combustible Liquids*, NOHSC:1015 (2001) *National Standard for the Storage and Handling of Workplace Dangerous Goods, Australian Code for the Transport of Dangerous Goods by Road and Rail, Dangerous Goods Safety Management Act 2001* - typically this is to include bunding for chemicals incorporating a capacity of at least 110% of the largest storage tank in each bunded area. Loading / unloading areas for chemicals and waste are to be capable of containing any spillage resulting from loading / unloading of vehicles.
	Spill kit: An appropriate spill kit, personal protective equipment and relevant operator instructions / emergency procedure guides for the management of wastes and chemicals associated with the STP must be located in close vicinity to the system.

The site owner/occupier/management staff shall have a suitable understanding of the operational requirements and limitations of the sewage treatment plant, and all plant operators shall be trained (written training records essential) by the manufacturer / supplier or another suitably qualified person. In addition, validation and ongoing monitoring of the system, irrigation area and surrounding environment are required as described briefly below.

Furthermore, Appendix D, Table A and Table B must also be sourced for other site related environmental objectives, performance outcomes and land rehabilitation requirements.

5.2 Monitoring

The below sections detail typical monitoring requirements for the site. DES may impose additional monitoring requirements for the site as part of the EA at their discretion. A detailed list of the requirements for ongoing monitoring of effluent and other components of the sewage treatment system, including noise and odour monitoring and reporting should be documented in a Site Based Management Plan (SBMP) or equivalent, and may form part of the EA conditions of approval. All instruments and devices used for the measurement or monitoring of any parameter shall be calibrated, and appropriately operated and maintained.

5.2.1 Commissioning phase monitoring

For the initial 'commissioning' phase when the system is first installed, the sampling regime will include five samples on day 1 followed by one sample per day thereafter for the duration of the 'commissioning' phase (typically four consecutive weeks). Irrigation and/or re-use is not to occur until five consecutive samples

(taken at not less than 30 minutes apart) are taken that meet both the median and maximum criteria in Table 17.

Following this 'commissioning' phase, testing for *E. coli* is required on a monthly basis as a single sample. During any sampling for *E. coli*, should a single sample return a result greater than the maximum value in Table 17, a follow up sample must be taken immediately. Should this follow-up sample return a value greater than the criterion value in Table 17, the 'commissioning' phase shall recommence and land irrigation must cease.

5.2.2 Monitoring of effluent

Monitoring of effluent shall be undertaken in accordance with the EA conditions and at the frequencies specified in Table 17 below to ensure that effluent complies with the EA release limits and requirements for Class B effluent. All determinations of the quality of contaminants released shall be:

- Sampled in accordance with methods prescribed in the latest edition of the Monitoring and Sampling Manual - Environmental Protection (Water) Policy 2009 (DES 2018)
- Carried out on samples that are representative of the discharge.

Furthermore, the inflow and outflow volumes must be recorded daily, including confirmation of the instantaneous peak flow via use of data loggers.

Table 17. Effluent quality limits.

Quality Characteristic	Unit	Release limit				Monitoring frequency
		Min	Median	95th Percentile	Max	
E. coli	colony forming units/100 mL	-	<100	-	150	Monthly
5-day biochemical oxygen demand (inhibited)	mg/L	-	20	-	30	Monthly
Total suspended solids	mg/L	-	30	-	45	Monthly
Electrical conductivity	µS/cm	-	-	-	1,600	Monthly
pH	units	6	-	-	8.5	Monthly
Recommended water quality specifications (Site specific EA conditions)						
Total chlorine	mg/L	1	-	-	5	Daily
Total nitrogen (TN)	mg/L	-	-	-	60	Monthly
Total phosphorus (TP)	mg/L	-	-	-	10	Monthly

Table notes:

Sampling to be undertaken at the outlet of the WWST for all parameters

Double disinfection should be considered with the primary method being via chlorine or UV

Total chlorine must not exceed 5 mg/L and should be measured onsite daily using a photometer.

The release limits for total nitrogen and total phosphorus are supported by the MEDLI model. PE recommends that the site specific EA should stipulate a total chlorine range of 1 – 5 mg/L, as opposed to a maximum concentration of 1 mg/L (under standard EA conditions).

It is noted that standard EA conditions stipulate a different pH range (5 – 8.5) when compared against the Queensland Water Recycling Guidelines for Class B effluent. PE recommends the site specific EA stipulate the pH to be 6 – 8.5 units.

5.2.3 Infrastructure requirements

Maintenance of the disinfection system shall be undertaken as per manufacturer's specifications, including as a minimum:

- Daily visual inspection and recording of disinfection indicators e.g. total chlorine (UV intensity if applicable)
- Regular lamp cleaning and inspection – if UV
- Lamp changes when required as per manufacturer's specifications – if UV.

Suitable infrastructure shall be incorporated into the STP to allow sewage that is not in accordance with relevant quality criteria specified in Table 15 to be automatically diverted into the start of the treatment system in situations due to plant failure.

If a UV disinfection system is utilised it shall have a dose of at least 140 mJ/cm^2 to treat meet Class B effluent requirements. The UV disinfection system shall have an auto-sleeve cleaning system, intensity indicator reading in mw/cm^2 and lamp failure detection.

5.2.4 Noise monitoring

When requested by the administering authority, noise monitoring shall be undertaken to investigate any complaint of noise nuisance, and the results notified within 14 days to the administering authority. Monitoring shall include:

- Background noise level
- LA, max adj, T
- LA 10, adj, 10 mins
- LA 1, adj, 10 mins
- The level and frequency of occurrence of impulsive or tonal noise
- Atmospheric conditions including wind speed and direction
- Effects due to extraneous factors such as traffic noise
- Location, date and time of recording.

The method of measurement and reporting of noise levels shall comply with the latest edition of the administering authority's Noise Measurement Manual.

5.3 Reporting

5.3.1 Site Based Management Plan

A SBMP or similar may be a condition of the EA approval by DES. If required, the SBMP should include:

- Environmental commitments - a commitment by senior management to achieve environmental goals
- Identification of environmental issues and potential impacts
- Control measures for routine operations to minimise likelihood of environmental harm
- Contingency plans and emergency procedures for non-routine situations
- Organisational structure and responsibility

- Effective communication
- Monitoring of the contaminant releases
- Conducting environmental impact assessments
- Staff training
- Record keeping
- Periodic review of environmental performance and continual improvement.

5.3.2 Onsite irrigation management plan

An irrigation area management plan (IAMP) may also be a condition of the EA approval by DES. If required, the IAMP should include:

- Local climatic conditions and estimation of correct crop water requirements or irrigation demand
- Buffer zones and security for the protection of sensitive receptors and public safety
- Irrigation infrastructure and its maintenance
- Soil properties and details of an ongoing soil monitoring program
- Irrigation rate and frequency required to avoid surface runoff, ponding, excessive deep drainage, optimise evapotranspiration, nutrient uptake and the reduction of build-up of salts and toxicants in the soil
- Crop selection and management
- Monitoring of local receiving environment, including surface and groundwater, and
- Contingency plans for managing overflows when irrigation is not possible.

5.3.3 Annual monitoring report

An annual monitoring report must be provided to DES with the annual return and provide details relevant to the site's compliance with the EA each year.

6 ERA 63 APPLICATION

Sewage treatment works with a peak design capacity of 21 equivalent persons (EP) or more are considered by the Queensland Government to be an Environmentally Relevant Activity (ERA) 63 due to the potential to cause environmental harm.

The Department of Environmental and Resource Management (DERM – now DES) *Planning Guidelines for Water Supply and Sewerage* (DERM 2010) defines equivalent person to mean:

The water supply demand or the quantity and/or quality of sewage discharge for a person resident in a detached house. It is also applied to:

- *The number of persons who would have a water demand equivalent to the establishment being considered.*
- *The number of persons who would contribute the same quantity and/or quality of domestic sewage as the establishment being considered.*

The Queensland Government defines an EP as the greater of (source):

a) EP = V/200 (where V is the volume, in litres, of the average dry weather flow of sewage that can be treated at the works in a day)

b) EP = M/2.5 (where M is the mass, in grams, of phosphorus in the influent that the works are designed to treat as the inlet load in a day).

Applying an estimated peak 'equalised' daily flow of 40,000 L/day and a phosphorus inlet design loading of 14 mg/L, the following EPs have been calculated:

a) EP = **V** / 200 = 40,000 L/day ÷ 200 = 200 EP

b) EP = **M** / 2.5 = (40,000 L/day) x [(14 mg/L x (1g ÷ 1,000 mg)] ÷ 2.5 = 224 EP.

As such, the more conservative 224 EP is considered most relevant. Both EP scenarios fall under the same ERA category being ERA 63 1(b)(i) - Operating sewage treatment works, other than no-release works, with a total daily peak design capacity of more than 100 but not more than 1,500 equivalent persons - where treated effluent is discharged from the works to an infiltration trench or through an irrigation scheme.

6.1 ERA 63 eligibility criteria and standard conditions

DES impose eligibility criteria and standard conditions for all ERA 63 applications, and the type of application to be made will be dependent on whether the applicant is able to meet all of these requirements. For a new application, there are three main types of applications which can be made.

1. Standard application - A standard application can be submitted to DES if the applicant **can comply with all** eligibility criteria and standard conditions.
2. Variation application - A variation application can be submitted to DES if the applicant **can comply with all** eligibility criteria but requires a variation of one or more of the standard conditions
3. Site specific application - A site specific application can be submitted to DES if the applicant **cannot comply with all** eligibility criteria.

Table 18 and Table 19 below details the eligibility criteria and standard conditions that the site is able to comply with and are derived from Eligibility criteria and standard conditions for sewage treatment works (ERA 63) – Version 2.

Table 18. Eligibility criteria compliance assessment.

Eligibility criteria	Detail	Can the site comply
Activity	The activity is sewage treatment works with a total daily peak design capacity of 21 to 100 equivalent persons (EP), if treated effluent is discharged through an irrigation scheme	✗
	The activity does not discharge effluent to an infiltration trench	✓
Location	The effluent disposal area is not within 250 m of any bore used for domestic water supply however an onsite bore is proposed for potable use.	✓
	The effluent disposal area is not within 1,000 m of any bore used for town water supply.	✓
	The activity is not carried out in a designated precinct in a strategic environmental area as defined in the Regional planning Interests Regulation 2014 or regional plan.	✓
	The facility is not within 100 m of any watercourse, wetland or spring	✓
Water	There is no release of aqueous waste from the activity to waters	✓

Table 19. Standard conditions compliance assessment.

Standard conditions	Detail	Can the site comply
General	G1: All reasonable steps must be taken to ensure the activity complies with the eligibility criteria.	✓
	G2: The activity must be undertaken in accordance with written procedures that: • Identify potential risks to the environment from the activity • Establish control measures that minimise the potential for environmental harm • Ensure plant and equipment is maintained and operated in proper and effective condition • Ensure that staff are trained and aware of their obligations under the Environmental Protection Act 1994 • Ensure that reviews of environmental performance are undertaken at least annually.	✓
	G3: The activity must not cause environmental nuisance at a nuisance sensitive place.	✓
	G4: All documents and records of monitoring required by conditions of this (to be issued) authority must be kept for at least five years.	✓
	G5: Storage of chemicals and fuels in bulk containers of greater than 15 L must be within a secondary containment system and releases controlled in a manner that prevents environmental harm.	✓
Land	L1: Contaminants from the activity must not be released to land except as authorised under conditions.	✓
Water	W1: Stormwater contaminated by the activity must be managed to minimise or prevent any adverse effect on the environmental values of the receiving environment.	✓

<table>
<tr><th>Standard conditions</th><th>Detail</th><th>Can the site comply</th></tr>
<tr><td></td><td>W2: Ponds used for the storage or treatment of effluent or wastes must be constructed, installed and maintained to:
Prevent any release of effluent or wastes from the ponds
Ensure the stability of the pond structure.</td><td>✓</td></tr>
<tr><td rowspan="5">Disposal of effluent to land</td><td>D1: Treated effluent is permitted to be released to land provided that it is done in accordance with a written procedure that ensures:
Infiltration to groundwater and subsurface flows of contaminants to surface waters are prevented
Surface pondage and run-off of effluent is prevented
Degradation of soil structure is minimised
Soil sodicity and the build up of nutrients and heavy metals in the soil and subsoil are minimised
Spray drift or overspray do not carry beyond effluent disposal areas
Effluent disposal areas are maintained with an appropriate crop in a viable state for transpiration and nutrient uptake
The crop on the disposal area is harvested and removed from the disposal area.</td><td>✓</td></tr>
<tr><td>D2: When weather conditions or soil conditions preclude the release of effluent to land, effluent must be directed to wet weather storage or be lawfully removed from the site.</td><td>✓</td></tr>
<tr><td>D3: In addition to the requirements of D1, the treated effluent must be evenly distributed over an area stated in the table below or a greater area.
<table>
<tr><th>Rainfall (mm/year)</th><th>Maximum irrigation rate (mm/day)</th><th>Minimum land required (m² per m³ of treated effluent irrigation)</th></tr>
<tr><td>< 600</td><td>3</td><td>335</td></tr>
<tr><td>> 600 – 1,000</td><td>2</td><td>500</td></tr>
<tr><td>> 1,000</td><td>1</td><td>1,000</td></tr>
</table></td><td>✓</td></tr>
<tr><td>D4: Treated effluent released to land must comply with the limits in the below table.
<table>
<tr><th>Quality characteristics</th><th>Release limit</th><th>Limit type</th></tr>
<tr><td>Total nitrogen*</td><td>60 mg/L</td><td>maximum</td></tr>
<tr><td>Total phosphorus*</td><td>20 mg/L</td><td>maximum</td></tr>
<tr><td>Electrical conductivity</td><td>1,600 µS/cm</td><td>maximum</td></tr>
<tr><td>pH</td><td>5 – 8.5</td><td>range</td></tr>
<tr><td>Total residual chlorine (if used)</td><td>1 mg/L</td><td>maximum</td></tr>
<tr><td>E.coli</td><td>< 1,000 cfu/100 mL</td><td>maximum</td></tr>
<tr><td colspan="3">* Limits would typically correspond to long term total nitrogen and total phosphorus concentrations of 30 mg/L and 10 mg/L respectively</td></tr>
</table></td><td>✗</td></tr>
<tr><td>Quarterly monitoring of treated effluent must be carried out in accordance with the Monitoring and Sampling Manual 2009 to assess compliance with condition (D4) and records of the results maintained</td><td>✓</td></tr>
</table>

Standard conditions	Detail	Can the site comply
Waste	Other than effluent released to land in accordance with conditions D1, D3 and D4, all waste generated in carrying out the activity must be reused, recycled or lawfully disposed of offsite.	✓

Based on the compliance assessment in Table 18 and Table 19 a site specific application must be made for ERA 63 1(b)(i) – operating a sewage treatment works with a total daily peak design capacity of 100 to 1,500 equivalent persons if treated effluent is discharged to an infiltration trench or through an irrigation scheme. The standard conditions which cannot be complied with are addressed in preceding sections of this report and will be modified to site specific conditions by DES or the Office of the Coordinator General (OCG) as part of the assessment.

The site specific effluent release characteristics which should be endorsed within the EA are specified in Table 17. DES / OCG at their discretion may modify or change the monitoring requirements of this site specific application to form part of the conditions of approval.

In addition to the above application being submitted, an application to be a registered suitable operator (RSO) must also be submitted concurrently for approval if the applicant is not already a RSO.

6.2 Fees

The below information is accurate as of 1 February 2023.

A review of the forms and fees finder for environmental authorities was undertaken on 28 February 2019. Table 20 details the application fee (a one off fee that DES charges to process the application) and an annual fee which is due 20 days after the environmental authority takes effect, and annually on the anniversary date of the EA thereafter.

Table 20. Environmental authority fees.

Fee type	Fee
Application fee	$3,085.59
Annual fee	$7,935.30

6.3 Other licencing considerations

It is acknowledged that if the planning approval for the SRAIP and EA is issued, an EA amendment application will need to be lodged when:

1. The phase two subdivision has been completed; and
2. The titles and registered plans (RP) have been designated.

Relevant conditions of approval my require modification to reflect the details of the subdivision (i.e. the correct lot information.

7 REFERENCES

ANZECC/ARMCANZ. 2000. Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand.

ANZG 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia.

ARMCANZ, ANZECC & NHMRC. 2000. *Guidelines for Sewerage Systems - Use of Reclaimed Water.* Agriculture and Resource Management Council of Australia and New Zealand, Australian and New Zealand Environment and Conservation Council, National Health and Medical Research Council, November 2000.

AS/NZS 1547:2000 *On-site Domestic-Wastewater Management.* Standards Australia.

DNRM. 2014. *Queensland Globe.* Department of Natural Resources and Mines, February 2015.

DERM. 2010. *Planning Guidelines for Water Supply & Sewerage*. Department of Environment and Resource Management, April 2010.

DES. 2018, Monitoring and Sampling Manual: Environmental Protection (Water) Policy. Brisbane: Department of Environment and Science Government.

DHPW. 2013. *Queensland Plumbing and Wastewater Code*. Department of Housing and Public Works, January 2013.

DSITI. 2016. Model for Effluent Disposal using Land Irrigation User Manual, Department of Science, Information, Technology and Innovation, State of Queensland, version 2, Rev: 2016-09-13.

EPA. 2005. *Queensland Water Recycling Guidelines*. Queensland Environmental Protection Agency, December 2005.

EPHC, NRMMC & AHMC. 2006. *National Guidelines for Water Recycling: Managing Health and Environmental Risks*, Environment Protection and Heritage Council, National Resource Management Ministerial Council and Australian Health Ministers' Conference, November 2006.

Geological Survey of Queensland (1971) Bowen 1:250,000 Geology Sheet, Geological Survey of Queensland, Brisbane.

NEPC. 2013. National Environment Protection (Assessment of Site Contamination) Measure 1999, Schedule B(2) Guideline on Site Characterisation, National Environment Protection Council Service Corporation.

NHMRC. 2022. Australian Drinking Water Guidelines 6 2011, Version 3.7, National Health and Medical Research Council, updated January 2022.

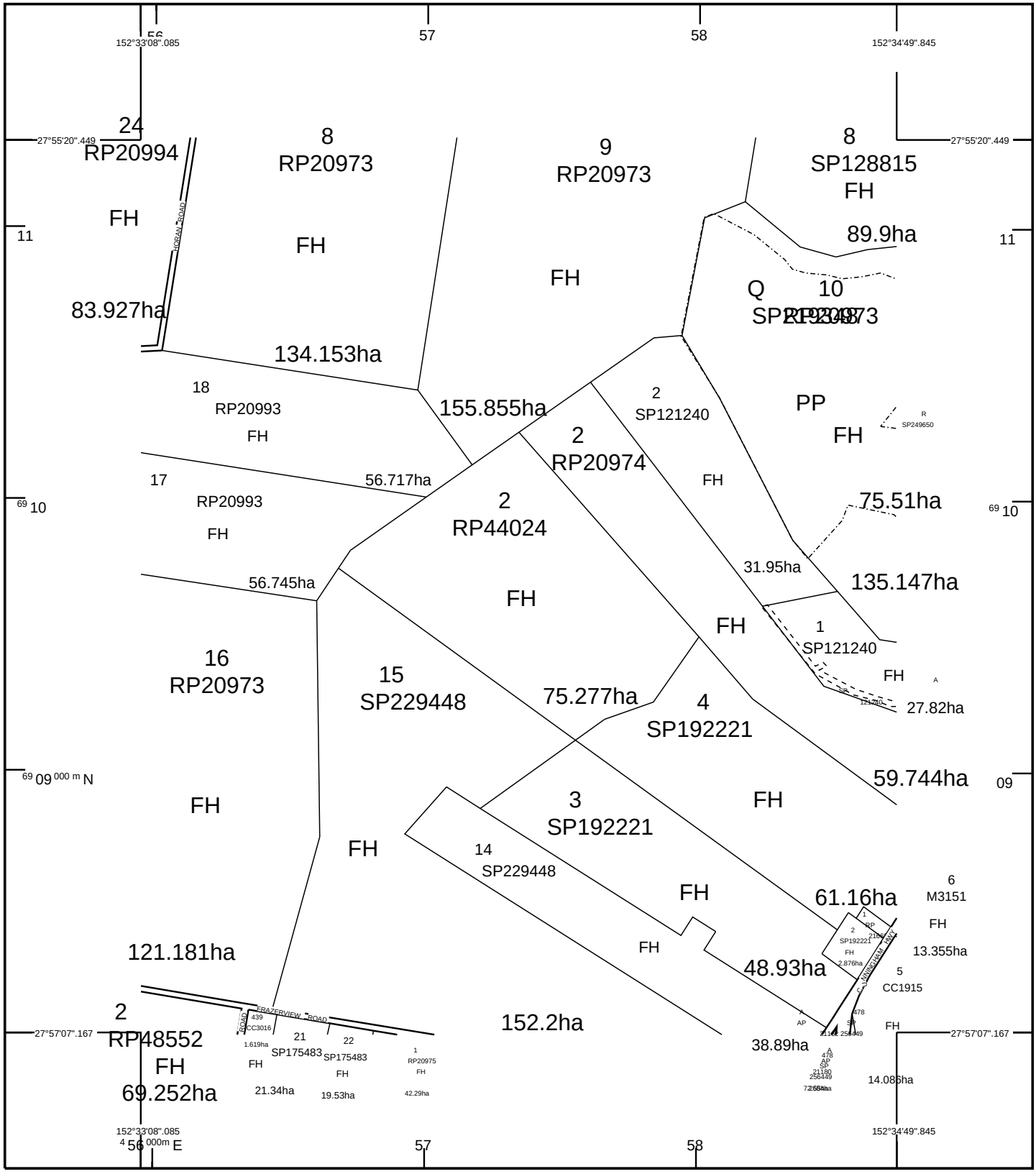
NR&W. 2008. *Water Quality Guidelines for Recycled Water Schemes*. Queensland Government Natural Resources and Water, 2008.

QPC. 2010. *Public Health Regulation 2005*. Queensland Parliamentary Counsel, Reprint 2B, January 2016.

QWSR, WSSS & DEWS. 2010. *Planning Guidelines for Water Supply & Sewerage*. Queensland Water Supply Regulator, Water Supply and Sewerage Services, Department of Energy and Water Supply, April 2010.

APPENDIX A – FIGURES

Figure 1A



STANDARD MAP NUMBER
9442-33133

0 400 800 1200 1600 2000 m

HORIZONTAL DATUM:GDA94 ZONE:56 SCALE 1 : 20000

MAP WINDOW POSITION & NEAREST LOCATION

152°33'58".965
27°56'13".808
FASSIFERN
2.97 KM

SUBJECT PARCEL DESCRIPTION

DCDB

Lot/Plan	2/RP44024
Area/Volume	75.277ha
Tenure	FREEHOLD
Local Government	SCENIC RIM REGIONAL
Locality	FRAZERVIEW
Segment/Parcel	14936/59

CLIENT SERVICE STANDARDS

PRINTED (dd/mm/yyyy) 21/10/2019

DCDB 20/10/2019 (Lots with an area less than 3000m² are not shown)

Users of the information recorded in this document (the Information) accept all responsibility and risk associated with the use of the Information and should seek independent professional advice in relation to dealings with property.

Despite Department of Natural Resources, Mines and Energy(DNRME)'s best efforts, DNRME makes no representations or warranties in relation to the Information, and, to the extent permitted by law, exclude or limit all warranties relating to correctness, accuracy, reliability, completeness or currency and all liability for any direct, indirect and consequential costs, losses, damages and expenses incurred in any way (including but not limited to that arising from negligence) in connection with any use of or reliance on the Information

For further information on SmartMap products visit http://nrw.qld.gov.au/property/mapping/blinmap

GDA

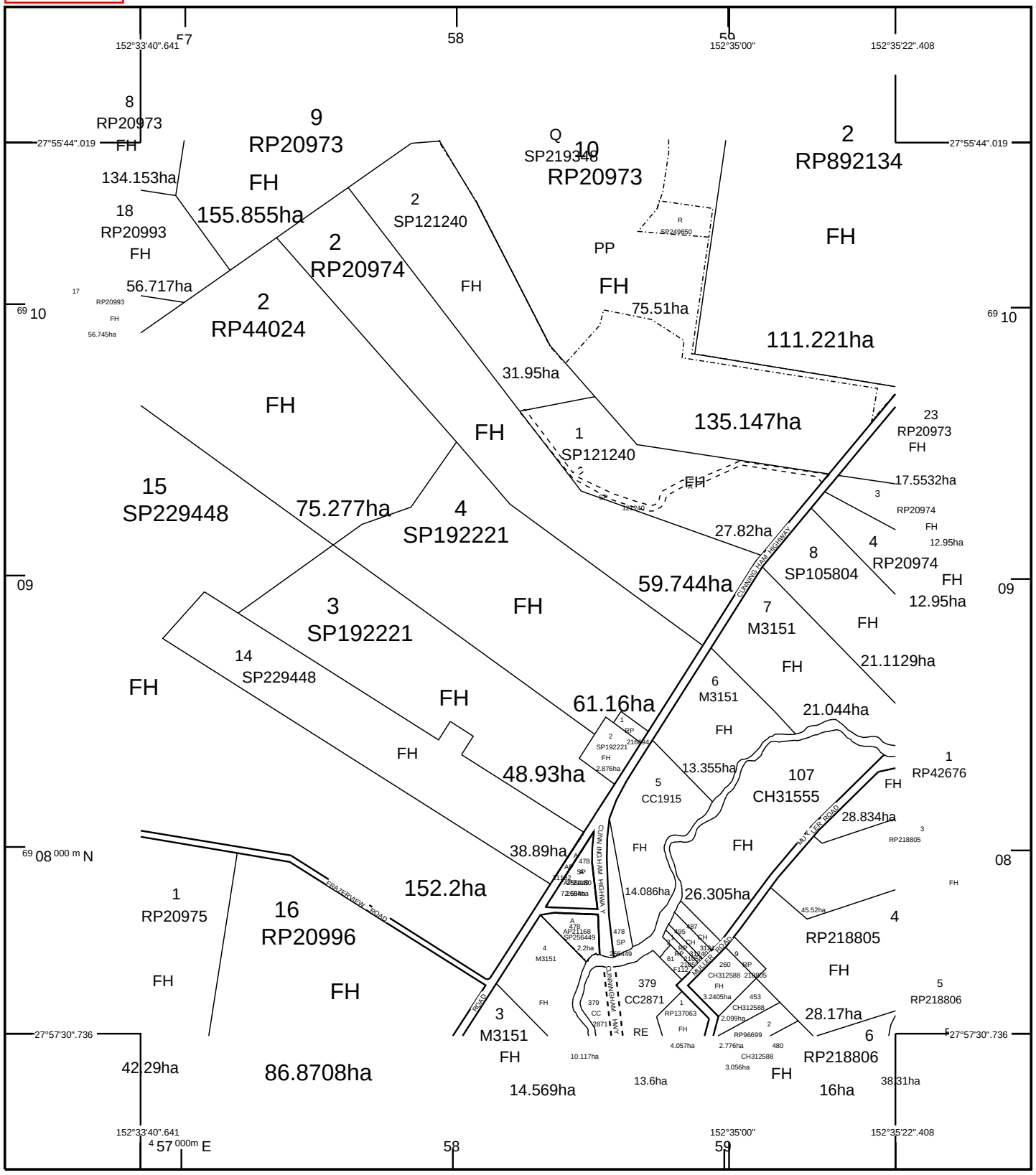
SmartMap

An External Product of SmartMap Information Services

Based upon an extraction from the Digital Cadastral Data Base

Queensland Government

Figure 1B



STANDARD MAP NUMBER
9442-33244

0 400 800 1200 1600 2000 m

HORIZONTAL DATUM:GDA94 ZONE:56 SCALE 1 : 20000

SmartMap

An External Product of
SmartMap Information Services

Based upon an extraction from the
Digital Cadastral Data Base

MAP WINDOW POSITION &
NEAREST LOCATION

152°34'31".525
27°56'37".378
FASSIFERN
1.83 KM

GDA

SUBJECT PARCEL DESCRIPTION

DCDB

Lot/Plan	4/SP192221
Area/Volume	61.16ha
Tenure	FREEHOLD
Local Government	SCENIC RIM REGIONAL
Locality	KALBAR
Segment/Parcel	14936/160

CLIENT SERVICE STANDARDS

PRINTED (dd/mm/yyyy) 24/10/2019

DCDB 23/10/2019 (Lots with an area less than 3000m² are not shown)

Users of the information recorded in this document (the Information) accept all responsibility and risk associated with the use of the Information and should seek independent professional advice in relation to dealings with property.

Despite Department of Natural Resources, Mines and Energy(DNRME)'s best efforts, DNRME makes no representations or warranties in relation to the Information, and, to the extent permitted by law, exclude or limit all warranties relating to correctness, accuracy, reliability, completeness or currency and all liability for any direct, indirect and consequential costs, losses, damages and expenses incurred in any way (including but not limited to that arising from negligence) in connection with any use of or reliance on the Information

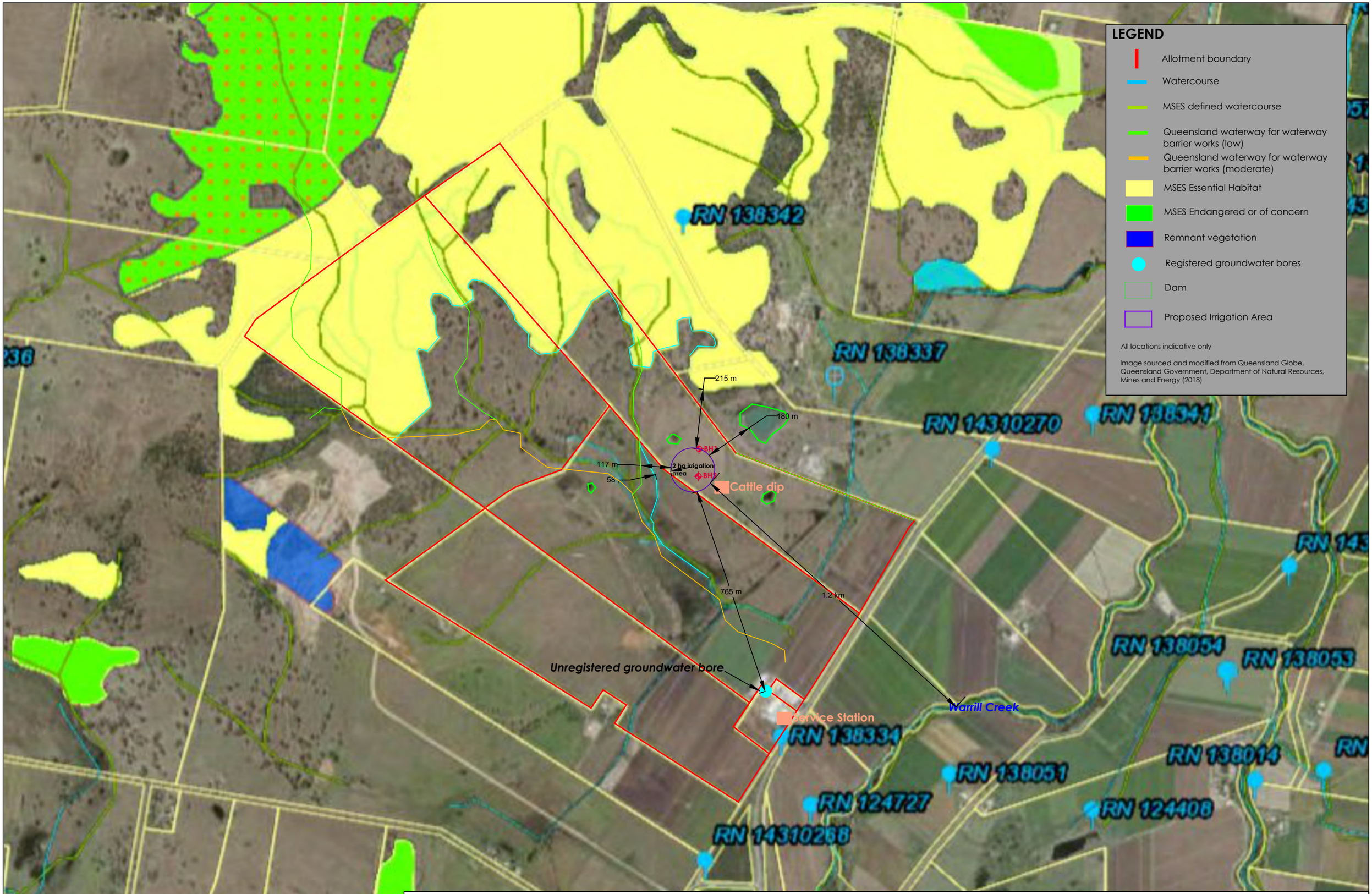
For further information on SmartMap products visit http://nrw.qld.gov.au/property/mapping/blinmap

Queensland Government

Client: KALFRESH PTY LTD	Site location: 6200 - 6206 CUNNINGHAM HIGHWAY, KALBAR, QUEENSLAND		Real property description: AS SHOWN		Drawing number: FIGURE 2 Drawing version: A	PRECISE ENVIRONMENTAL
Project: ONSITE WASTEWATER MANAGEMENT REPORT	Project number: PE2898.19	Scale: AS SHOWN	Drawn by: DB Date drawn: 21.10.2019	Reviewed by: CB Approved: CB	Drawing title: SITE LOCATION	N

Unit 7 / 14 Fremantle Street, Burleigh Heads, Qld, 4220
PO Box 4424, Robina Town Centre, Qld 4230
Ph: (07) 5593 7848 Fax: (07) 5593 7020
mail@preciseenvironmental.com.au

Client: KALFRESH PTY LTD	Site location: 6200 - 6206 CUNNINGHAM HIGHWAY, KALBAR, QUEENSLAND		Real property description: VARIOUS		Drawing number: FIGURE 3 Drawing version: B	PRECISE ENVIRONMENTAL Unit 7 / 14 Fremantle Street, Burleigh Heads, Qld, 4220 PO Box 4424, Robina Town Centre, Qld 4230 Ph: (07) 5593 7848 Fax: (07) 5593 7020 mail@preciseenvironmental.com.au
Project: ONSITE WASTEWATER MANAGEMENT REPORT	Project number: PE2898.19	Scale: AS SHOWN	Drawn by: DB Date drawn: 14.11.2019	Reviewed by: CB Approved: CB	Drawing title: ONSITE GROUNDWATER BORE LOCATIONS	



Client: KALFRESH PTY LTD	Site location: 6200 - 6206 CUNNINGHAM HIGHWAY, KALBAR, QUEENSLAND		Real property description: VARIOUS		Drawing number: FIGURE 4	PRECISE ENVIRONMENTAL
					Drawing version: C	
Project: ONSITE WASTEWATER MANAGEMENT REPORT	Project number: PE2898.19	Scale: AS SHOWN	Drawn by: DB	Reviewed by: CB	Drawing title: ENVIRONMENTAL RECEPTORS	N
			Date drawn: 13.11.2019	Approved: CB		

Unit 7 / 14 Fremantle Street, Burleigh Heads, Qld, 4220
PO Box 4424, Robina Town Centre, Qld 4230
Ph: (07) 5593 7848 Fax: (07) 5593 7020
mail@precisenvironmental.com.au

LEGEND

- Current allotment boundary
- Proposedf SRAIP boundary
- Proposed Irrigation Area
- Soil monitoring location (SML)

All locations indicative only

Aerial photograph sourced from Queensland Globe and overlayed for informative purposes only
Proposed development information

Regulated vegetation

180 m

117 m

58 m

102 m

Proposed 20,000 m² irrigation area

Proposed lot designated for sewage treatment plant

PROPOSED WATER STORAGE DAM

(PART) 18
5.975 ha

PROPOSED OVERLAND FLOW PATH

Future Access Track Connection To Composter Lot

PLANT & EQUIPMENT STORAGE
PARKING/ OFFICE AMENITIES

AREA: 1.66ha

DAM ID: 4

FINISHED PRODUCT STORAGE AREA: 1.57ha

AREA: 2.72ha

COMPOSTER AREA: 15.337HA

DAM ID: 3

FEEDSTOCK HOLDING BAY AREA: 2.08ha

WINDROW PAD (A) AREA: 3.92ha

GRAZING

(PART) 18
63.774 ha

GRAZING

0.081 ha

17
0.700 ha

3
0.623 ha

0.561 ha

2
1.374 ha

1
1.439 ha

16
1.681 ha

15
1.016 ha

14
1.001 ha

5
0.832 ha

13
2.749 ha

6
0.800 ha

4
1.627 ha

(PART) 19
PROPOSED OVERLAND FLOW PATH
16.138 ha

12
2.745 ha

7
1.982 ha

8
2.107 ha

11
5.120 ha

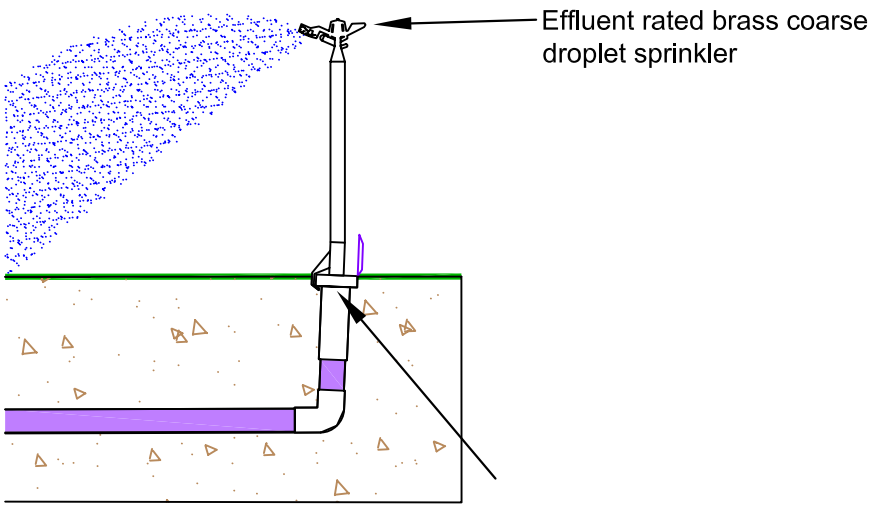
9
6.335 ha

10
3.810 ha

250 m

Client: KALFRESH PTY LTD	Site location: 6200 - 6206 CUNNINGHAM HIGHWAY, KALBAR, QUEENSLAND		Real property description: VARIOUS		Drawing number: FIGURE 5	PRECISE ENVIRONMENTAL
					Drawing version: C	
Project: ONSITE WASTEWATER MANAGEMENT REPORT	Project number: PE2898.19	Scale: AS SHOWN	Drawn by: SG	Reviewed by: CB	Drawing title: PROPOSED SRAIP AND EFFLUENT IRRIGATION AREA	N
			Date drawn: 06.02.2023	Approved: CB		

Unit 7 / 14 Fremantle Street, Burleigh Heads, Qld. 4220
PO Box 4424, Robina Town Centre, Qld 4230
Ph: (07) 5593 7848 Fax: (07) 5593 7020
mail@preciseenvironmental.com.au



Cannon style sprinkler

Centre-pivot sprinkler

INSTALLATION NOTES

- Wetted irrigation area to be a minimum of 2 hectares
- System to be maintained and operated as per manufacturers specifications.
- All plumbing and drainage work is to comply with the Plumbing and Drainage Act, AS/NZS 3500, AS/NZS 1547:2000 and the Queensland Plumbing and Wastewater Code.
- Distribution delivery lines must be coloured or fitted with warning tape and must be installed a minimum of 200 mm below the ground surface level.
- All irrigation lines and fittings must be suitable for effluent use.
- The irrigation system must be constructed by a licensed person, following the requirements of AS/NZS 1547:2000.
- The irrigation areas must be established with kikuyu grass and warning signs displayed prior to commissioning the wastewater treatment system.
- All buried pipes shall be indicated using underground marking tape to AS/NZS 2648.1 or be indicated by signage stating the words: Sewage effluent pipework installed below. DO NOT DIG.

Client: KALFRESH PTY LTD	Project number: PE2898.19	Site address: 6200 - 6206 CUNNINGHAM HIGHWAY, KALBAR, QUEENSLAND		
Project: ONSITE WASTEWATER MANAGEMENT REPORT	Scale: NOT TO SCALE	Real property description: VARIOUS		
	Drawn by: SEAN GARDINER	Drawing number: FIGURE 6	Drawning version: A	Date drawn: 25.10.2019
PRECISE ENVIRONMENTAL Consulting Environmental Scientists Unit 7 / 14 Fremantle Street, Burleigh Heads, Qld, 4220 PO Box 4424, Robina Town Centre, Qld, 4230 Ph: (07) 55937848 Fax: (07) 5593 7020 mail@preciseenvironmental.com.au www.preciseenvironmental.com.au	Reviewed by: CHRIS BUTLER	Drawing title: IRRIGATION DETAIL		

Figure 7

Yield Breakdown	
Allotments	**Overall**
Management Allotments	4
Total Allotments	**4**

Land Budget		
Land Use	**Area**	**%**
Site Area	**248.530 ha**	**99.0%**
Existing Lot 1	0.626 ha	0.3%
Existing Lot 2	2.905 ha	1.2%
Proposed Lots		
Lot 30	121.633 ha	48.9%
Lot 40	17.603 ha	7.1%
Lot 50	78.130 ha	31.4%
Lot 60	25.181 ha	10.1%
Lot 70	2.452 ha	1.0%
Lot 30 and Lot 50 Access (within Lot 60 and Lot 70)	*3.879 ha*	-

0 25 50 75 100 150 1 : 5,000 @ A1

KALFRESH

SCENIC RIM AGRICULTURAL INDUSTRIAL PRECINCT

6206 CUNNINGHAM HWY, KALBAR 4309 QLD

MANAGEMENT SUBDIVISION PLAN - PHASE 1

PLAN REF: 142489 – 11
Rev No: N
DATE: 31 JANUARY 2023
CLIENT: KALFRESH
DRAWN BY: NV
CHECKED BY: JC / PHE

Legend

- Site Boundary
- Existing Property Boundaries
- Proposed Flow Path (Q100)
- Land subject to approved boundary realignment and access easement in conjunction with approved Quarry on Lot 9 on SP209733 (Lot 6)
- Proposed access easement servicing Lot 3 and Lot 5

LOT 60
27.633 ha

LOT 50
78.130 ha

LOT 30
121.633 ha

LOT 70
2.452 ha

LOT 40
17.604 ha

EXISTING LOT 1

EXISTING LOT 2

9 RP209733
18 RP20993
17 RP20993
2 SP121240
1 SP121240
8 SP105804
7 M3151
6 M3151
5 CC1915
15 SP229448
14 SP229448
478 SP256449

CUNNINGHAM HWY

Note:
All Lot Numbers, Dimensions and Areas are approximate only, and are subject to survey and Council approval.

Dimensions have been rounded to the nearest 0.1 metres.

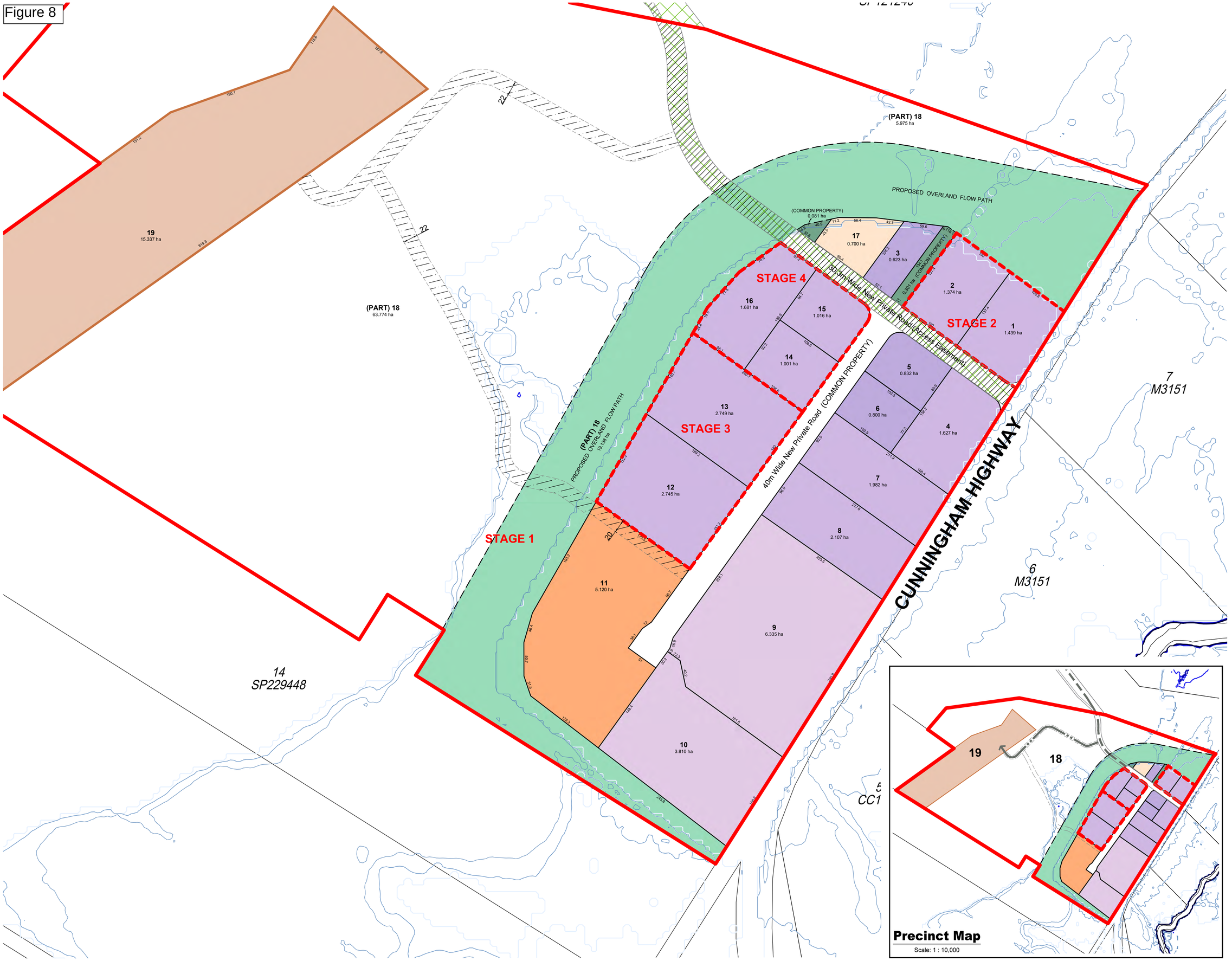
Areas have been rounded down to the nearest 5m².

The boundaries shown on this plan should not be used for final detailed engineers design.

Source Information:
Site boundaries: DCDB
Adjoining information: DCDB.
Contours: RPS Survey
Overland Flow Path: Aurecon

URBAN DESIGN
Level 4 HQ South
520 Wickham Street
PO Box 1559
Fortitude Valley QLD 4006
T +61 7 3539 9500
W rpsgroup.com

Figure 8



0 10 20 40 60 80 1 : 2,500 @ A1

KALFRESH
SCENIC RIM AGRICULTURAL INDUSTRIAL PRECINCT
6200 CUNNINGHAM HWY, KALBAR 4309 QLD

MANAGEMENT SUBDIVISION PLAN - PHASE 2 (STAGES 1-4)

PLAN REF: 142489 – 11
Rev No: N
DATE: 31 JANUARY 2023
CLIENT: KALFRESH
DRAWN BY: NV
CHECKED BY: JC / PHE

Legend

- Site Boundary
- Stage Boundary
- Proposed Flow Path Q100
- Proposed Future Compost Lot
- Proposed access easement servicing Lot 3 and Lot 5
- Land subject to approved boundary realignment and access easement in conjunction with approved Quarry on Lot 9 on SP209733 (Lot 6)
- Proposed Access Easement - Composter Lot Access

Total No. of Allotments	17
Industry Allotments 6000m² – 1.00 ha	3
Industry Allotments 1.00 ha – 2.99 ha	10
Industry Allotments 3.000 ha +	2
Digester & Energy Site	1
Sewerage & Water Treatment Plants (Common Property)	1

DRAFT
For Discussion Only

Note:
All Lot Numbers, Dimensions and Areas are approximate only, and are subject to survey and Council approval.

Dimensions have been rounded to the nearest 0.1 metres.

Areas have been rounded down to the nearest 5m².

The boundaries shown on this plan should not be used for final detailed engineers design.

Source Information:
Site boundaries: DCDB
Adjoining information: DCDB.
Contours: RPS Survey
Overland Flow Path: Aurecon

URBAN DESIGN
Level 4 HQ South
520 Wickham Street
PO Box 1559
Fortitude Valley QLD 4006
T +61 7 3539 9500
W rpsgroup.com

APPENDIX B – SITE PHOTOGRAPHS

Photograph 1: View northwest across proposed irrigation area.

Photograph 2: View north across proposed irrigation area.

Photograph 3: Soil and bedrock exposed in excavation on adjacent Lot 4 SP192221 which is typical of site conditions within Lot 2 RP20974.

Photograph 4: Disused cattle tick dip located immediately east of proposed effluent irrigation area on Lot 2 RP20974.

Photograph 5: Aerial view to north of existing Kalfresh development footprint and surrounding agricultural land use.

Photograph 6: Aerial view to east of existing Kalfresh development footprint and surrounding agricultural land use.

APPENDIX C – ENVIRONMENTAL MAPPING AND GROUNDWATER BORE INFORMATION

Legend

Zones

- Community Facilities
- Conservation
- District Centre
- Emerging Community
- Industry
- Limited Development
- Local Centre
- Low Density Residential
- Low-medium Density Residential
- Major Centre
- Major Tourism
- Minor Tourism
- Mixed Use
- Neighbourhood Centre
- Recreation & Open Space
- Rural
- Rural Residential
- Special Purpose
- Township

General Information

- Cadastral Boundary
- Road Reserve
- Waterway or Waterbody

Precincts

- BSDA Bromelton State Development Area
- BW Bulk Water Storage
- CI Commercial Industrial
- FL Flood Land
- HS Historical Subdivision
- MR Mountain Residential
- RE Rural Escarpment Protection
- RREA Rural Residential A
- TMR Tamborine Mountain Rural
- TR Township Residential
- PR Passive Recreation

DRAFT Scenic Rim Planning Scheme

Datum: GDA 1994 MGA Zone 56

SECOND CONSULTATION DRAFT 2019

Approx Scale @ A3 1:30000

0 0.4 0.8 1.6 KM

N

Map Sheet Reference

		01	02	03	04							
05	06	07	08	09	10	11	12			13	14	
15	16	17	18	19	20	21	22	23	24	25		
26	27	28	29	30	31	32	33	34	35	36		
37	38	39	40	41	42	43	44	45	46	47		
	48	49	50	51	52	53	54	55	56	57		
	58	59	60	61	62	63	64	65	66	67		
		68	69	70	71	72	73	74	75			

SCENIC RIM Regional Council


4
SP192221
3
SP192221
2
SP192221
7
M3151
6
M3151
5
CC1915
107
CH31555
lat: -27.94950
long: 152.58282
1:6319
2D
3D
360
Previous
Next
Highway
Muller Road
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Powered by Esri

BREMER RIVER, INCLUDING ALL TRIBUTARIES OF THE RIVER

Part of Basin 143

152°20'E 152°40'E 153°E

27°40'S 28°S

Redbank Creek
Lockyer Creek
GATTON
FOREST HILL
Ma Ma Creek
Tenthill Creek
LAIDLEY
Sandy Creek
GRANDCHESTER
Western Creek
Deep Gully
Wonga Creek
Laidley Creek
LOCKYER VALLEY REGIONAL COUNCIL
Dry Creek
Black Duck Creek
Blackfellow Creek
HEVm1141
Dalrymple Creek
Hann Creek
North Branch Creek
Middle Branch Creek
Glengallan Creek
South Branch Creek
Gap Creek
MARYVALE
Millar Vale Creek
Inglis Creek
Willie Creek
Freestone Creek
Hell Hole Creek
SOUTHERN DOWNS REGIONAL COUNCIL
Swan Creek
Gap Creek
Barney Creek
Emu Creek (north branch)
Emu Creek
Lamb Creek
YANGAN
Emu Creek (south branch)
Dolley Creek
EMU VALE
SOMERSET REGIONAL COUNCIL
MINDEN
MARBURG
Black Snake Creek
GLAMORGAN VALE
Deebing Creek
WALLOON
Lower Bremer River
ROSEWOOD
Bremer River
IPSWICH CITY COUNCIL
Western Creek
Mid Bremer River
Upper Bremer River
Middle Warrill Creek
Upper Warrill Creek
Upper Reynolds Creek
Lake Moogerah
Coulson Creek
Clayton Gully
Seven Mile Creek
Wild Cattle Creek (left branch)
ARATULA
Reynolds Creek
Lower Reynolds Creek
Lake Moogerah
MOUNT ALFORD
Alfords Creek
Franklin Vale Creek
Warrill Creek
Purga Creek
HARRISVILLE
WARRILL VIEW
MUNBILLA
KALBAR
Lower Warrill Creek
Purga Creek
Bremer River
estuary
Bundamba Creek
estuary
Bundamba Creek
freshwater
Users must refer to Table 1 of the scheduling document for Environmental Values for this subcatchment.
Brisbane River
BRISBANE CITY COUNCIL
Happy Jack Gully
Oxley Creek
Bundamba Creek
LOGAN CITY COUNCIL
JIMBOOMBA
Woollaman Creek
Teviot Brook
Allan Creek
BEAUDESERT
Allan Creek (right branch)
BOONAH
DUGANDAN
SCENIC RIM REGIONAL COUNCIL
Sandy Creek
Sheepstation Creek
Logan River
Cannon Creek
Albert River
Knapps Creek
Christmas Creek
Tamrookum Creek
Burnett Creek
Canungra Creek
RATHDOWNEY
HILLVIEW
Running Creek
Oaky Creek
Widgee Creek

Users must refer to Table 1 of the scheduling document for Environmental Values for this subcatchment.

Note: Areas outside of the waters covered by the scheduling document have a transparent mask applied over them and appear lighter in colour. Please refer to the relevant plan for information on adjacent areas.

Key to Environmental Values

Aquatic Ecosystems · Irrigation · Farm Supply · Stock Water · Aquaculture · Human Consumer

Primary Recreation · Secondary Recreation · Visual Recreation · Drinking Water · Industrial Use · Cultural & Spiritual Values

Legend

- Town
- River / creek
- Sub-catchment boundary
- Boundary of waters covered by the scheduling document
- Local government boundary

Management Intent for Waters

- High ecological value freshwaters (maintain)
- Highly disturbed freshwaters (achieve)

Water Types

Marine / estuarine waters

- Middle estuary
- Upper estuary

Freshwaters

- Lowland freshwaters
- Wallum / tannin freshwaters
- Coastal freshwaters
- Upland freshwaters
- Lakes / reservoirs

Note for users: Areas of the catchment that are not shown on this map as having a management intent of high ecological values, slightly disturbed or highly disturbed, have a **management intent of moderately disturbed.**

Environmental Protection (Water) Policy 2009
South-east Queensland Map Series
PLAN WQ1436

Publication date: July 2010

This plan forms part of the Bremer River Environmental Values and Water Quality Objectives scheduling document, prepared pursuant to the *Environmental Protection (Water) Policy 2009*.

Queensland Government

N

Projection: Map Grid of Australia (MGA) Zone 56

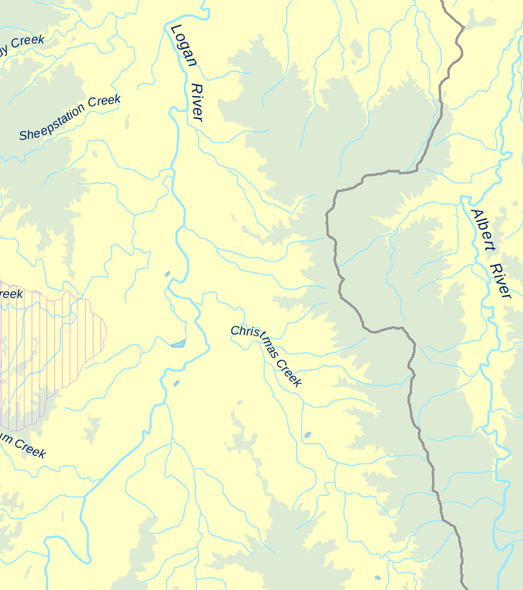
Horizontal Datum: Geocentric Datum of Australia 1994 (GDA94)

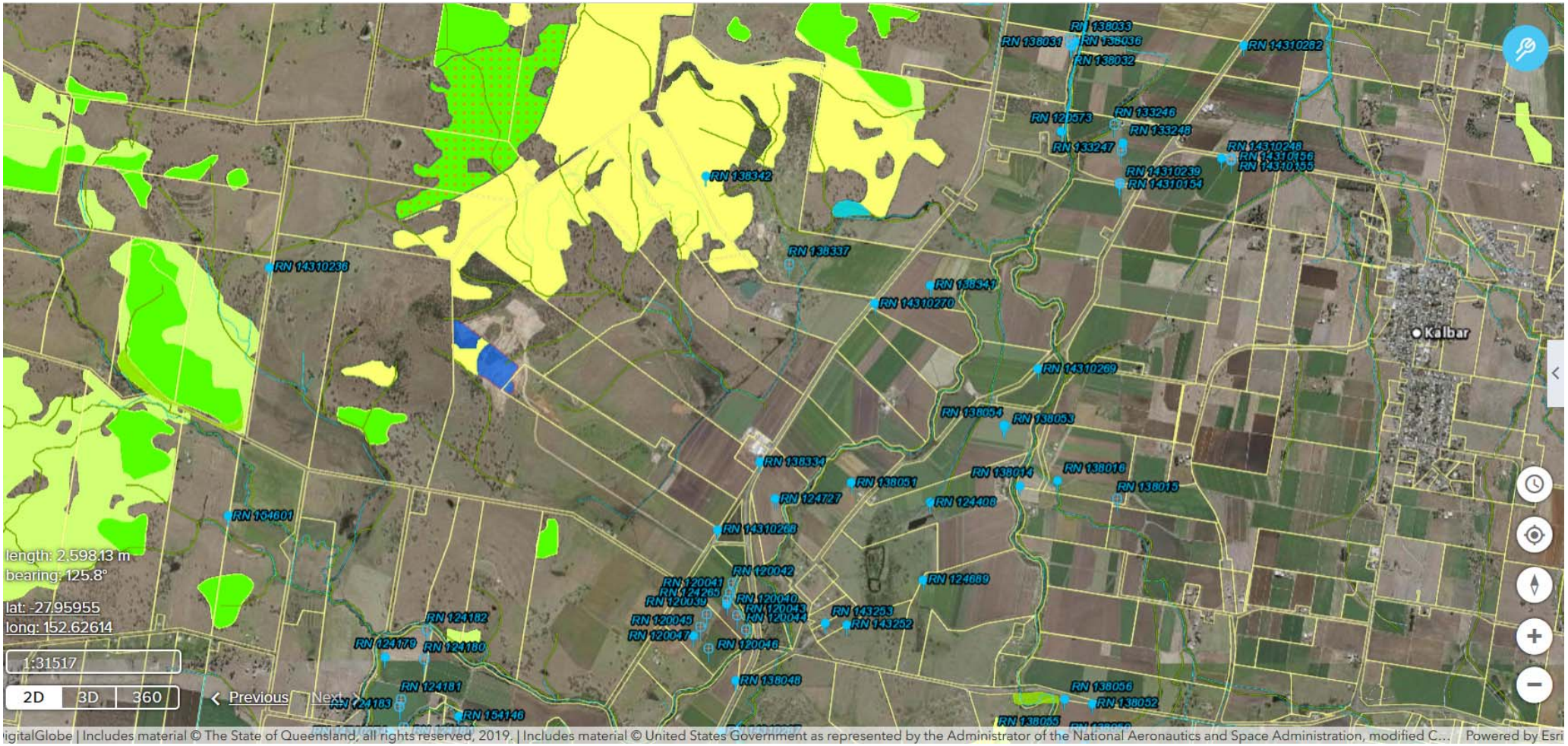
0 5 10 15 20

Kilometres

Scale of 1:150,000 when printed @ A1

Location Map

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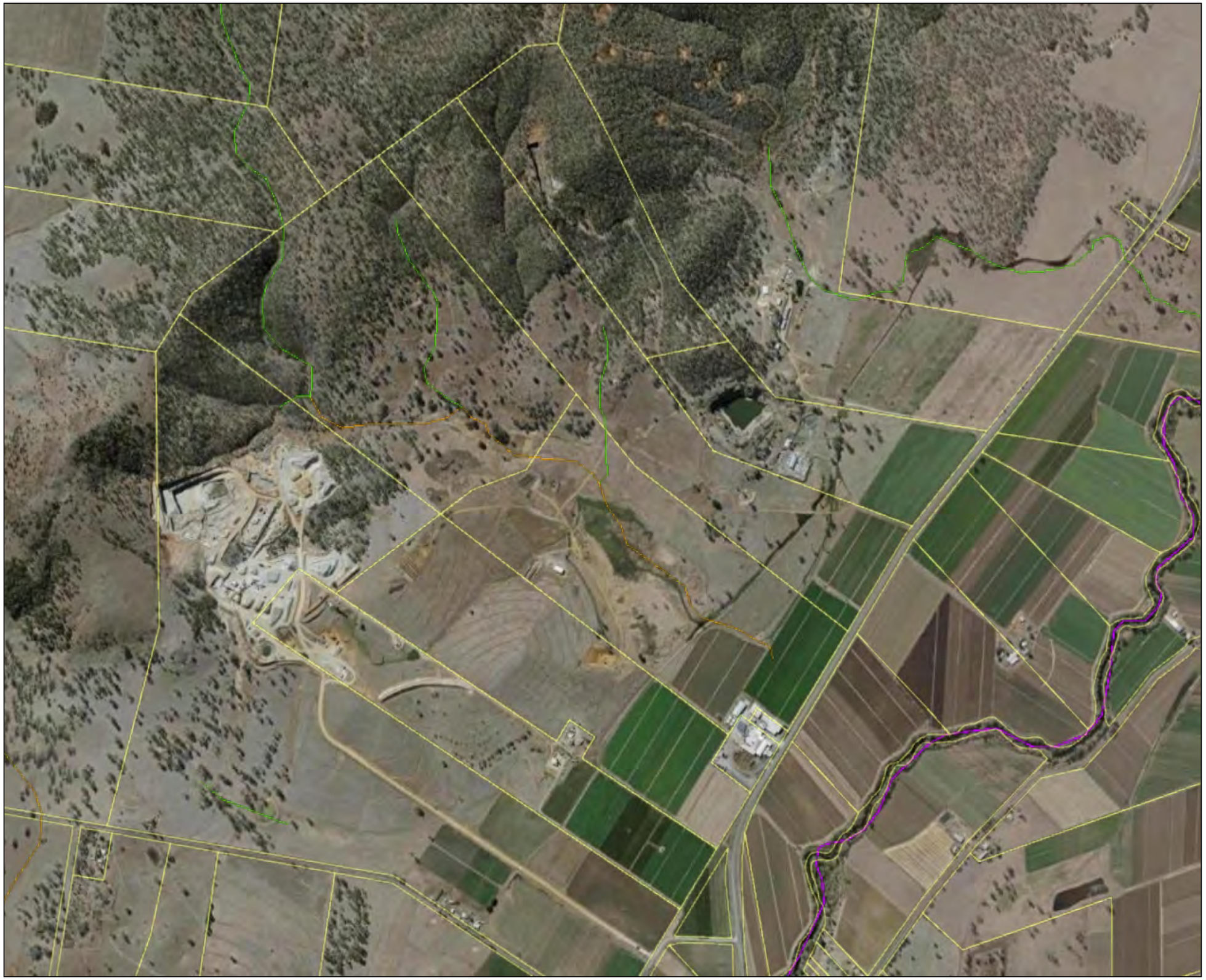
RN 14310154
RN 138342
RN 14310236
RN 138337
RN 138341
RN 14310270
Kalbar
RN 14310269
RN 138034
RN 138053
RN 138334
RN 138014
RN 138016
RN 138051
RN 138015
RN 124727
RN 124408
RN 164801
RN 14310268
RN 120042
RN 124689
RN 120041
RN 124265
RN 120039
RN 120040
RN 120043
RN 120044
RN 143253
RN 143252
RN 120045
RN 120047
RN 120046
RN 124182
RN 124179
RN 124180
RN 124181
RN 124183
RN 164146
RN 138048
RN 138056
RN 138052
RN 138055
length: 2.598.13 m
bearing: 125.8°
lat: -27.95955
long: 152.62614
1:31517
2D
3D
360
Previous
Next
igitalGlobe | Includes material © The State of Queensland, all rights reserved, 2019. | Includes material © United States Government as represented by the Administrator of the National Aeronautics and Space Administration, modified C...
Powered by Esri

6200 - 6206 Cunningham Highway, Kalbar, Queensland

Queensland waterway barrier mapping

27°55'39"S 152°33'13"E

27°55'39"S 152°35'39"E



27°57'19"S 152°33'13"E

27°57'19"S 152°35'39"E

A product of Queensland Globe

Legend located on next page

N

0 250 metres

Scale: 1:13546

Printed at: A3

Print date: 4/3/2020

Datum: Geocentric Datum of Australia 1994

Projection: Web Mercator EPSG 102100

For more information, visit https://qldglobe.information.qld.gov.au/help-info/Contact-us.html

Queensland Government

Department of Natural Resources, Mines and Energy

6200 - 6206 Cunningham Highway, Kalbar, Queensland

Queensland waterway barrier mapping

Legend

Queensland waterways for waterway barrier works

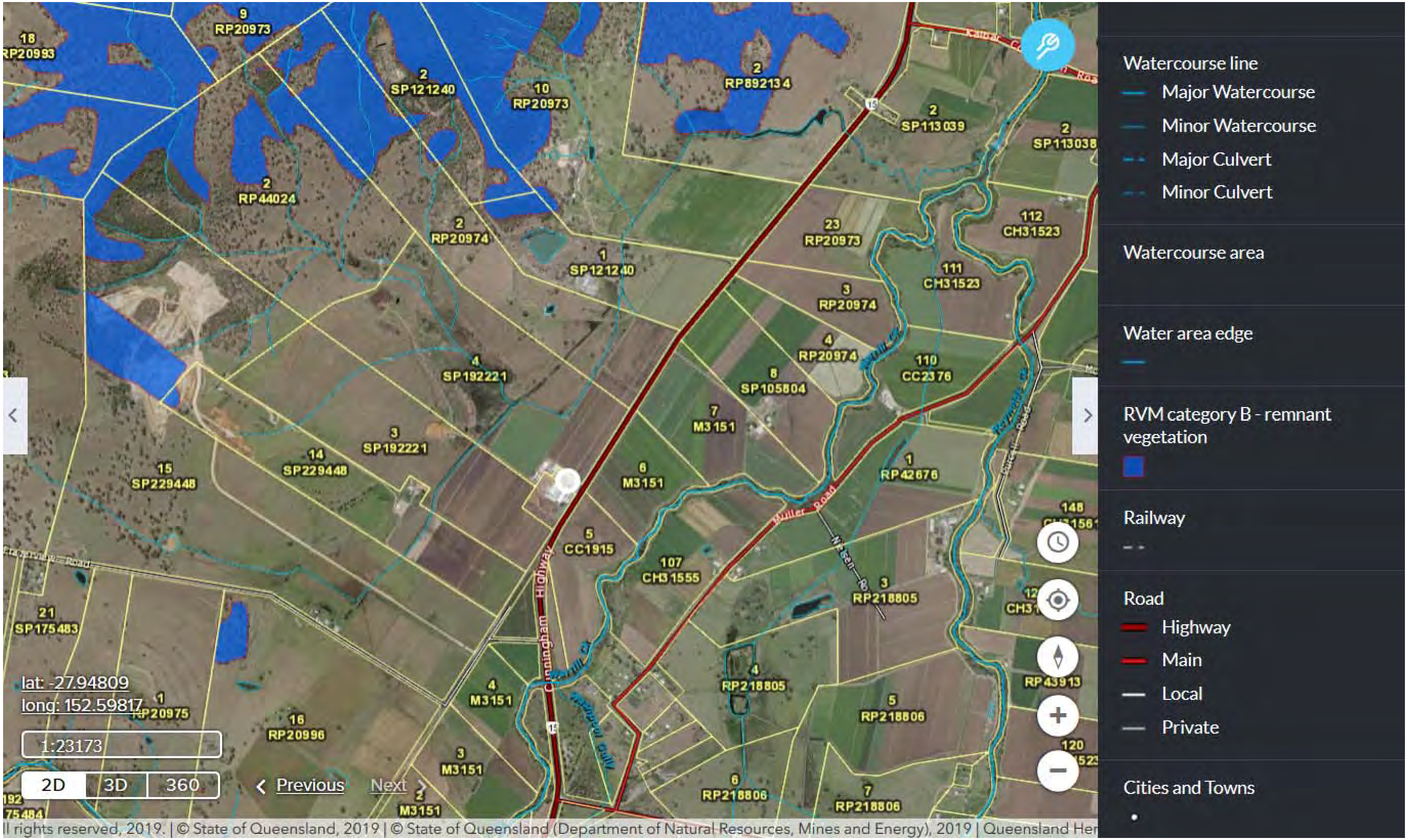
- Major
- High
- Moderate
- Low

Land parcel

- Parcel

Cities and Towns

Attribution



Watercourse line
Major Watercourse
Minor Watercourse
Major Culvert
Minor Culvert
Watercourse area
Water area edge
RVM category B - remnant vegetation
Railway
Road
Highway
Main
Local
Private
Cities and Towns
lat: -27.94809
long: 152.59817
1:23173
2D
3D
360
Previous
Next
Cunningham Highway
Muller Road
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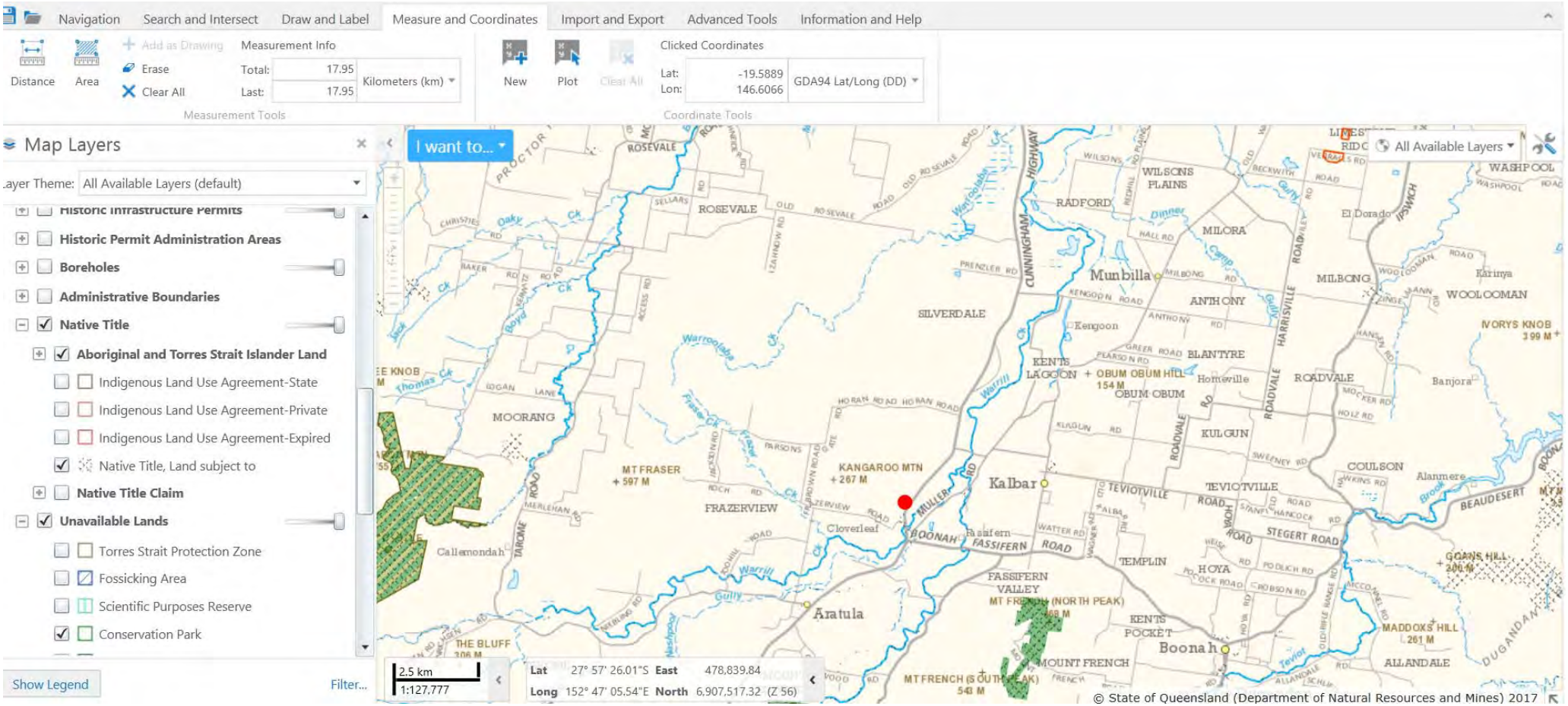
Navigation
Search and Intersect
Draw and Label
Measure and Coordinates
Import and Export
Advanced Tools
Information and Help
Distance
Area
Add as Drawing
Erase
Clear All
Measurement Info
Total: 17.95
Last: 17.95
Kilometers (km)
Measurement Tools
New
Plot
Clear All
Clicked Coordinates
Lat: -19.5889
Lon: 146.6066
GDA94 Lat/Long (DD)
Coordinate Tools
Map Layers
Layer Theme: All Available Layers (default)
Historic Infrastructure Permits
Historic Permit Administration Areas
Boreholes
Administrative Boundaries
Native Title
Aboriginal and Torres Strait Islander Land
Indigenous Land Use Agreement-State
Indigenous Land Use Agreement-Private
Indigenous Land Use Agreement-Expired
Native Title, Land subject to
Native Title Claim
Unavailable Lands
Torres Strait Protection Zone
Fossicking Area
Scientific Purposes Reserve
Conservation Park
Show Legend
Filter...
I want to...
All Available Layers
ROSEVALE
SILVERDALE
MOORANG
MT FRASER
+ 597 M
KANGAROO MTN
+ 267 M
FRAZERVIEW
Cloverleaf
Callemondah
Aratula
THE BLUFF
306 M
Kalbar
BOONAH
FASSIFERN ROAD
FASSIFERN VALLEY
MT FRENCH (NORTH PEAK)
MOUNT FRENCH
MT FRENCH (SOUTH PEAK)
543 M
KENTS POCKET
Boonah
RADFORD
WILSONS PLAINS
MILORA
Munbilla
ANTHONY
Kengoon
KENTS LAGOON
+ OBUM OBUM HILL
154 M
OBUM OBUM
BLANTYRE
Homeville
ROADVALE
KULGUN
TEVIOTVILLE
TEMPLIN
HOYA
STEGERT ROAD
COULSON
Alanmere
BEAUDESERT
MILBONG
WOOLOOMAN
Karinya
IVORYS KNOB
399 M
Banjora
WASHPOOL
El Dorado
IPSWICH
HARRISVILLE ROAD
CUNNINGHAM HIGHWAY
GOANS HILL
200 M
MADDOXS HILL
261 M
ALLANDALE
DUGANDAN
2.5 km
1:127,777
Lat 27° 57' 26.01"S East 478,839.84
Long 152° 47' 05.54"E North 6,907,517.32 (Z 56)
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Bore Report

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
124727	Sub-Artesian Facility	Existing	12/07/2005	Gatton	6510 - SCENIC RIM REGIONAL

Details

Description			
Parish	1854 - FASSIFERN		
Original Name			
Driller Name	HOFFMANN, SCOTT BRADLEY		
Drill Company	ABUNDANT WATER SOLUTIONS		
Const Method	ROTARY AIR & ROTARY MUD		
Bore Line			
D/O File No	515/000/0163	**Polygon**	
R/O File No		**Equipment**	
H/O File No		**RN of Bore Replaced**	
Log Received Date	08/08/2005	**Data Owner**	
Roles	Water Supply		

Location

Latitude	27-57-06	**Basin**	1431
Longitude	152-34-50	**Sub-area**	
GIS Latitude	-27.9518043	**Lot**	5
GIS Longitude	152.5804708	**Plan**	CC1915
Easting	458732		
Northing	6908066	**Map Scale**	
Zone	56	**Map Series**	
Accuracy	GPS	**Map No**	9442.33
GPS Accuracy	10	**Map Name**	
Checked	Yes	**Prog Section**	

Casing

7 ***records for RN*** **124727**

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	12/07/2005	1	1.00	40.00	Steel Casing	9.500	WT - Wall Thickness	335
A	12/07/2005	2	1.00	268.00	Steel Casing	8.800	WT - Wall Thickness	273
A	12/07/2005	3	268.00	512.00	Steel Casing	7.100	WT - Wall Thickness	219
A	12/07/2005	4	460.00	510.00	Stainless Steel	2.500	AP - Aperture Size	219
A	12/07/2005	5	10.00	518.00	Gravel Pack	4.000	GR - Gravel Size	

Bore Report

From Year:

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	12/07/2005	6	0.00	40.00	Grout			406
A	12/07/2005	7	0.00	10.00	Grout			315

Strata Logs

10 *records for RN* **124727**

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	10.00	TOP SOIL
2	10.00	15.00	SILTY CLAY
3	15.00	23.00	MUDSTONE SANDSTONE
4	23.00	36.00	CRUMBLY TUFF *
5	36.00	40.00	DECO BASALT
6	40.00	162.00	BASALT * WATER IN BASALT
7	162.00	272.00	COAL SHALE SOFT MUDSTONE *
8	272.00	363.00	SOFT COAL TURN INTO HARD SANDSTONE *
9	363.00	454.00	HARD/SOFT SANDSTONE BANDS *
10	454.00	518.00	HARDER CONSISTANT SANDSTONE

Stratigraphies

0 *records for RN* **124727**

Aquifers

1 *records for RN* **124727**

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	36.00	454.00	COAL - Coal SDST - Sandstone SHLE - Shale	12/07/2005	-10.00	N	POTABLE	4.00	Y	SC	

Pump Tests Part 1

0 *records for RN* **124727**

Bore Report

From Year:

Pump Tests Part 2

0 *records for RN* **124727**

Bore Conditions

0 *records for RN* **124727**

Elevations

0 *records for RN* **124727**

Water Analysis Part 1

0 *records for RN* **124727**

Water Analysis Part 2

0 *records for RN* **124727**

Water Levels

1 *records for RN* **124727**

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project		Quality
A	12/07/2005		-10.00	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality

Wire Line Logs

0 *records for RN* **124727**

Field Measurements

1 *records for RN* **124727**

Pipe	Date	Depth (m)	Conduct (uS/cm)	pH	Temp (C)	NO3 (mg/L)	DO2 (mg/L)	Eh (mV)	Alkalinity (mV)	Samp	Method	Samp	Source
A	12/07/2005			7.6						AI	Air Lifting	GB	Groundwater - from Bore

Special Water Analysis

0 *records for RN* **124727**

Bore Report

From Year:

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Bore Report

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
138334	Sub-Artesian Facility	Existing	15/10/2008	Gatton	6510 - SCENIC RIM REGIONAL

Details

Description			
Parish	1854 - FASSIFERN		
Original Name	KALFRESH		
Driller Name	HARCH, RUSSELL KEVIN		
Drill Company	HARCH DRILLING		
Const Method	ROTARY AIR		
Bore Line			
D/O File No	515 000 0163	**Polygon**	
R/O File No		**Equipment**	
H/O File No		**RN of Bore Replaced**	
Log Received Date	07/11/2008	**Data Owner**	
Roles	Water Supply		

Location

Latitude	27-56-59	**Basin**	1431
Longitude	152-34-46	**Sub-area**	
GIS Latitude	-27.9496203	**Lot**	2
GIS Longitude	152.5794043	**Plan**	SP192221
Easting	458627		
Northing	6908307	**Map Scale**	
Zone	56	**Map Series**	
Accuracy	GPS	**Map No**	9442-33
GPS Accuracy	10	**Map Name**	
Checked	Yes	**Prog Section**	

Casing

6 ***records for RN*** **138334**

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	15/10/2008	1	0.00	15.80	Steel Casing	8.000	WT - Wall Thickness	275
A	15/10/2008	2	0.00	141.70	Polyvinyl Chloride			177
A	15/10/2008	3	129.50	141.70	Perforated or Slotted Casing	4.000	AP - Aperture Size	177
X	15/10/2008	4	0.00	6.10	Grout			324
X	15/10/2008	5	0.00	91.40	Grout			242

Bore Report

From Year:

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
X	15/10/2008	6	91.40	141.70	Gravel Pack	5.000	GR - Gravel Size	242

Strata Logs

10 *records for RN* **138334**

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	12.20	TOPSOIL CLAY & LOAM
2	12.20	14.00	GRAVEL
3	14.00	15.80	CLAY BOUND GRAVEL
4	15.80	38.10	GRANITE
5	38.10	42.70	BASALT
6	42.70	50.30	HARD BLACK SHALE
7	50.30	67.70	BLACK SHALE
8	67.70	76.20	BASALT
9	76.20	134.70	VERY HARD BASALT
10	134.70	141.70	SMALL FRACTURED BASALT

Stratigraphies

0 *records for RN* **138334**

Aquifers

1 *records for RN* **138334**

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	134.70	141.70	INTR - Intrusive	15/10/2008	-17.70	N	1800 US/CM	25.20	Y	FR	VOLCANICS - UNDIFF.

Pump Tests Part 1

0 *records for RN* **138334**

Pump Tests Part 2

0 *records for RN* **138334**

Bore Report

From Year:

Bore Conditions

0 *records for RN* **138334**

Elevations

0 *records for RN* **138334**

Water Analysis Part 1

0 *records for RN* **138334**

Water Analysis Part 2

0 *records for RN* **138334**

Water Levels

1 *records for RN* **138334**

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project		Quality
A	15/10/2008		-17.70	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality

Wire Line Logs

0 *records for RN* **138334**

Field Measurements

1 *records for RN* **138334**

Pipe	Date	Depth (m)	Conduct (uS/cm)	pH	Temp (C)	NO3 (mg/L)	DO2 (mg/L)	Eh (mV)	Alkalinity (mV)	Samp	Method	Samp	Source
A	15/10/2008		1800							AI	Air Lifting	GB	Groundwater - from Bore

Special Water Analysis

0 *records for RN* **138334**

Bore Report

From Year:

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Bore Report

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
14310270	Sub-Artesian Facility	Existing	07/06/2011	Gatton	6510 - SCENIC RIM REGIONAL

Details

Description			
Parish	1854 - FASSIFERN		
Original Name			
Driller Name	HANNANT, GRAHAM WILLIAM		
Drill Company	GW & JJ HANNANT		
Const Method	CABLE TOOL		
Bore Line			
D/O File No	520 000 0051	**Polygon**	
R/O File No		**Equipment**	NE
H/O File No		**RN of Bore Replaced**	
Log Received Date	09/06/2011	**Data Owner**	DNR
Roles	WR Investigation Sub-Artesian Monitoring		

Location

Latitude	27-56-25	**Basin**	1431
Longitude	152-35-14	**Sub-area**	
GIS Latitude	-27.94025842	**Lot**	
GIS Longitude	152.5871179	**Plan**	
Easting	459382		
Northing	6909347	**Map Scale**	253 - 1: 25 000
Zone	56	**Map Series**	M - Metric Series
Accuracy	GPS	**Map No**	9442-33
GPS Accuracy	2	**Map Name**	
Checked	Yes	**Prog Section**	

Casing

8 ***records for RN*** **14310270**

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	07/06/2011	1	0.00	16.00	Polyvinyl Chloride	6.000	WT - Wall Thickness	80
A	07/06/2011	2	14.90	15.90	Perforated or Slotted Casing	4.000	AP - Aperture Size	80
X	07/06/2011	3	0.00	5.00	Grout			160
X	07/06/2011	4	5.00	8.00	Cuttings or other fill between casing and hole wall			160
X	07/06/2011	5	8.00	11.00	Cuttings or other fill between casing and hole wall			145

Bore Report

From Year:

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
X	07/06/2011	6	11.00	12.00	Bentonite Seal			145
X	07/06/2011	7	12.00	17.20	Gravel Pack	5.000	GR - Gravel Size	145
X	07/06/2011	8	8.00	15.90	Centraliser			

Strata Logs

8 *records for RN* **14310270**

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	0.40	DARK GREY TOPSOIL
2	0.40	2.90	GREY CLAY
3	2.90	6.00	BROWN CLAY
4	6.00	12.10	BROWN WITH SOME LIGHT GREY CLAY
5	12.10	13.30	CLAYBOUND GRAVEL & ROCKS
6	13.30	15.00	RIVER GRAVEL
7	15.00	15.80	CLAYBOUND GRAVEL & LARGE ROCKS
8	15.80	17.30	BASALT

Stratigraphies

2 *records for RN* **14310270**

Source	Rec	Top (m)	Bottom (m)	Strata Description
DNR	1	0.00	15.80	WARRILL CREEK ALLUVIUM
DNR	2	15.80	17.30	VOLCANICS - UNDIFF.

Aquifers

1 *records for RN* **14310270**

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	12.10	15.80	GRAV - Gravel	07/06/2009	-2.50	N			Y	UC	WARRILL CREEK ALLUVIUM

Bore Report

From Year:

Pump Tests Part 1

0 *records for RN* 14310270

Pump Tests Part 2

0 *records for RN* 14310270

Bore Conditions

0 *records for RN* 14310270

Elevations

2 *records for RN* 14310270

Pipe	Date	Elevation (m)	Precision		Datum	Meas	Point	Survey Source
A	01/01/1900	80.50	EST	Estimate Using Contours	AHD - Aust. Height Datum	R	Reference Point	ESTIMATED FROM MAPINFO
X	01/01/1900	80.00	EST	Estimate Using Contours	AHD - Aust. Height Datum	N	Natural Surface	ESTIMATED FROM MAPINFO

Water Analysis Part 1

1 *records for RN* 14310270

Pipe	Date	Rec	Analyst	Analysis No	Depth (m)	Meth	Src	Cond (uS/cm)	pH	Si (mg/L)	Total Ions (mg/L)	Total Solids (mg/L)	Hard	Alk	Fig. of Merit	SAR	RAH
A	11/07/2011	1	GCL	303317		PH	GB	1920	7.7	44	1210.00	1000.00	668	410	2.5	2.0	0.00

Water Analysis Part 2

1 *records for RN* 14310270

Pipe	Date	Rec	Na	K	Ca	Mg	Mn	HCO3	Fe	CO3	Cl	F	NO3	SO4	Zn	Al	B	Cu
A	11/07/2011	1	121.0	1.5	127.0	85.0	<0.01	496.0	<0.01	1.8	360.0	0.26	3.2	12.0	<0.01	<0.05	0.02	<0.03

Water Levels

84 *records for RN* 14310270

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	07/06/2011		-2.50	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded	130	Data is of unknown quality
A	15/06/2011		-3.41	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded	130	Data is of unknown quality
A	14/07/2011		-3.27	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded	130	Data is of unknown quality
A	22/08/2011		-3.75	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded	130	Data is of unknown quality

Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project		Quality
A	14/09/2011		-3.68	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality
A	01/11/2011		-3.39	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality
A	01/12/2011		-3.48	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality
A	02/02/2012		-2.70	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality
A	02/03/2012		-2.06	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality
A	17/04/2012		-2.78	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality
A	13/06/2012		-2.99	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality
A	11/07/2012		-3.09	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality
A	15/08/2012		-3.36	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality
A	25/09/2012		-3.85	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality
A	25/10/2012		-4.21	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality
A	22/11/2012		-4.19	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality
A	11/12/2012		-4.67	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality
A	15/01/2013		-4.61	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality
A	27/03/2013		-2.64	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality
A	26/07/2013		-3.53	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality
A	26/09/2013		-4.38	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality
A	05/11/2013		-4.60	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality
A	18/12/2013		-4.35	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality
A	04/02/2014		-4.61	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality
A	19/03/2014		-5.11	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality
A	08/05/2014		-4.89	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality
A	17/06/2014		-4.76	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality
A	16/07/2014		-5.00	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality
A	19/08/2014		-5.28	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality

Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project		Quality
A	10/09/2014		-4.98	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality
A	21/10/2014		-5.25	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality
A	19/11/2014		-5.43	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality
A	20/01/2015		-4.82	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality
A	18/02/2015		-4.56	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130	Data is of unknown quality
A	19/03/2015		-4.50	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1	Good - Actual Manual Measurements
A	21/04/2015		-3.88	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1	Good - Actual Manual Measurements
A	25/05/2015		-3.86	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1	Good - Actual Manual Measurements
A	19/06/2015		-3.98	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1	Good - Actual Manual Measurements
A	27/07/2015		-4.49	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1	Good - Actual Manual Measurements
A	25/08/2015		-4.68	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1	Good - Actual Manual Measurements
A	21/09/2015		-4.57	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1	Good - Actual Manual Measurements
A	02/11/2015		-4.59	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1	Good - Actual Manual Measurements
A	30/11/2015		-4.66	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1	Good - Actual Manual Measurements
A	23/12/2015		-4.72	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1	Good - Actual Manual Measurements
A	27/01/2016		-4.81	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1	Good - Actual Manual Measurements
A	23/02/2016		-4.76	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1	Good - Actual Manual Measurements
A	22/03/2016		-5.07	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1	Good - Actual Manual Measurements
A	27/04/2016		-5.03	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1	Good - Actual Manual Measurements
A	25/05/2016		-5.16	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1	Good - Actual Manual Measurements
A	22/06/2016		-4.58	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1	Good - Actual Manual Measurements
A	28/07/2016		-4.69	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1	Good - Actual Manual Measurements
A	14/09/2016		-4.63	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1	Good - Actual Manual Measurements
A	12/10/2016		-4.74	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1	Good - Actual Manual Measurements
A	15/11/2016		-4.99	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1	Good - Actual Manual Measurements

Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project		Quality
A	08/12/2016		-5.18	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1	Good - Actual Manual Measurements
A	05/01/2017		-5.00	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1	Good - Actual Manual Measurements
A	28/02/2017		-5.11	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1	Good - Actual Manual Measurements
A	03/04/2017		-4.78	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1	Good - Actual Manual Measurements
A	08/05/2017		-4.92	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1	Good - Actual Manual Measurements
A	13/06/2017		-4.28	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1	Good - Actual Manual Measurements
A	17/07/2017	1603	-4.27	R	Reference Point		ACT	Actual	DH	DL	Data Logger		1	Good - Actual Manual Measurements
A	15/08/2017	1327	-4.52	R	Reference Point		ACT	Actual	DH	MA	Manual/Hand		1	Good - Actual Manual Measurements
A	12/09/2017	1027	-5.14	R	Reference Point		ACT	Actual	DH	MA	Manual/Hand		1	Good - Actual Manual Measurements
A	18/10/2017	0944	-4.80	R	Reference Point		ACT	Actual	DH	MA	Manual/Hand		1	Good - Actual Manual Measurements
A	23/11/2017		-4.52	R	Reference Point		ACT	Actual	DH	MA	Manual/Hand		1	Good - Actual Manual Measurements
A	21/02/2018		-4.54	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand		1	Good - Actual Manual Measurements
A	15/03/2018		-3.50	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand		1	Good - Actual Manual Measurements
A	17/04/2018		-4.16	R	Reference Point		ACT	Actual	DH	MA	Manual/Hand		1	Good - Actual Manual Measurements
A	15/05/2018		-4.28	R	Reference Point		ACT	Actual	DH	MA	Manual/Hand		1	Good - Actual Manual Measurements
A	06/06/2018		-4.68	R	Reference Point		ACT	Actual	DH	MA	Manual/Hand		1	Good - Actual Manual Measurements
A	16/07/2018		-4.80	R	Reference Point		ACT	Actual	DH	MA	Manual/Hand		1	Good - Actual Manual Measurements
A	14/08/2018		-5.07	R	Reference Point		ACT	Actual	DH	MA	Manual/Hand		1	Good - Actual Manual Measurements
A	25/09/2018		-5.31	R	Reference Point		ACT	Actual	DH	MA	Manual/Hand		1	Good - Actual Manual Measurements
A	22/10/2018		-4.88	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1	Good - Actual Manual Measurements
A	26/11/2018		-5.27	R	Reference Point		ACT	Actual	DH	MA	Manual/Hand		1	Good - Actual Manual Measurements
A	19/12/2018		-5.09	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1	Good - Actual Manual Measurements
A	18/01/2019		-5.34	R	Reference Point		ACT	Actual	DH	MA	Manual/Hand		1	Good - Actual Manual Measurements
A	12/03/2019		-5.60	R	Reference Point		ACT	Actual	DH	MA	Manual/Hand		1	Good - Actual Manual Measurements
A	11/04/2019		-5.24	R	Reference Point		ACT	Actual	DH	MA	Manual/Hand		1	Good - Actual Manual Measurements

Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	15/05/2019		-5.46	R	Reference Point		ACT	Actual	DH	MA	Manual/Hand	1	Good - Actual Manual Measurements
A	21/06/2019		-5.35	R	Reference Point		ACT	Actual	DH	MA	Manual/Hand	1	Good - Actual Manual Measurements
A	16/07/2019		-5.81	R	Reference Point		ACT	Actual	DH	MA	Manual/Hand	1	Good - Actual Manual Measurements
A	20/08/2019		-5.97	R	Reference Point		ACT	Actual	DH	MA	Manual/Hand	1	Good - Actual Manual Measurements
A	18/09/2019		-6.24	R	Reference Point		ACT	Actual	DH	MA	Manual/Hand	1	Good - Actual Manual Measurements

Wire Line Logs

0 ***records for RN*** **14310270**

Field Measurements

1 ***records for RN*** **14310270**

Pipe	Date	Depth (m)	Conduct (uS/cm)	pH	Temp (C)	NO3 (mg/L)	DO2 (mg/L)	Eh (mV)	Alkalinity (mV)	Samp	Method	Samp	Source
A	08/07/2011		1899							PU	Pump - Other or Flowing Bore	GB	Groundwater - from Bore

Special Water Analysis

0 ***records for RN*** **14310270**

Bore Report

From Year:

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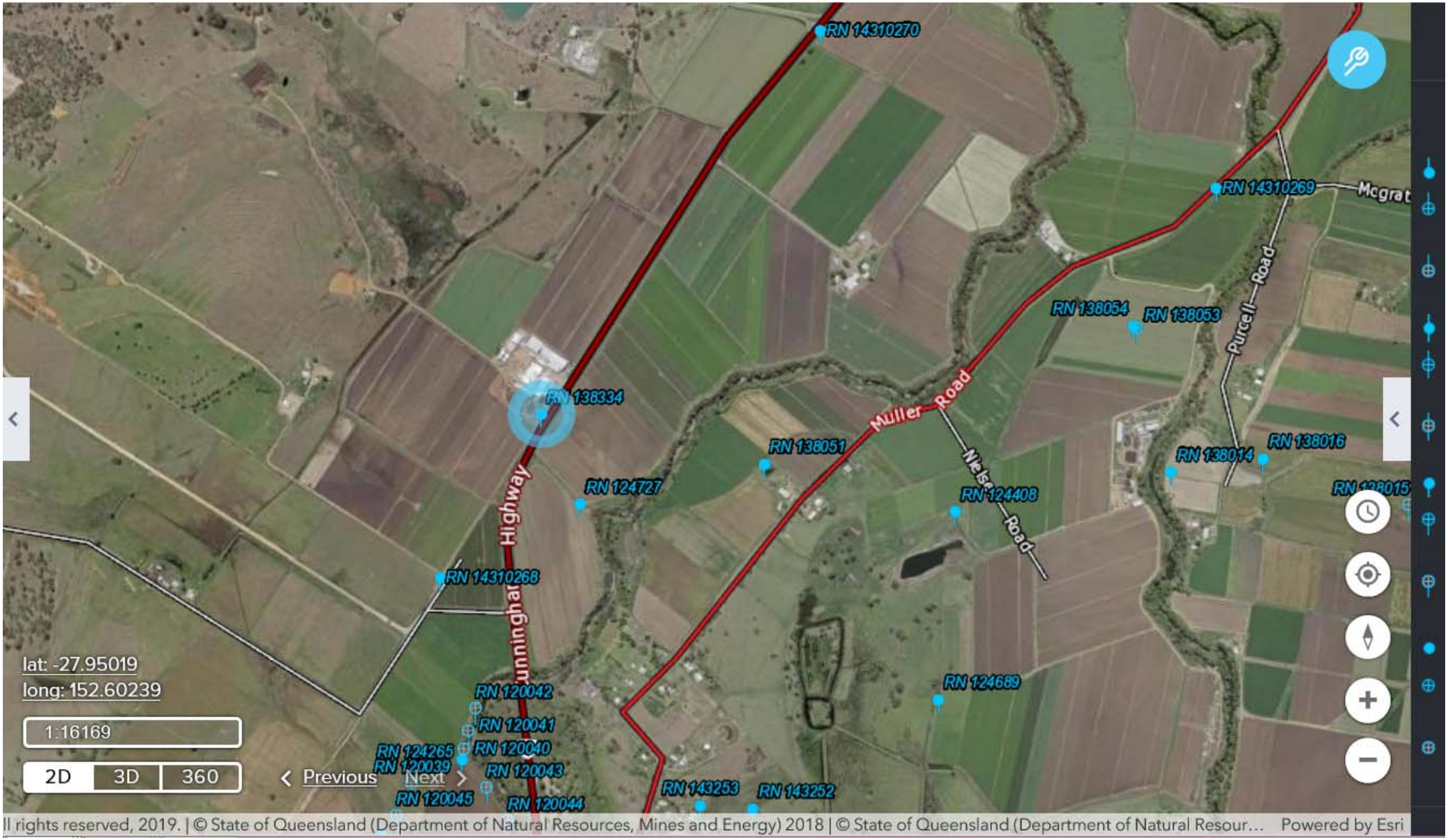
RN 14310270
RN 14310269
Mcgrat
Purcell Road
RN 138054
RN 138053
RN 138334
Muller Road
RN 138051
RN 124727
RN 124408
Nels Road
RN 138014
RN 138016
RN 138015
Highway
RN 14310268
lat: -27.95019
long: 152.60239
1:16169
2D
3D
360
Previous
Next
RN 120042
RN 120041
RN 120040
RN 120043
RN 124265
RN 120039
RN 120045
RN 120044
RN 124689
RN 143253
RN 143252
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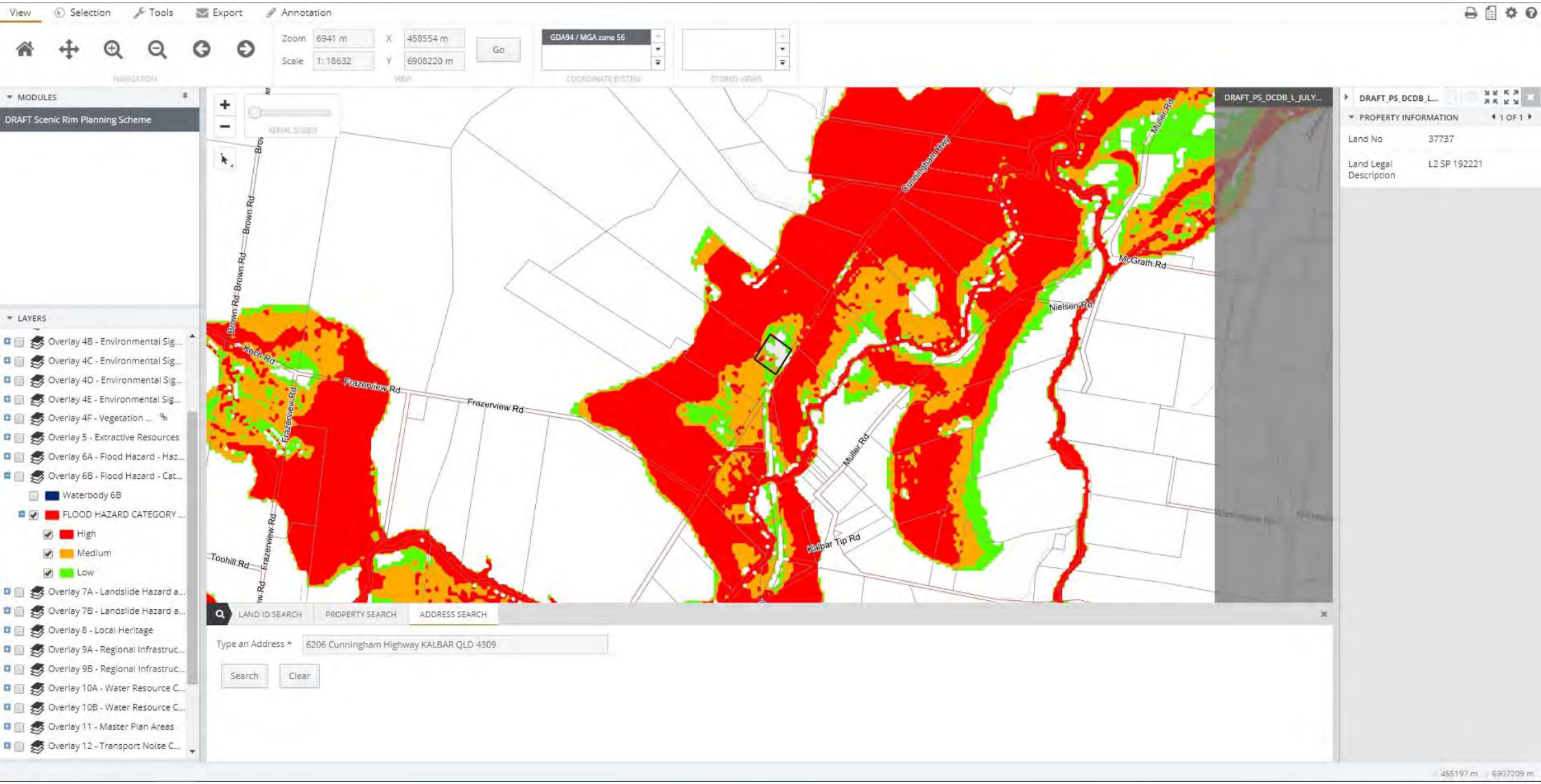
View
Selection
Tools
Export
Annotation
Zoom 6941 m
Scale 1: 18632
X 458554 m
Y 6908220 m
Go
GDA94 / MGA zone 56
MODULES
DRAFT Scenic Rim Planning Scheme
LAYERS
Overlay 4B - Environmental Sig...
Overlay 4C - Environmental Sig...
Overlay 4D - Environmental Sig...
Overlay 4E - Environmental Sig...
Overlay 4F - Vegetation ...
Overlay 5 - Extractive Resources
Overlay 6A - Flood Hazard - Haz...
Overlay 6B - Flood Hazard - Cat...
Waterbody 6B
FLOOD HAZARD CATEGORY ...
High
Medium
Low
Overlay 7A - Landslide Hazard a...
Overlay 7B - Landslide Hazard a...
Overlay 8 - Local Heritage
Overlay 9A - Regional Infrastruc...
Overlay 9B - Regional Infrastruc...
Overlay 10A - Water Resource C...
Overlay 10B - Water Resource C...
Overlay 11 - Master Plan Areas
Overlay 12 - Transport Noise C...
Brown Rd
Koch Rd
Frazerview Rd
Toohill Rd
Cunningham Hwy
Miller Rd
McGrath Rd
Nielsen Rd
Muller Rd
Kalbar Tip Rd
DRAFT_PS_DCDB_L_JULY...
DRAFT_PS_DCDB_L...
PROPERTY INFORMATION
1 OF 1
Land No 37737
Land Legal Description L2 SP 192221
LAND ID SEARCH
PROPERTY SEARCH
ADDRESS SEARCH
Type an Address *
6206 Cunningham Highway KALBAR QLD 4309
Search
Clear
455197 m
6907209 m

REFERENCE

MAP UNIT		MAJOR CHARACTERISTICS OF DOMINANT SOIL	GREAT SOIL GROUP †	PPF**
SOILS OF THE ALLUVIAL PLAINS				
DARK CLAY LOAMS				
Mr	MOORE	Dark clay loam to 30cm over dark sand	Alluvial soil	Um1.44
Mg	MOOGERAH	Dark clay loam with dark or brown neutral massive clay loam or light clay subsoil	No provision	Gn2.42 Gn2.02
Br	BROMELTON*	Dark clay loam or light clay with neutral or alkaline structured clay subsoil	Prairie soil - Chernozem	Um6.32 Gn3.42
DARK WEAKLY SELF-MULCHING SEASONALLY CRACKING CLAYS				
Mu	MULLER	Dark weakly self-mulching cracking clay with dark or brown neutral subsoil	Black earth	Ug5.15 Ug5.17
DARK MODERATELY SELF-MULCHING SEASONALLY CRACKING CLAYS				
Wr	WARRILL	Dark moderately self-mulching cracking clay with dark or grey alkaline subsoil	Black earth	Ug5.16 Ug5.17
Ug	UGARAPUL	Dark moderately self-mulching cracking clay with brown neutral subsoil	Black earth	Ug5.15 Ug5.17
GILGAIED MOTTLED DARK SEASONALLY CRACKING CLAYS				
Fa	FASSIFERN*	Gilgaied mottled dark weakly or non self-mulching cracking clay with grey alkaline subsoil	Weisenboden - Grey clay	Ug5.16 Ug5.24
SOILS OF THE UNDULATING PLAINS				
SHALLOW RED SANDY CLAY LOAMS				
St	STIBBES	Shallow red friable sandy loam to sandy clay loam	Red earth	Um5.51
FRIABLE NON-CRACKING CLAY LOAMS / CLAYS				
Ka	KALAMBA	Shallow grey friable gravelly clay with brown acid subsoil	No provision	Um6.31
Ch	CHURCHBANK*	Shallow dark or brown friable clay loam / clay with red or brown neutral clay subsoil	Prairie soil	Um6.31 Gn3.22
Pu	PURDON	Deep dark friable clay loam/clay with dark or brown calcareous subsoil	Chernozem	Um6.31 Db3.13 Gn3.43
SHALLOW SELF-MULCHING SEASONALLY CRACKING CLAYS				
Wk	WARUMKARIE	Shallow dark to grey self-mulching clay with dark or grey alkaline calcareous subsoil	Black earth - Grey clay	Ug5.12 Ug5.22
Pe	PENNELL	Shallow dark to brown self-mulching clay with brown neutral subsoil	Black earth - Brown clay	Ug5.13 Ug5.32
DEEP SELF-MULCHING SEASONALLY CRACKING CLAYS				
Ku	KULGUN*	Deep dark to grey self-mulching clay loam / clay with grey alkaline calcareous subsoil	Black earth - Grey clay	Ug5.14 Ug5.24 Gn3.93
Ke	KELLY	Deep dark to grey self-mulching clay with yellow alkaline calcareous subsoil	Black earth - Grey clay	Ug5.23 Ug5.32
Mc	McGRATH	Deep dark to brown self-mulching clay with red to brown neutral or alkaline subsoil	Black earth - Brown clay	Ug5.15 Ug5.34 - Ug5.37
SANDY DUPLEX SOILS				
Ro	ROSEVALE*	Dark to grey hard sandy loam 12-30 cm with bleached A_2 - horizon over red to brown acid to neutral deep clay subsoil	Soloth	Dr2.41 Db1.42
Di	DIECKMANN	Dark to grey friable fine sandy loam to loam 20-40 cm with bleached A_2 - horizon over manganiferous mottled grey to brown neutral deep clay subsoil	Soloth	Dy5.42 Db4.32
Wi	WISS	Brown hard sandy loam 45-70 cm with thick pale A_2 - horizon over red acid to neutral deep clay subsoil	Red podzolic	Dr2.51 Gn2.14
CLAY LOAM DUPLEX SOILS				
La	LANCE	Dark to brown hard clay loam 20-25 cm with pale A_2 - horizon over mottled yellow or brown acid deep clay subsoil	Soloth	Dy2.21 Dy3.41
Ye	YELLUNGA	Dark to grey hard clay loam 10-20 cm with thin bleached A_2 - horizon over brown alkaline calcareous deep clay subsoil	Solodic	Db1.33 Db2.43
SOILS OF THE LOW HILLS				
SHALLOW GRAVELLY LOAMS / CLAY LOAMS				
Ra	RANGEVIEW	Shallow dark cobbly loam / clay loam	Lithosol	Um6.21 Gn2.81
Fr	FRAZER*	Shallow red gravelly sandy loam / loam	Lithosol	Um4.1 Gn2.11 Uc1.44
SHALLOW GRAVELLY DUPLEX SOILS				
Or	ORTELS	Dark to grey gravelly loam / clay loam 25 cm with bleached A_2 - horizon over brown or grey alkaline shallow clay subsoil	Solodic	Db1.43 Dy4.43
Wt	WATTERS	Dark to brown gravelly loam 15 cm with bleached A_2 horizon over mottled red acid shallow clay subsoil	Soloth	Dr2.41 Dr3.41

SEVERELY DEGRADED SOILS

Br-E	BROMELTON	- ERODED PHASE
Mu-E	MULLER	- ERODED PHASE
Wr-S	WARRILL	- SALINE PHASE

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QUEENSLAND
DEPARTMENT OF PRIMARY INDUSTRIES

REFERENCE AREA — KALBAR
SOILS

by B.Powell

SCALE 1:25 000

500 0 500 1000 1500 Metres

Drawn by P.Zande

NOTE

* This soil is identified as a soil described by Paton (1971) and is given the Paton name.

** Principal Profile Forms (Northcote, 1971)

† Peech Stace et al (1968). 'A Handbook of Australian Soils'.

clear boundary
gradual boundary
diffuse boundary

Map units are named after the dominant soil.

Dominant soil occupies >70% of a map unit area.

Deep soils are usually greater than 70 cm deep.

Bleached A_2 - horizons have a whitish colour and are much paler than the surface soil and subsoil.

Duplex soils: soils which have strongly contrasting texture profiles with a lighter textured surface soil (clay loam or lighter) over a heavier textured (more clayey) subsoil.

R9 Soil Sample Site R9

LOCALITY PLAN

COMPILED by B.Powell, Agricultural Chemistry Branch, Department of Primary Industries, Brisbane.

PREPARED by Drafting Section, Division of Land Utilisation, Department of Primary Industries, Brisbane.

BASE MAP supplied by Department of Mapping and Surveying, Brisbane.

PRINTED by the Government Printer, Brisbane, 1979.

APPENDIX D – ENVIRONMENTAL OBJECTIVES, PERFORMANCE OUTCOMES AND LAND REHABILITATION

ENVIRONMENTAL OBJECTIVES AND PERFORMANCE OUTCOMES

Risk assessment – Environmental Protection Regulation Schedule 5, Part 3, Table 1.

Table A. Environmental objectives and performance outcomes.

Environmental objective	***Performance outcomes***	***Possible impacts and associated risks to environmental values***	***How the proposal meets the environmental objective and performance outcomes*** Include other EPP considerations where relevant (*Management hierarchy, environmental values, quality objectives, management intent)*
AIR			
EO1 The activity will be operated in a way that protects the environmental values of air.	**PO1.1** There is no discharge to air of contaminants that may cause an adverse effect on the environment from the operation of the activity. **PO1.2** All of the following— 1. Fugitive emissions of contaminants from storage, handling and processing of materials and transporting materials within the site are prevented or minimised; 2. Contingency measures will prevent or minimise adverse effects on the environment from unplanned emissions and shut down and start up emissions of contaminants to air; 3. Releases of contaminants to the atmosphere for dispersion will be managed to prevent or minimise adverse effects on environmental values.	Air quality has the potential to be degraded if noxious and/or offensive odours are permitted to emanate from the sewage treatment system and/or irrigation area; with the potential to impact the environment and/or the neighbouring users (customers, neighbours, guests).	The STP will most likely be contained on a concrete slab and individual tank components will be fully closed. As such, the STP is not expected to cause any unwanted odours to any nearby sensitive receptors. The irrigation system will distribute effluent above ground via cannon sprinklers, centre-pivot or other. Effluent will be irrigated via coarse droplet irrigation methods that do not produce aerosols. The irrigation area has been appropriately distanced from buildings to avoid any unwanted human contact. No nuisance odours are expected to leave the site boundary (Proposed Lot 17 and Lot 18). *Management* • All systems, machinery and tools used on the system, shall be fitted with appropriate emission reduction controls in accordance with the legal requirements. • Odorous systems and equipment shall be removed from the site for repair/replacement. • Specific environmental monitoring for air quality (dust and/or odours) is not proposed, providing the operation of the treatment system does not generate nuisance odours and the access road for servicing and desludging does not generate dust. *Corrective action – if required* • Cease any activities that cause an offensive odour until odour emission levels have reduced. • A suitably qualified person shall determine the source of the odour or the reason for the non-compliance, and investigate the failure. • Undertake maintenance work if possible, in accordance with the manufacturer's maintenance guidelines or contact the service agent. • Ensure that the source of the odour is repaired or replaced. • Review the reason for the failure and the procedures to prevent re-occurrence. Further details can be provided following approval in an operational management plan (if required).
WATER			
EO2 The activity will be operated in a way that protects environmental values of waters.	**PO2.1** There is no actual or potential discharge to waters of contaminants that may cause an adverse effect on an environmental value from the operation of the activity. **PO2.2** All of the following— 1. The storage and handling of contaminants will include effective means of secondary containment to prevent or minimise releases to the environment from spillage or leaks; 2. Contingency measures will prevent or minimise adverse effects on the environment due to unplanned releases or discharges of contaminants to water; 3. The activity will be managed so that stormwater contaminated by the activity that may cause an adverse effect on an environmental value will not leave the site without prior treatment; 4. The disturbance of any acid sulfate soil, or potential acid sulfate soil, will be managed to prevent or minimise adverse effects on environmental values; 5. Acid producing rock will be managed to ensure that the production and release of acidic waste is prevented or minimised, including impacts during operation and after the environmental authority has been surrendered;	Surface water and groundwater could be impacted by effluent runoff or infiltration if the facility is not managed appropriately.	The irrigation area is located 100 m east of an ephemeral gully, 75 m southeast of the closest dam and 1.2 km northwest of Warrill Creek as shown in Appendix A, Figures 4 and 5. The irrigation area has been specifically designed using MEDLI to maximise evapotranspiration in order to prevent ponding and runoff of effluent to surface waters. *Management* • Regular monitoring of the sewage treatment system and irrigation area/s will be undertaken to minimise the potential impact on water quality. • Water quality monitoring will be undertaken for the parameters outlined in the approved conditions set for the site. • Sewage treatment and irrigation systems to be maintained in accordance with manufacturers specifications. • No ponding or runoff of effluent on/from the irrigation area/s. • Flow meters to be installed on inflow point of the sewage treatment plant to ensure that the design volume of effluent being irrigated is not exceeded. • Regular monitoring to be conducted to confirm that there is no ingress of stormwater into the sewage treatment plant. • Flow meters to be installed on the out flow point of the wet weather storage tank. • When conditions prevent the irrigation of effluent to land (such as during or following rain events), the effluent will be stored in a 200 kL tank. *Corrective action – if required* • Cease any activities that are impacting the water quality of the sewage treatment system. • A suitably qualified person shall determine the source of the impact or the reason for the non-compliance, and investigate the failure. • Provide additional temporary storage or pump out effluent if required, until system is repaired. • Undertake maintenance work if possible, in accordance with the manufacturer's maintenance guidelines or contact the service agent. • Review the reason for the failure and the procedures to prevent re-occurrence. • Commission an Environmental Consultant to assess any requirement for remediation.

	6. Any discharge to water or a watercourse or wetland will be managed so that there will be no adverse effects due to the altering of existing flow regimes for water or a watercourse or wetland; 7. For a petroleum activity, the activity will be managed in a way that is consistent with the coal seam gas water management policy, including the prioritisation hierarchy for managing and using coal seam gas water and the prioritisation hierarchy for managing saline waste; 8. The activity will be managed so that adverse effects on environmental values are prevented or minimised.		
WETLANDS			
EO3 The activity will be operated in a way that protects the environmental values of wetlands.	**PO3.1** There will be no potential or actual adverse effect on a wetland as part of carrying out the activity. **PO3.2** The activity will be managed in a way that prevents or minimises adverse effects on wetlands.	Nearby wetlands could be impacted by effluent runoff or infiltration if the facility is not managed appropriately. Not applicable as there are no mapped wetlands within 5 km of the site.	While this condition is redundant in the absence of wetlands in the locale, MEDLI modelling has predicted the loading which the irrigation area is able to sustainably receive. The activity shall be maintained with reference to the below management strategies and corrective actions taken if any non-compliances occur. *Management* • All components of the sewage treatment plant and irrigation system must be maintained in accordance with manufacturer's specification • If ponding and/or runoff of effluent is observed throughout the life of the irrigation system, effluent irrigation must cease until such time as ponding and/or runoff is appropriately managed. DES must be notified if runoff offsite occurs *Corrective action – if required* • Cease any activities in the event that effluent runoff migrates beyond the site boundary or threatens to reach environmental receptors. • A suitably qualified person shall determine the reason for the runoff, and provide recommendations to avoid any re-occurrence. • Undertake maintenance/remedial work if possible, in accordance with the manufacturer's maintenance guidelines or contact the service agent. • Reduce the volume of water directed to the IA if runoff ever occurs. Further details can be provided following approval in an operational management plan (if required).
GROUNDWATER			
EO4 The activity will be operated in a way that protects the environmental values of groundwater and any associated surface ecological systems.	**PO4.1** Both of the following apply— 1. There will be no direct or indirect release of contaminants to groundwater from the operation of the activity; 2. There will be no actual or potential adverse effect on groundwater from the operation of the activity. **PO4.2** The activity will be managed to prevent or minimise adverse effects on groundwater or any associated surface ecological systems.	The activity may have the potential to contact nearby groundwater receptors (i.e. particularly if the site is within an unconfined aquifer) if not managed appropriately.	Groundwater will not be impacted by the operation of the STP or the irrigation of effluent to the irrigation area/s. No groundwater dependant ecosystems are mapped within 5 km of the site, furthermore the nearest groundwater bore is 745 m south of the irrigation area. MEDLI modelling has been utilised when developing a sustainable irrigation method for effluent. The concentration of nitrate in deep drainage of irrigated effluent is 0.38 mg/L, while the phosphate deep drainage concentration is 0.04mg/L. Dilution and assimilation of the residual nitrogen and phosphorous in the deep drainage is expected prior to any contact with groundwater. The site has been mapped by DERM as lowland freshwaters, with applicable environmental values listed in Table 6 of this report. Noting baseline total nitrogen in the shallow aquifer has been recorded at 7.3 mg/L. *Management* • Regular monitoring of the sewage treatment system and irrigation area will be undertaken to minimise the potential impact on water quality. This may be substituted with cattle grazing at the subject site. • No ponding or runoff of effluent on/from the irrigation area. • Flow meters to be installed on inflow and out flow points of the sewage treatment plant to ensure that the design volume of effluent being irrigated is not exceeded and that infiltration of groundwater and stormwater is detected and minimised. Groundwater monitoring wells can be installed as a condition of approval if considered to be required by DES.
NOISE			
EO5 The activity will be operated in a way that protects the environmental values of the acoustic environment.	**PO5.1** Sound from the activity is not audible at a sensitive receptor. **PO5.2** The release of sound to the environment from the activity is managed so that adverse effects on environmental values including health and wellbeing and sensitive ecosystems are prevented or minimised.	Sewage treatment systems can cause excessive noise if they are not correctly serviced and maintained. Common sources of noise include pumps, aerators, audible alarms, irrigation sprinklers and maintenance vehicles. Excessive noise can impact work camp residents, staff, site owners, neighbours and fauna.	The STP will not cause a noise to any nearby sensitive receptors, e.g. staff, contractors, nearby occupants, flora or fauna. The STP is to be fully enclosed (if practical) to avoid any excessive noise emanating from the STP. No noise is to leave the site boundary (Lot 2 RP20974). *Management* • All systems and machinery will be efficient, operated appropriately, and maintained in good order. • All systems, machinery and tools used on the systems are to be fitted with appropriate noise reduction controls in accordance with the legal requirements. • Non-conforming systems and equipment are to be removed from the site for repair/replacement. • Specific environmental monitoring for noise is not proposed, providing the operation of the treatment system does not generate excessive or nuisance noise levels. • All noise related complaints will be recorded in a complaints register. If complaints are received regarding noise, the site manager will take all reasonable actions to prevent further complaints. Monitoring may be required based on the degree of complaints and/or council concerns.

			• If noise monitoring is required at the operational phase, the monitoring program will be undertaken in accordance with AS1055, AS2991.2 and the latest edition of DES's Noise Management Manual (EPA, 2000). *Corrective action – if required* • Cease any activities that cause excessive or nuisance noise levels. • A suitably qualified person shall determine the source of the noise or the reason for the non-compliance, and investigate the failure. • Undertake maintenance work if possible, in accordance with the manufacturer's maintenance guidelines or contact the service agent. • Have the source of the noise repaired or replaced. • Review the reason for the failure and the procedures to prevent re-occurrence. • Review the speed limit of the access roads and consult access road users.
WASTE			
EO6 **Any waste generated, transported, or received as part of carrying out the activity is managed in a way that protects all environmental values.**	**PO6.1** Both of the following apply— 1. Waste generated, transported or received is managed in accordance with the waste and resource management hierarchy in the *Waste Reduction and Recycling Act 2011*; 2. If waste is disposed of, it is disposed of in a way that prevents or minimises adverse effects on environmental values.	The potential sources of waste may include: • Accumulated general waste which can cause aesthetic issues and impact human health and the environment • Sludge accumulation in the sewage treatment tanks which can cause the carryover of solid material to the irrigation area and fouling or surface pooling • Sludge spillage during desludging operations which can impact human health and the environment.	Waste generated from the operation of the STP, such as sludge, will not cause impact to human health or the surrounding environment. *Management* • When conditions prevent the irrigation of effluent to land (such as during or following rain events), the effluent will be stored in a 200 kL tank. • The effluent can be removed by a licensed liquid waste contractor or irrigated on site when rain ceases and deemed to be appropriate either via daily visual inspection and/or via the use of soil moisture meters. • The tank is to be fitted with a high level alarm capable of providing sufficient time to engage a licensed contractor to pump out the tank prior to any overflows occurring (to trigger at 80% capacity). • A flow meter is to be installed on the outlet to measure irrigation flows on a daily basis. • The collection system must not receive trade waste and water generated as a result of recreational equipment washing. • Waste material is not to be disposed of by burning or burying onsite. • All wastes temporarily stored onsite will be confined to dedicated areas and managed to prevent the occurrence of environmental harm or nuisance. • Where storage of oils and other hazardous liquids is required, the liquids are to be shelved in catch trays within a bunded area. Any spillages are to be cleaned up as soon as possible and disposed of offsite at an approved facility. • A dedicated desludging area will be constructed directly adjacent to the sewage treatment system. The desludging area/s will be bunded and constructed with an impermeable base. This area will also be utilised as a designated wash-down area for cleaning service vehicles and equipment. • A spill clean-up kit will be located within the storage area. • A licensed contractor as required will undertake removal of sludge from the sewage treatment system. • All sludge and wastes transported from the site shall be covered or suitably handled to prevent the occurrence of environmental harm or nuisance • A bag filter or stainless screen will capture solids and these will be appropriately disposed of as solid waste. *Corrective action – if required* • Ensure that the sludge level within the sewage treatment system is monitored regularly to identify when desludging is required. • Increase the frequency of desludging in order to prevent sludge accumulation in the sewage treatment tanks which may cause carry over of solid material to the irrigation area resulting in fouling or surface pooling. • The desludging contractor will be made aware of the location of which the desludging process is to be undertaken. • Should a spillage occur during the desludging process, the spillage will be cleaned up immediately in an appropriate manner. • All sludge and wastes transported from the site will be covered or suitably handled to prevent the occurrence of environmental harm or nuisance.
LAND			
EO7 The activity is operated in a way that protects the environmental values of land including soils, subsoils, landforms, and associated flora and fauna.	**PO7.1** There is no actual of potential disturbance or adverse effect to the environmental values of land as part of carrying out the activity. **PO7.2** All of the following— 1. Activities that disturb land, soils, subsoils, landforms and associated flora and fauna will be managed in a way that prevents or minimises adverse effects on the environmental values of land; 2. Areas disturbed will be rehabilitated or restored to achieve sites that are— a) safe to humans and wildlife;	Land contamination could occur as a result of the following: • Untreated sewage overflowing from the sewage treatment system • Substandard effluent being discharged to the irrigation areas • Sludge spillages during desludging	Land contamination as a result of the treatment and irrigation of effluent will be prevented by appropriate treatment of sewage to the criteria outlined in the EA conditions, and ongoing monitoring of influent/effluent quality and routine inspections of the irrigation area/s. A site based management plan and/or contaminant release area monitoring program (or similar) may be conditioned by the administering authority as part of the EA approval. Management • Contaminants from the activity must not be released to land except as authorised in the Environmental Authority. • Effluent (treated) is permitted to be released to land provided that the activity is conducted in accordance with the EA conditions and that ensures: a) infiltration to groundwater and subsurface flows of contaminants to surface waters are prevented b) surface ponding and run-off of effluent is prevented c) degradation of soil structure is minimised d) soil sodicity and the build-up of nutrients and heavy metals in the soil and subsoil are minimised e) runoff caused through trenching does not carry beyond effluent disposal areas

	b) non-polluting; and c) stable; and d) able to sustain an appropriate land use after rehabilitation or restoration; 3. The activity will be managed to prevent or minimise adverse effects on the environmental values of land due to unplanned releases or discharges, including spills and leaks of contaminants; 4. The application of water or waste to the land is sustainable and is managed to prevent or minimise adverse effects on the composition or structure of soil and subsoils.	• Offsite migration of contaminants to adjacent properties and waterways.	f) effluent disposal areas are maintained with an appropriate crop in a viable state for transpiration and nutrient uptake g) the crop on the disposal area is harvested and removed from the disposal area. • When weather conditions or soil conditions preclude the release of effluent to land, irrigation must not occur. • A total of 20,000 m^2 irrigation area shall be utilised for an estimated hydraulic flow of 40,000 L/day and has been confirmed via MEDLI modelling. • Effluent release limits to comply with those specified in the Environmental Authority. • Effluent to comply with the conditions of any Development Permit (past, current or future). • Sewage treatment and irrigation systems to be maintained in accordance with manufacturers specifications. • Flow meters to be installed in sewage treatment system to ensure that the proposed volume of effluent being irrigated is not exceeded. • During wet weather periods (i.e. when wet weather storage capacity will be exceeded) the effluent storage tanks will be pumped out by a licensed contractor and disposed of offsite. • All chemicals to be stored in appropriately bunded areas. A soil monitoring program may be developed as a condition of approval if considered to be required by DES. *Corrective action – if required* • Cease any activities that cause possible land contamination. • A suitably qualified person shall determine the source of the land contamination or the reason for the non-compliance, and investigate the failure. • Provide additional temporary storage or pump out of sewage if required, until system is repaired. • Undertake maintenance work if possible, in accordance with the manufacturer's maintenance guidelines or contact the service agent. • Review the reason for the failure and the procedures to prevent re-occurrence. • Commission a suitably qualified Environmental Consultant to assess any requirement for remediation. • All chemical/fuel spills to be contained within an appropriate system.

LAND REHABILITATION STRATEGY

A rehabilitation strategy for cessation of the proposed ERA 63 is presented in Table B.

Table B. Land rehabilitation strategies.

Aspect	**Strategy**	
Current real property description	Lot 2 RP20974	
Current address	6200 – 6206 Cunningham Highway, Kalbar, Queensland.	
Proposed real property description following subdivision	Lot 17 and Lot 18 (registered plan details to be confirmed)	
Current site use	The site is currently used for cattle grazing.	
Proposed site use	Scenic Rim Agricultural Industrial Precinct (SRAIP)	
Description of ERA activity	Sewage treatment plant (STP), wet weather storage tank (WWST), pump stations, surface spray irrigation and associated pipework. Irrigation area is proposed to be a maximum of 20,000 m^2.	
Site use following ERA activity ceases	The proposed activity does not have an anticipated 'end date'. The activity will most likely cease if the site becomes connected to the reticulated sewer network (expected to be 30 + years).	
Rehabilitation goal	To make the site suitable for agricultural land use at the cessation of the ERA. In addition, the site shall be made: - Safe to humans, livestock, cropping, wildlife - Non-polluting - Stable - Able to sustain an agreed post ERA land use.	
Contaminants of concern associated with the proposed ERA 63	Nutrients (nitrogen and phosphorus accumulation) Salt (salt accumulation) Disinfectants (e.g. Chlorine) Pathogens (*E.coli* and faecal coliforms).	
Potential environmental receptors/impacts	**Land / soil:** - Degradation in the physical and chemical properties of soil and vegetation within and adjacent to the designated irrigation areas, STP and WWST (i.e. contamination with bacterial and viral pathogens, increased nutrients, salinity, erosion and sedimentation, plant stress, contamination with disinfection chemicals and their derivatives, anions and cations).	**Surface waters:** - Contaminants reaching surface waters (including all matters of state environmental significance) - Overland runoff causing flooding of waterways and sediment deposits - Eutrophication of waterways (algal blooms, reduction in dissolved oxygen and fish kills).
	Health impacts: - Impacts to human health via inhalation, ingestion or dermal	**Waste:** - Overtopping of the STP or WWST or accidental spillage of sludge (i.e.

Aspect	Strategy	
	contact with contaminants (i.e. pathogens).	during sludge removal) from the STP onsite causing land contamination.
	Groundwater: Contaminants reaching groundwaters and impacting nearby groundwater users.	
Actions to mitigate potential environmental impacts	Conduct the ERA 63 in accordance with the conditions specified in the Environmental Authority including ongoing monitoring of effluent.	
Remediation steps to be supervised by suitably qualified persons	- Remove any sludge and liquid in the STP and associated infrastructure to a licenced landfill or similar. - Remove and appropriately dispose/recycle the sewerage infrastructure including the STP, WWST, irrigation pipe work and any required pump stations. - Conduct representative sampling of soil in the irrigation areas and adjacent to the sewerage infrastructure and analysis of the samples for parameters including nitrogen, phosphorus, salt/electrical conductivity, pH, pathogens (e.g. E. coli), anions, cations and permeability. - The number, location and depth of samples shall be determined by a suitably qualified scientist with reference to current Queensland Government made and/or approved guidelines. - Relevant land use criteria to be derived from current Queensland Government made and/or approved guidelines - Remediate soil as required under the guidance of a suitably qualified scientist. This may include removal of soil to landfill and replacement with clean soil or onsite remediation of soil using a variety of techniques (e.g. addition of gypsum for stabilisation, ploughing, addition of organic material, lime addition for pathogen reduction). - Infill any depressions with clean soil or other engineered material and compact to site specific engineer density - Conduct representative sampling of any waters if present (surface and or groundwater) within the bounds of the site (for parameters including nitrogen, phosphorus, biochemical oxygen demand, electrical conductivity, pH, pathogens (e.g. E. coli), anions, cations, turbidity, and suspended solids, free and residual chlorine. - The number and location of samples shall be determined by a suitably qualified scientist with reference to current Queensland Government made and/or approved guidelines - Remediate waters as required under the guidance of a suitably qualified scientist. Guidance considered in conducting the above scope (unless superseded) shall include: - Australian Standard: Guide to the investigation and sampling of sites with potentially contaminated soil, Part 1: Non-volatile and semi-volatile compounds - (AS 4482.1-2005) - withdrawn - Australian Standard: Guide to sampling and investigation of potentially contaminated soil, Part 2: Volatile substances - (AS 4482.2 1999) - withdrawn - National Environmental Protection (Assessment of Site Contamination) Measure 1999 (NEPC 2013). - Environmental Protection Regulation 2019.	

APPENDIX E – LABORATORY CERTIFICATES OF ANALYSIS

Queensland Government

Department of Environment and Science - Chemistry Centre
Eco Sciences Precinct
Level 3, Block A, 41 Boggo Rd
Dutton Park Qld 4102

Sample Receival Advice

Customer Details

Customer:	Precise Environmental
	7/14 Fremantle Street
	Burleigh Heads
	QLD
Contact:	Danae Bragg
Phone:	07 5593 7848
Mobile:	614 39 973 878
email:	danae@preciseenvironmental.com.au

Job Details

Job No:	**19-0928**
No Samples:	3
Date Sampled:	21/10/2019 to 21/10/2019
Date Received:	23/10/2019 to 23/10/2019
Consignor:	
Contact:	Angus Mcelnea
Phone:	07 31705648
Fax:	07 31705801
email:	angus.mcelnea@des.qld.gov.au

Approx time (working days): _____

Sample Details

Comment:

Sample Type	Samples
Soil	3

Water Bottle Details

A	B	C	D	E	Other	Total
0	0	0	0	0	0	0

19-0928

CHAIN OF CUSTODY

DES CHEMISTRY CENTRE - LEVEL 3 EAST, BLOCK A, ECOSCIENCES PRECINCT, 41 BOGGO ROAD, DUTTON PARK, QLD, 4102

CLIENT:	Precise Environmental	TURNAROUND REQUIREMENTS :	☐ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)	
OFFICE:	Unit 7 / 14 Fremantle Street, Burleigh Heads, Qld 4220	(Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact?	Yes / No / N/A
PROJECT:	PE2898.19		COC SEQUENCE NUMBER (Circle)	Free ice / frozen ice bricks present upon receipt?	Yes / No / N/A
ORDER NUMBER:	PE2898.19		COC: 1 2 3 4 5 6 7 8 9 10 11	Random Sample Temperature on Receipt:	°C
PROJECT MANAGER:	Chris Butler	CONTACT PH: 0431 565 210	OF: 1 2 3 4 5 6 7 8 9 10 11	Other comment:	
SAMPLER:	Chris Butler	SAMPLER MOBILE: 0431 565 210	RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY: / RECEIVED BY:
COC emailed? (YES / NO)		EDD FORMAT (or default):	Danae Bragg	S. MORK	
Email Reports to: danae@preciseenvironmental.com.au / sean@preciseenvironmental.com.au			DATE/TIME:	DATE/TIME: 23/10/19 8:45AM	DATE/TIME: / DATE/TIME:
Email Invoice to: danae@preciseenvironmental.com.au / sean@preciseenvironmental.com.au			22.10.19 @ 9 am		

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

LAB USE ONLY	SAMPLE DETAILS		MATRIX: Solid(S) Water(W)	CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES														Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE *(refer to codes below)*	TOTAL BAGS	S_AQ4_EL (pH and EC)	S_AQ4_AA	S_COLWELL	Organic nitrogen	Phonsphorus buffer index (PBI)	S_DUM_TOC	S_KJ_AA	S_ADM_105	S_PSA	S_15_BAR	S_03_BAR	SP_2	SP_05	Exchangeable sodium percentage (ESP)	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	BH1 0.1 - 0.25	21.10.19	S	Bag, <4° C	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	BH2 0.0 - 0.6	21.10.19	S	Bag, <4° C	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	BH3 0.3 - 0.6	21.10.19	S	Bag, <4° C	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
				TOTAL	3															

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VS = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

Queensland Government

Department of Environment and Science - Chemistry Centre
Eco Sciences Precinct
Level 3, Block A, 41 Boggo Rd
Dutton Park Qld 4102
Telephone: 07 3170 5696
Facsimile: 07 3170 5801

Analysis Report

Job Number: 19-0928

Precise Environmental
7/14 Fremantle Street
Burleigh Heads

QLD 4220

Attn : Danae Bragg

Date Sampled: 21-Oct-2019 to 21-Oct-2019
Date Received: 25-Oct-2019 to 25-Oct-2019
Date Tested: 25-Oct-2019 to 1-Dec-2019
Date Reported: 1-Dec-19

Final Report

Report ID: 19-0928-F-V2

This report supersedes report : 19-0928-I-V1 issued on 26-Nov-2019.

MISCEX , Miscellaneous External

PE2898.19

NOTE: Results pertain to samples as received by this laboratory and relate to the items tested

Additional Notes

Queensland Government

Department of Environment and Science - Chemistry Centre

Soil Analysis Report

Job No: 19-0928
Report ID: 19-0928-F-V2

Sample No	Customer's ID	Description	Depth (m)	S_AQ4_EL pH -	S_AQ4_EL EC dS/m	S_AQ4_AA Cl mg/kg	S_AQ4_AA NO3-N mg/kg	S_COLWELL P mg/kg	* S_PBI PBI col	* S_PBI PBI unadj	S_DUM_CN TC %	S_DUM_CN TN %	S_DUM_TOC OC %	S_KJ_AA TKN %
19-0928-0001	1	BH1 0.1 - 0.25	0.10-0.25	6.36	0.04	<20	5	131	73	50	0.94	0.085	0.933	0.072
19-0928-0002	2	BH2 0.0 - 0.6	0.00-0.60	6.23	0.05	23	2	5	184	182	1.44	0.110	1.40	0.094
19-0928-0003	3	BH3 0.3 - 0.6	0.30-0.60	7.87	0.30	257	11	16	195	191	0.69	0.065	0.688	0.054

Sample No	Customer's ID	Description	Depth (m)	S_KJ_AA TKP %	S_KC2_AA_D NH4-N air dry mg/kg	S_KC2_AA_D NO3-N air dry mg/kg	S_CAT_EQ Ca cmol_c/kg	S_CAT_EQ Mg cmol_c/kg	S_CAT_EQ K cmol_c/kg	S_CAT_EQ Na cmol_c/kg	S_CAT_EQ Na corr cmol_c/kg	S_CAT_ALC Ca cmol_c/kg	S_CAT_ALC Mg cmol_c/kg
19-0928-0001	1	BH1 0.1 - 0.25	0.10-0.25	0.038	3	4	6.83	3.58	0.588	0.166	0.166	-----	-----
19-0928-0002	2	BH2 0.0 - 0.6	0.00-0.60	0.018	3	<2	18.9	9.38	0.414	1.42	1.36	-----	-----
19-0928-0003	3	BH3 0.3 - 0.6	0.30-0.60	0.092	9	12	-----	-----	-----	-----	-----	15.8	8.26

Sample No	Customer's ID	Description	Depth (m)	S_CAT_ALC K cmol_c/kg	S_CAT_ALC Na cmol_c/kg	S_CAT_ALCC Base sat %	S_CAT_ALCC CEC:Clay	S_CAT_ALCC Ca:CEC	S_CAT_ALCC ESP %	S_CAT_ALCC Ca:Mg	S_CAT_ALCC K:CEC	S_CAT_ALCC Mg:CEC	S_CAT_ALCC Mg:Ca
19-0928-0001	1	BH1 0.1 - 0.25	0.10-0.25	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
19-0928-0002	2	BH2 0.0 - 0.6	0.00-0.60	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
19-0928-0003	3	BH3 0.3 - 0.6	0.30-0.60	0.350	1.79	97	0.6	0.582	6.6	1.91	0.0129	0.304	0.523

Sample No	Customer's ID	Description	Depth (m)	S_CAT_ALCC Mg:K	S_CAT_ALCC Na:K	* S_CEC CEC cmol/kg	S_ADM_105 ADMC %	S_PSA Coarse sand %	S_PSA Fine sand %	S_PSA Silt %	S_PSA Clay %	S_03_BAR 1/3 Bar %	S_15_BAR 15 Bar %
19-0928-0001	1	BH1 0.1 - 0.25	0.10-0.25	-----	-----	-----	4.1	32.3	37.1	21.9	14.0	35.7	13.2
19-0928-0002	2	BH2 0.0 - 0.6	0.00-0.60	-----	-----	-----	8.3	8.4	16.8	15.4	57.9	48.1	25.1
19-0928-0003	3	BH3 0.3 - 0.6	0.30-0.60	23.6	5.12	27	3.7	11.0	35.8	9.5	45.1	40.7	19.9

Name : Angus McElnea
Title : Team Leader Soil and Plant

NATA Accredited Laboratory
Number: 5072

This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance ISO/IEC 17025 - Chemical testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Queensland Government

Department of Environment and Science - Chemistry Centre

Sample Details

Job No: 19-0928
Report ID: 19-0928-F-V2

Soil

Sample No	Customer's ID	Description	Date Sampled	Site	Obs	SNo	Depth (m)
19-0928-0001	1	BH1 0.1 - 0.25	21-Oct-2019		0	0	0.10-0.25
19-0928-0002	2	BH2 0.0 - 0.6	21-Oct-2019		0	0	0.00-0.60
19-0928-0003	3	BH3 0.3 - 0.6	21-Oct-2019		0	0	0.30-0.60

Queensland Government

Department of Environment and Science - Chemistry Centre

Methods of Analysis

Job No: 19-0928
Report ID: 19-0928-F-V2

Method	Analyte	Name	ALHS	Uncertainty ±%	PQL	Unit	Method Description	Reporting Basis	Method Notes
S_03_BAR v1	1/3 Bar	Field capacity moisture (1/3 Bar)	2E2	15	1.500	%	Soil: Moisture 1/3 Bar pressure plate	Oven dry (24 hours at 105°C)	
S_15_BAR v1	15 Bar	Permanent wilting point (15 Bar)	2E1	15	1.500	%	Soil: Moisture 15 Bar pressure plate	Oven dry (24 hours at 105°C)	
S_ADM_105 v1	ADMC	Air dry moisture content (105ºC)	2A1	8	1.500	%	Soil: Moisture air dry	Oven dry (48 hours at 105°C)	
S_AQ4_AA v2	Cl	Chloride	5A2	10	20.000	mg/kg	Soil: Cl NO3-N Aqueous (1:5)	Oven dry (48 hours at 40°C)	
S_AQ4_AA v2	NO3-N	Nitrate nitrogen	7B1	15	1.000	mg/kg	Soil: Cl NO3-N Aqueous (1:5)	Oven dry (48 hours at 40°C)	
S_AQ4_EL v1	EC	Electrical conductivity	3A1	10	0.010	dS/m	Soil: pH EC Aqueous (1:5)	Oven dry (48 hours at 40°C)	
S_AQ4_EL v1	pH	pH	4A1	5	0.100	-	Soil: pH EC Aqueous (1:5)	Oven dry (48 hours at 40°C)	
S_CAT_ALC v1	Ca	Calcium	15C1_Ca	10	0.600	cmol_c/kg	Soil: Cations exchangeable alcoholic NH4Cl pH 8.	Oven dry (48 hours at 40°C)	
S_CAT_ALC v1	K	Potassium	15C1_K	12	0.050	cmol_c/kg	Soil: Cations exchangeable alcoholic NH4Cl pH 8.	Oven dry (48 hours at 40°C)	
S_CAT_ALC v1	Mg	Magnesium	15C1_Mg	8	0.070	cmol_c/kg	Soil: Cations exchangeable alcoholic NH4Cl pH 8.	Oven dry (48 hours at 40°C)	
S_CAT_ALC v1	Na	Sodium	15C1_Na	10	0.070	cmol_c/kg	Soil: Cations exchangeable alcoholic NH4Cl pH 8.	Oven dry (48 hours at 40°C)	
S_CAT_ALCC v1	Base sat	Base saturation	15L1	10	1.000	%	Soil: Cations exchangeable alcoholic NH4Cl pH 8.	Oven dry (48 hours at 40°C)	
S_CAT_ALCC v1	CEC:Clay	Cation exchange capacity:clay	15Z1_CEC/clay	0	0.000		Soil: Cations exchangeable alcoholic NH4Cl pH 8.	Oven dry (48 hours at 40°C)	
S_CAT_ALCC v1	Ca:CEC	Calcium to cation exchange capacity ratio	15M1_Ca/CEC	10	0.000		Soil: Cations exchangeable alcoholic NH4Cl pH 8.	Oven dry (48 hours at 40°C)	
S_CAT_ALCC v1	Ca:Mg	Calcium to magnesium ratio	15M1_Ca/Mg	10	0.000		Soil: Cations exchangeable alcoholic NH4Cl pH 8.	Oven dry (48 hours at 40°C)	
S_CAT_ALCC v1	ESP	Exchangable sodium percentage	15N1	0	0.000	%	Soil: Cations exchangeable alcoholic NH4Cl pH 8.	Oven dry (48 hours at 40°C)	
S_CAT_ALCC v1	K:CEC	Potassium to cation exchange capacity ratio	15M1_K/CEC	10	0.000		Soil: Cations exchangeable alcoholic NH4Cl pH 8.	Oven dry (48 hours at 40°C)	
S_CAT_ALCC v1	Mg:CEC	Magnesium to cation exchange capacity ratio	15M1_Mg/CEC	10	0.000		Soil: Cations exchangeable alcoholic NH4Cl pH 8.	Oven dry (48 hours at 40°C)	
S_CAT_ALCC v1	Mg:Ca	Magnesium to calcium ratio	15M1_Mg/Ca	10	0.000		Soil: Cations exchangeable alcoholic NH4Cl pH 8.	Oven dry (48 hours at 40°C)	
S_CAT_ALCC v1	Mg:K	Magnesium to potassium ratio	15M1_Mg/K	10	0.000		Soil: Cations exchangeable alcoholic NH4Cl pH 8.	Oven dry (48 hours at 40°C)	
S_CAT_ALCC v1	Na:K	Sodium to potassium ratio	15M1_Na/K	10	0.000		Soil: Cations exchangeable alcoholic NH4Cl pH 8.	Oven dry (48 hours at 40°C)	
S_CAT_EQ v3	Ca	Calcium	15A1_Ca	10	0.140	cmol_c/kg	Soil: Cations extractable NH4Cl pH 7 ICP	Oven dry (48 hours at 40°C)	
S_CAT_EQ v3	K	Potassium	15A1_K	10	0.030	cmol_c/kg	Soil: Cations extractable NH4Cl pH 7 ICP	Oven dry (48 hours at 40°C)	
S_CAT_EQ v3	Mg	Magnesium	15A1_Mg	10	0.030	cmol_c/kg	Soil: Cations extractable NH4Cl pH 7 ICP	Oven dry (48 hours at 40°C)	
S_CAT_EQ v3	Na	Sodium	15A1_Na	10	0.080	cmol_c/kg	Soil: Cations extractable NH4Cl pH 7 ICP	Oven dry (48 hours at 40°C)	
S_CAT_EQ v3	Na corr	Exchangeable Sodium	15A3_Na	0	0.080	cmol_c/kg	Soil: Cations extractable NH4Cl pH 7 ICP	Oven dry (48 hours at 40°C)	
* S_CEC v2	CEC	Cation exchange capacity	15C1_CEC	15	2.000	cmol/kg	Soil: CEC alcoholic NH4Cl pH 8.5 AA	Oven dry (48 hours at 40°C)	
S_COLWELL v2	P	Phosphorus (Colwell)	9B2	10	2.000	mg/kg	Soil: P extractable 0.5M NaHCO3 AA	Oven dry (48 hours at 40°C)	
S_DUM_CN v5	TC	Total carbon	6B2a	5	0.050	%	Soil: C N total Dumas	Oven dry (48 hours at 40°C)	
S_DUM_CN v5	TN	Total nitrogen	7A5	10	0.005	%	Soil: C N total Dumas	Oven dry (48 hours at 40°C)	
S_DUM_TOC v3	OC	Organic carbon	6B5	10	0.050	%	Soil: Total Organic Carbon; Combustion	Oven dry (48 hours at 40°C)	
S_KC2_AA_D v1	NH4-N air dry	Ammonium nitrogen	7C2_NH4-N	10	2.000	mg/kg	Soil: Air dry sample| NO3-N NH4-N 2M KCl extrac	Air dry (48 hours at 40°C)	Soil: Air dry sample, NO3-N NH4-N 2M KCl extractable AA
S_KC2_AA_D v1	NO3-N air dry	Nitrate nitrogen	7C2_NO3-N	10	2.000	mg/kg	Soil: Air dry sample| NO3-N NH4-N 2M KCl extrac	Air dry (48 hours at 40°C)	Soil: Air dry sample, NO3-N NH4-N 2M KCl extractable AA
S_KJ_AA v3	TKN	Kjeldahl Nitrogen	7A2	10	0.013	%	Soil: Total N and P Kjeldahl digest AA	Air dry (48 hours at 40°C)	Soil: Total N and P Kjeldahl digest AA
S_KJ_AA v3	TKP	Kjeldahl Phosphorus	9A3a	10	0.013	%	Soil: Total N and P Kjeldahl digest AA	Air dry (48 hours at 40°C)	Soil: Total N and P Kjeldahl digest AA
* S_PBI v5	PBI col	Phosphorus buffer index (Colwell)	9I2	15	1.000		Soil: Phosphorus Single Point Buffer Index	Oven dry (48 hours at 40°C)	
* S_PBI v5	PBI unadj	Phosphorus buffer index (unadjusted)	9I4	15	1.000		Soil: Phosphorus Single Point Buffer Index	Oven dry (48 hours at 40°C)	
S_PSA v1	Clay	Clay: hydrometer <2 µm	2Z2_Clay	5	1.000	%	Soil: Particle size analysis	Oven dry (48 hours at 105°C)	
S_PSA v1	Coarse sand	Coarse sand: Sieve 0.2 – 2.0 mm	2Z2_CS	10	1.000	%	Soil: Particle size analysis	Oven dry (48 hours at 105°C)	
S_PSA v1	Fine sand	Fine sand: Sieve 0.02 – 0.2 mm	2Z2_FS	8	1.000	%	Soil: Particle size analysis	Oven dry (48 hours at 105°C)	
S_PSA v1	Silt	Silt: hydrometer 2 – 20 µm	2Z2_Silt	8	1.000	%	Soil: Particle size analysis	Oven dry (48 hours at 105°C)	

Analyses marked '*' are not NATA accredited

Analyses prefixed by 'X_' have been sub-contracted to an external laboratory listed in 'Method Description'.
The sub-contracted laboratory report will be sent as an attachment to this report.

The minimum Practic

Codes appearing in this report:

Key	Meaning
CO	Sample contaminated
DA	Sample damaged in transit
FL	Sample flocculated
IS	Insufficient sample
LS	Sample lost
NA	Not analysed
ND	Not detected
NR	Not received

Measurement of uncertainty is applicable between 10 times the PQL and 90% of the linear range

APPENDIX F – MEDLI OUTPUT

MEDLI REPORT - FULL RUN

Enterprise: **Kalbar**

Description:
Rural Enterprise Precinct

Client: **Kalfresh**

MEDLI User: PRECISE-LAP02\Main

Scenario Details:

DESCRIPTION

Climate Data: Kalbar, -27.95°, 152.62°

Run Period: 01/01/1889 to 31/12/2018 130 years, 0 days

Climate Statistics:

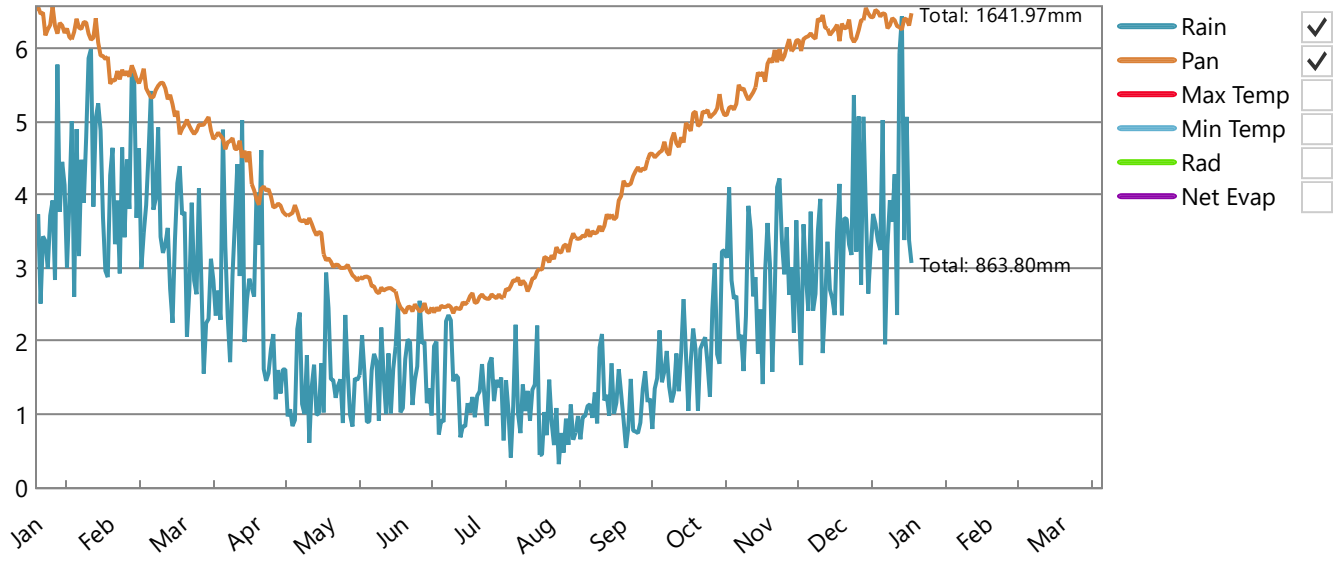
	5th Percentile	50th Percentile	95th Percentile
Rainfall (mm/year)	503	867	1219
Pan Evaporation (mm/year)	1483	1633	1804

Climate Data:

Chart Table

Monthly Daily

Daily Average Across Run Period

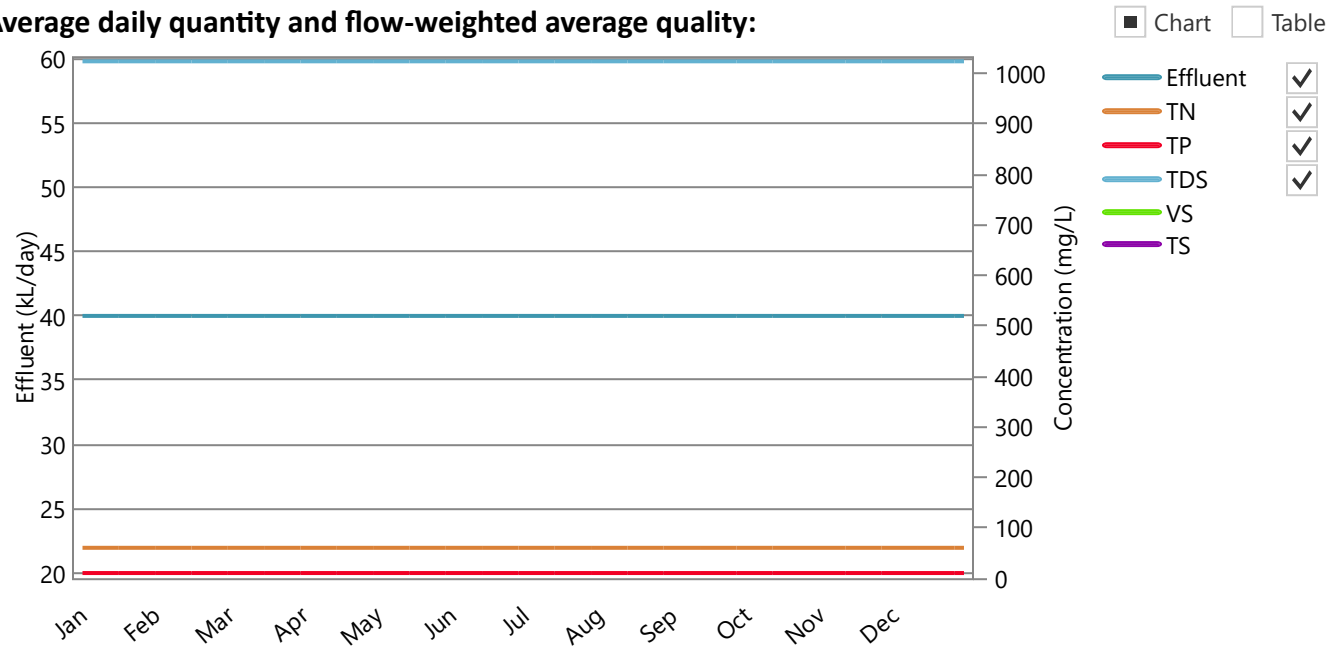


DESCRIPTION

Effluent type: New Generic System

Wastestream before any recycling or pretreatment

Average daily quantity and flow-weighted average quality:



Wastestream after any recycling and pretreatment if applicable

Effluent quantity: 14609.54 kL/year or 40.00 kL/day (Min-Max: 40.00 - 40.00)

Flow-weighted average (minimum - maximum) daily effluent quality entering pond system:

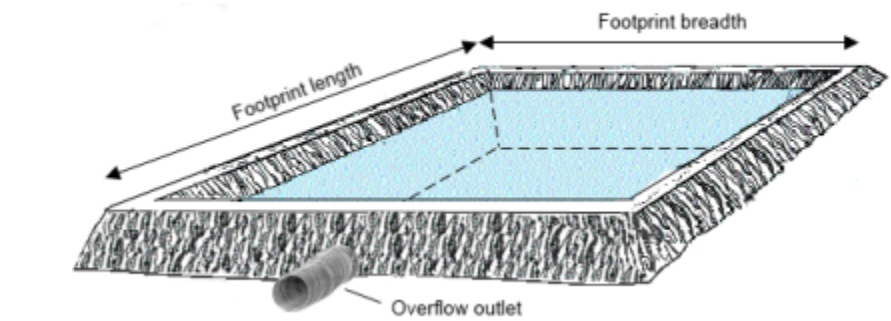
	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	60.00 (60.00 - 60.00)	876.57 (876.00 - 878.40)
Total Phosphorus	10.00 (10.00 - 10.00)	146.10 (146.00 - 146.40)
Total Dissolved Salts	1024.00 (1024.00 - 1024.00)	14960.17 (14950.40 - 14991.36)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

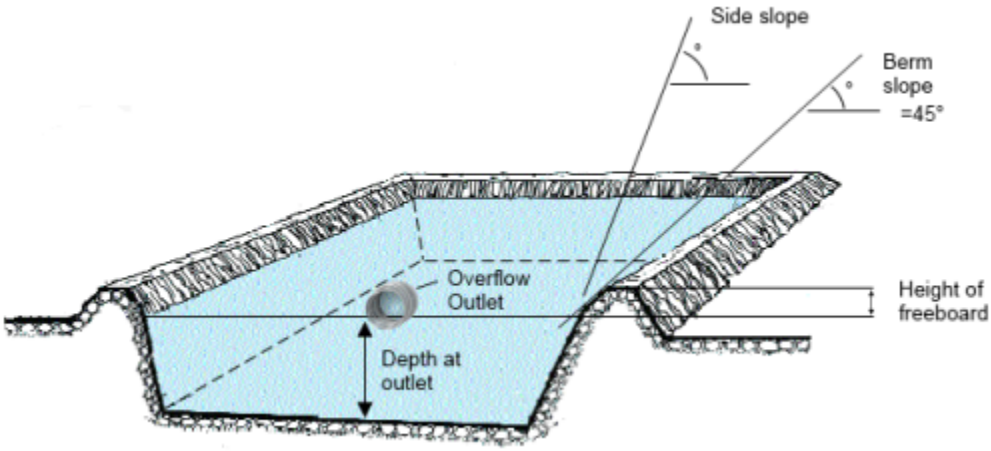
DESCRIPTION

Pond system: 1 closed storage tank

Pond system details:

	Pond 1
Maximum pond volume (kL)	200.00
Minimum allowable pond volume (kL)	0.00
Pond depth at overflow outlet (m)	6.00
Maximum water surface area (m2)	33.33
Pond footprint length (m)	5.77
Pond footprint width (m)	5.77
Pond catchment area (m2)	33.33
Average active volume (kL)	0.00





Irrigation pump limits:

Minimum pump rate limit (ML/day)	0.00
Maximum pump rate limit (ML/day)	1.00

Shandying water:

Annual allocation of fresh water available for shandying (kL/year)	0.00
Maximum rate of application of fresh water (ML/day)	0.00
Nitrogen concentration (mg/L)	0.00
Salinity (uS/cm)	0.00
Minimum shandy water is used	False

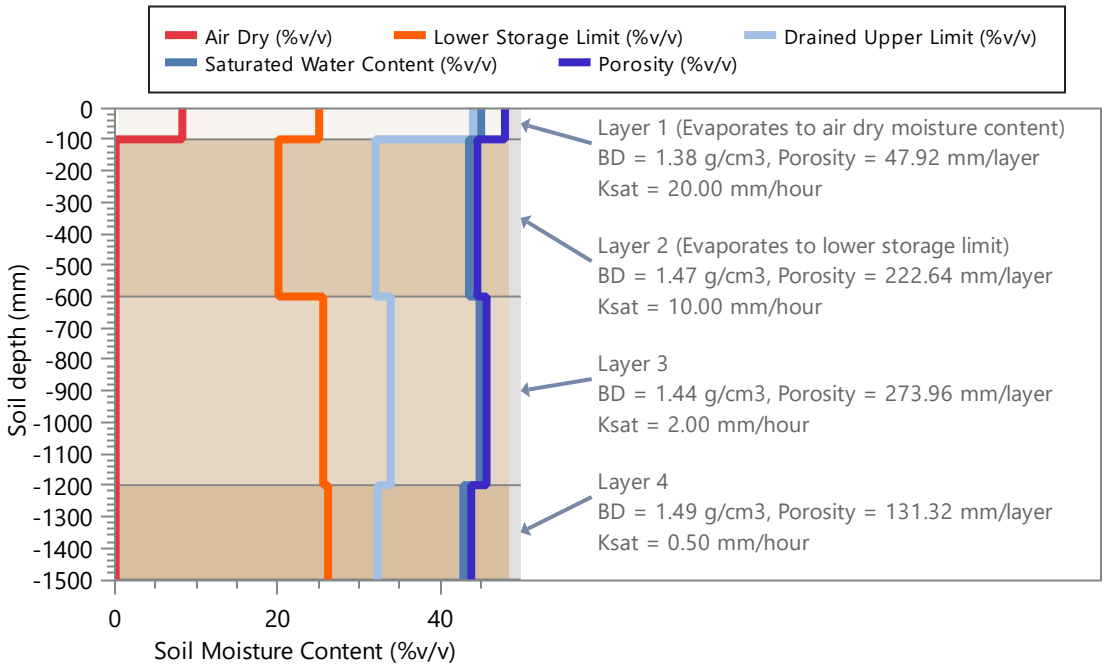
DESCRIPTION

Land: New Paddock

Area (ha): 2.00

Soil Type: Kalbar Low Permeability Red Brow, 1500.00 mm defined profile depth

Profile Porosity (mm)	675.85
Profile saturation water content (mm)	659.70
Profile drained upper limit (or field capacity) (mm)	504.30
Profile lower storage limit (or permanent wilting point) (mm)	357.80
Profile available water capacity (mm)	146.50
Profile limiting saturated hydraulic conductivity (mm/hour)	0.50
Surface saturated hydraulic conductivity (mm/hour)	20.00
Runoff curve number II (coefficient)	75.00
Soil evaporation U (mm)	10.00
Soil evaporation Cona (mm/sqrt day)	4.00



Plant Data: Continuous Lucerne (Winter Active) Pasture

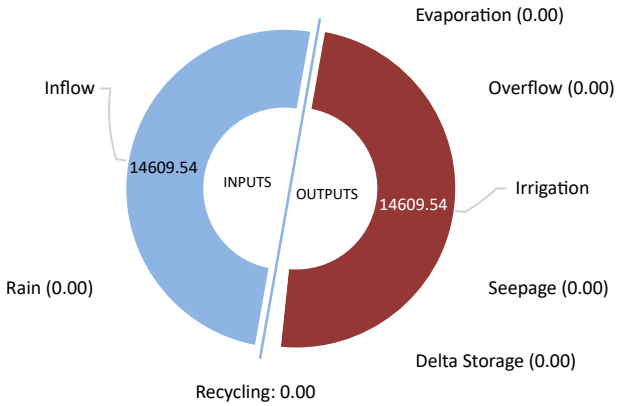
Average monthly cover (fraction) (minimum - maximum)	0.71 (0.70 - 0.71)
Maximum crop factor at 100% cover (mm/mm) (Maximum crop coefficient 0.9 x Pan coefficient 1)	0.90
Total plant cover (both green and dead) left after harvest (fraction)	0.75
Maximum potential root depth in defined soil profile (mm)	1500.00
Salt tolerance	Moderately sensitive
Salinity threshold EC sat. ext. (uS/cm)	1500.00
Proportion of yield decrease per dS/m increase (fraction/uS/cm)	0.00

PERFORMANCE

Pond System Water Performance - Overflow: 1 closed storage tank

Capacity of wet weather storage pond: **200 kL**

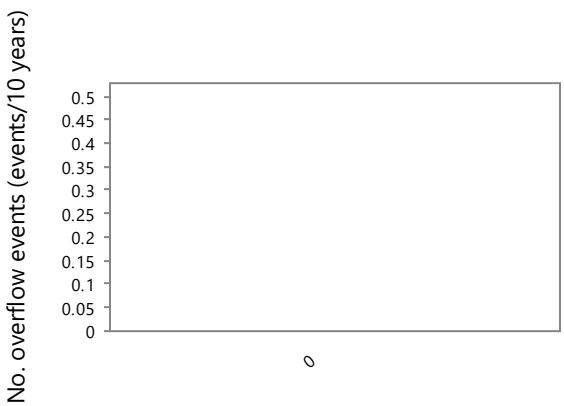
Pond System Water Balance (kL/year)



Name	Value
Rain	0.00
Inflow	14609.54
Recycling	0.00
Evaporation	0.00
Overflow	0.00
Irrigation	14609.54
Seepage	0.00
Delta Storage	0.00

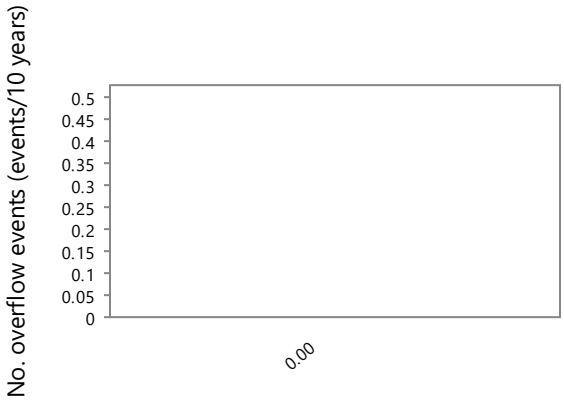
Overflow Diagnostics

Volume of overflow (kL/year)	0.00
No. days pond overflows (days/year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	1.00
Probability of at least 90% reuse (fraction)	1.00



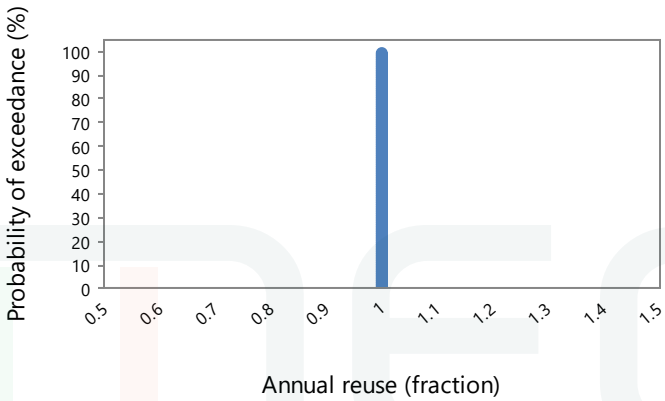
Overflow event duration exceeded (days)

Export plot



Overflow volume exceeded (kL)

Export plot



Annual reuse (fraction)

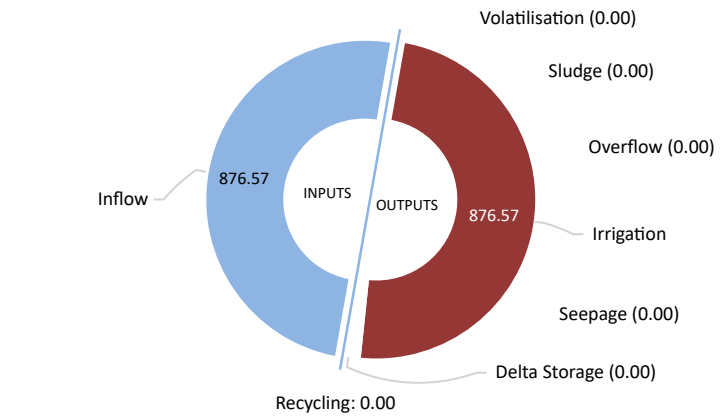
Export plot

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

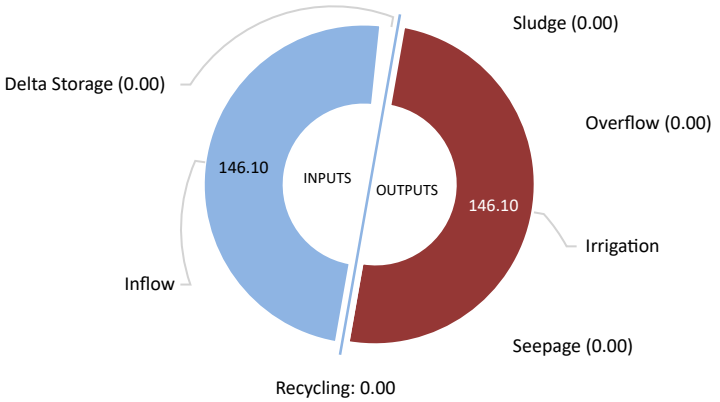
Pond System Nutrients and Salt Balance:

Nitrogen Balance (kg/year)



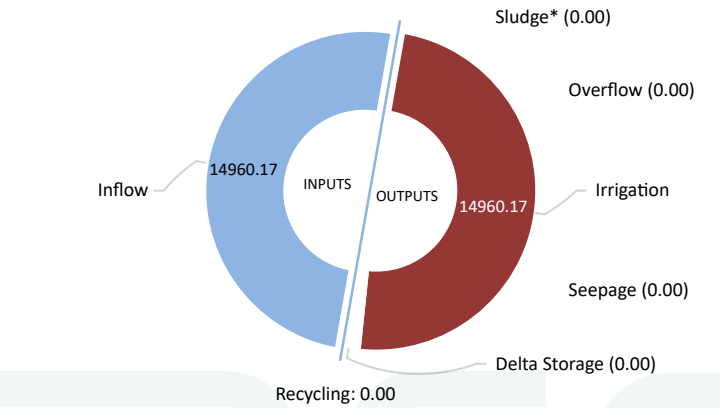
Name	Value
Inflow	876.57
Recycling	0.00
Volatilisation	0.00
Sludge	0.00
Overflow	0.00
Irrigation	876.57
Seepage	0.00
Delta Storage	0.00

Phosphorus Balance (kg/year)



Name	Value
Inflow	146.10
Recycling	0.00
Sludge	0.00
Overflow	0.00
Irrigation	146.10
Seepage	0.00
Delta Storage	0.00

Salt Balance (kg/year)



Name	Value
Inflow	14960.17
Recycling	0.00
Sludge*	0.00
Overflow	0.00
Irrigation	14960.17
Seepage	0.00
Delta Storage	0.00

* Salt removal in sludge is not calculated from the pond salt balance. However if salt could be assumed to be present in the sludge at the same concentration as in the pond supernatant (up to a maximum of salt added in inflow) - then salt accumulation in the sludge could be 0.00 kg/year

Pond System Sludge Accumulation: 0.00 kg dwt/year

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

Pond Nutrient Concentrations and Salinity:

Average across simulation period	Pond 1
Average nitrogen concentration of pond liquid (mg/L)	60.00
Average phosphorus concentration of pond liquid (mg/L)	10.00
Average salinity of pond liquid (uS/cm)	1600.00

Value on final day of simulation period	Pond 1
Final nitrogen concentration of pond liquid (mg/L)	N.D.*
Final phosphorus concentration of pond liquid (mg/L)	N.D.*
Final salinity of pond liquid (uS/cm)	N.D.*

* Not determined. Pond is empty.

PERFORMANCE

Irrigation Performance:

Water Use: (assumes 100% Irrigation Efficiency)

Pond water irrigated (kL/year)	14609.54
Average Shandy water irrigation (kL/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Total water irrigated (kL/year)	14609.54
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Proportion of years shandying water allocation of 0 kL/year is exceeded (fraction of years)	0.00
Average exceedance as a proportion of annual shandy water allocation (fraction of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)

Irrigation Quality:

Average nitrogen concentration of irrigation water - before ammonia loss during irrigation (mg/L)	60.00
Average nitrogen concentration of irrigation water - after ammonia loss during irrigation (mg/L)	60.00
Average phosphorus concentration of irrigation water (mg/L)	10.00
Average salinity of irrigation water (uS/cm)	1600.00

Irrigation Diagnostics:

Proportion of Days irrigation occurs (fraction)	1.00

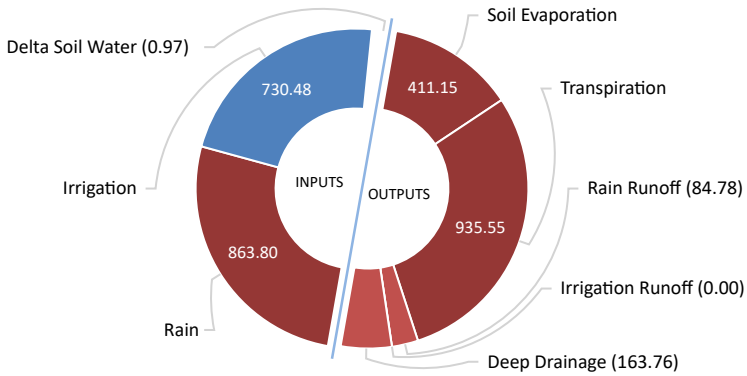
PERFORMANCE

Land Performance - Soil Water

Paddock: New Paddock, 2 ha
Soil Type: Kalbar Low Permeability Red Brow, 146.50 mm PAWC at maximum root depth

Land Water Balance (mm/year):

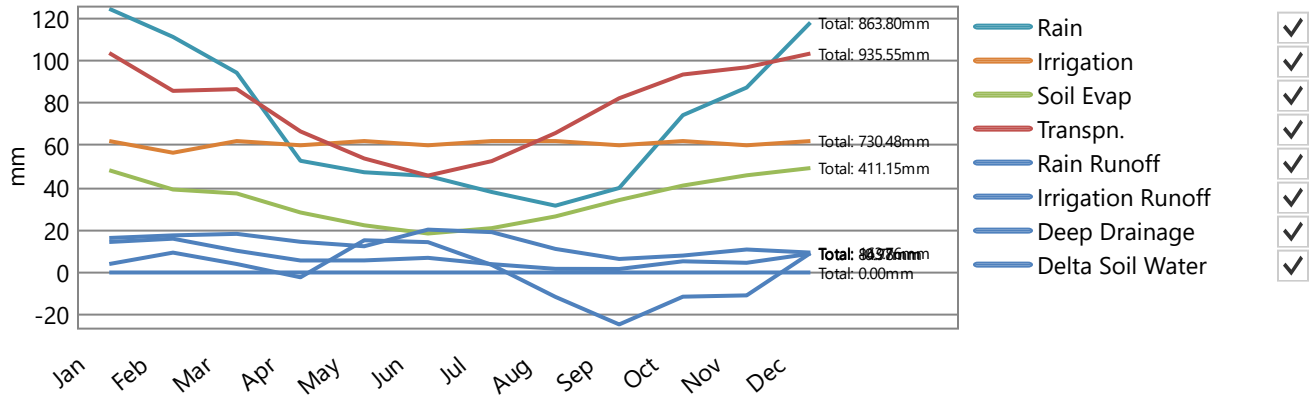
mm/year % Total inputs



Name	Value
Rain	863.80
Irrigation	730.48
Soil Evaporation	411.15
Transpiration	935.55
Rain Runoff	84.78
Irrigation Runoff	0.00
Deep Drainage	163.76
Delta Soil Water	-0.97

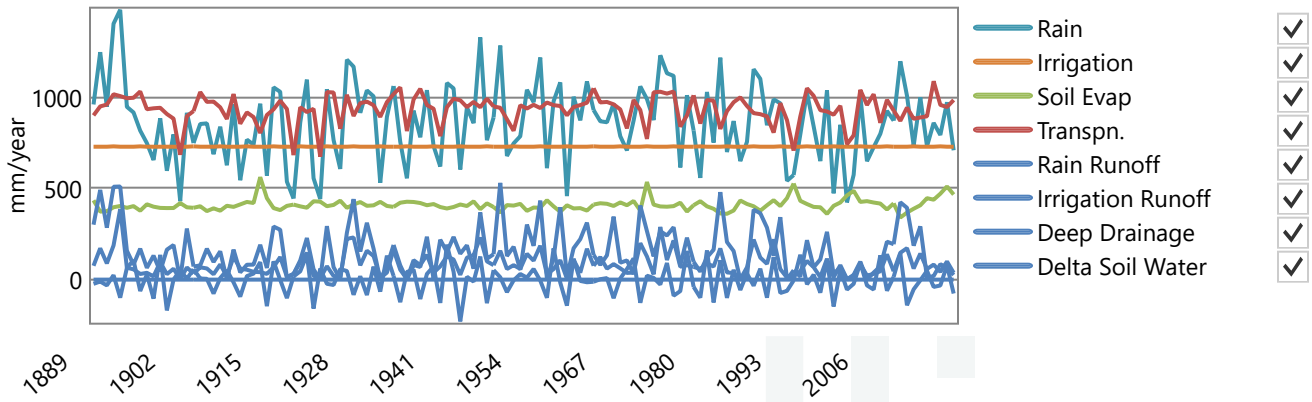
Average Monthly Totals (mm):

Chart Table



Average Annual Totals (mm/year):

Chart Table



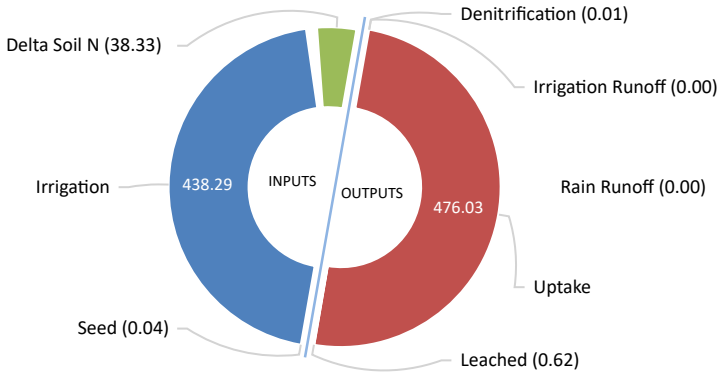
PERFORMANCE

Land Performance - Soil Nutrient

Paddock: New Paddock, 2 ha **Soil Type**: Kalbar Low Permeability Red Brow

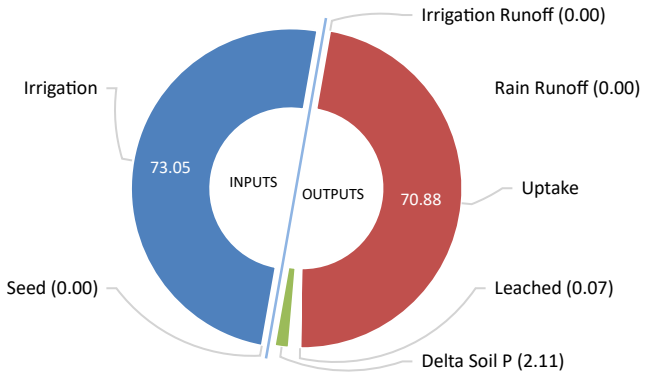
Irrigation ammonium volatilisation losses (kg/ha/year): 0.00
Proportion of total nitrogen in irrigated effluent as ammonium (fraction): 0.00

Land Nitrogen Balance (kg/ha/year)



Name	Value
Seed	0.04
Irrigation	438.29
Denitrification	0.01
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	476.03
Leached	0.62
Delta Soil N	-38.33

Land Phosphorus Balance (kg/ha/year)



Name	Value
Seed	4.15E-03
Irrigation	73.05
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	70.88
Leached	0.07
Delta Soil P	2.11

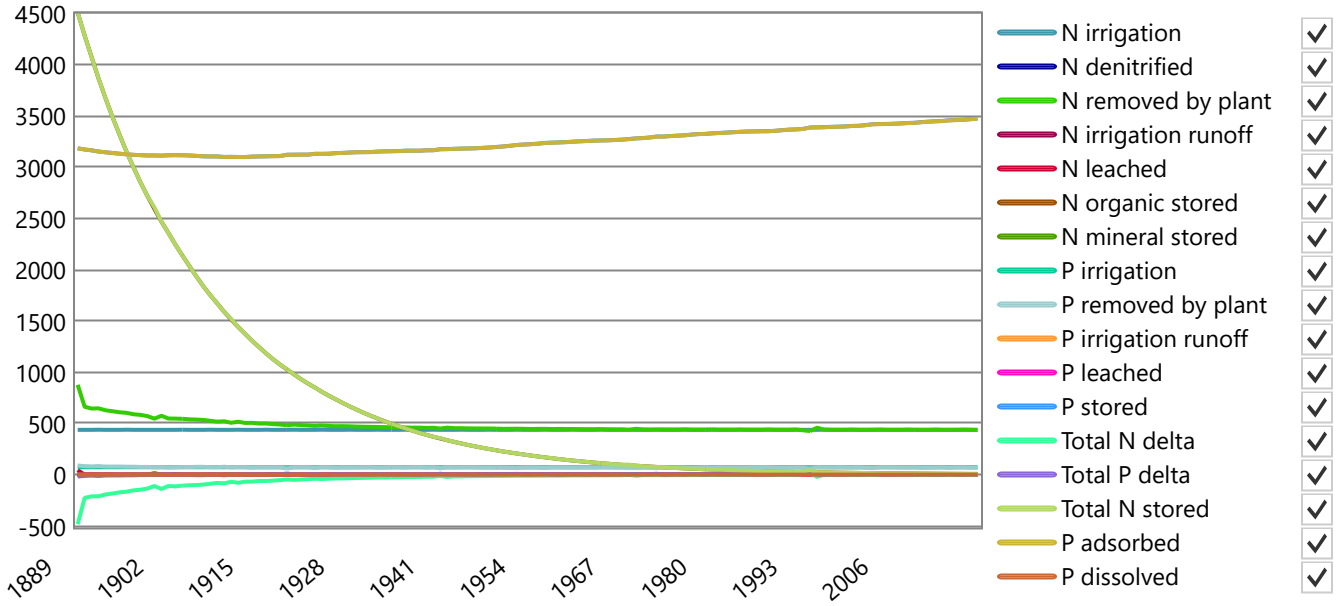
PERFORMANCE

Land Performance - Soil Nutrient

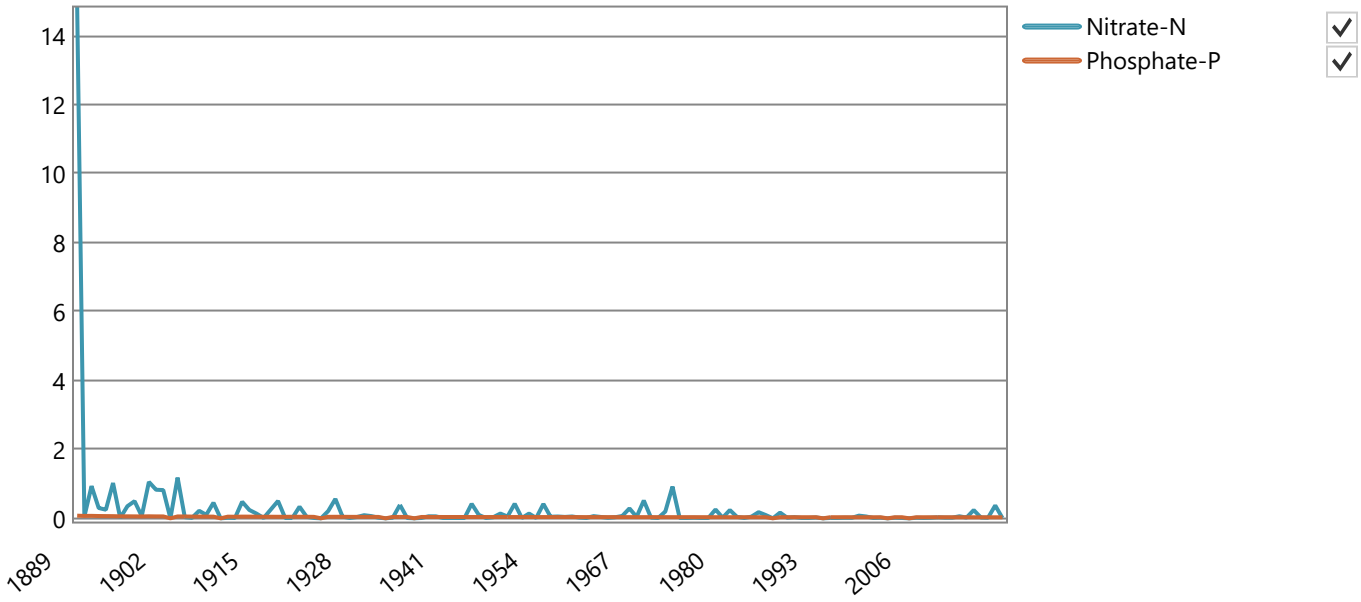
Paddock: New Paddock, 2 ha

Soil Type: Kalbar Low Permeability Red Brow

Annual Nutrient Totals (kg/ha):



Annual Nutrient Leaching Concentration (mg/L):



PERFORMANCE

Plant Performance and Nutrients

Paddock: New Paddock, 2 ha

Soil Type: Kalbar Low Permeability Red Brow

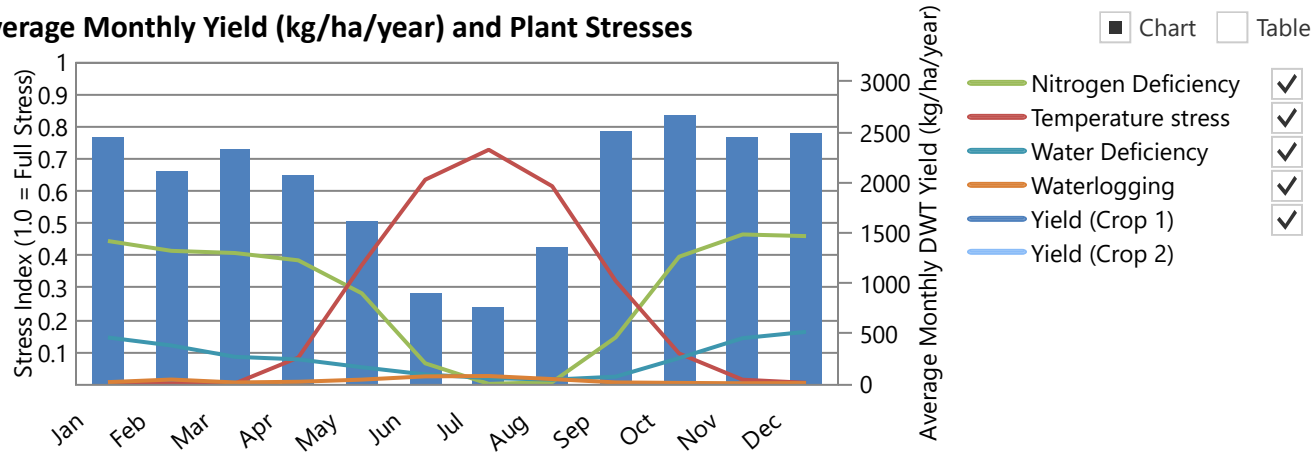
Plant: Continuous Lucerne (Winter Active) Pasture

Average annual shoot dry matter yield (kg/ha/year)	23697.39 (19783.96 - 31776.25)
Average monthly plant (green) cover (fraction) (minimum - maximum)	0.71 (0.70 - 0.71)
Average monthly root depth (mm) (minimum - maximum)	1492.41 (1479.69 - 1500.00)

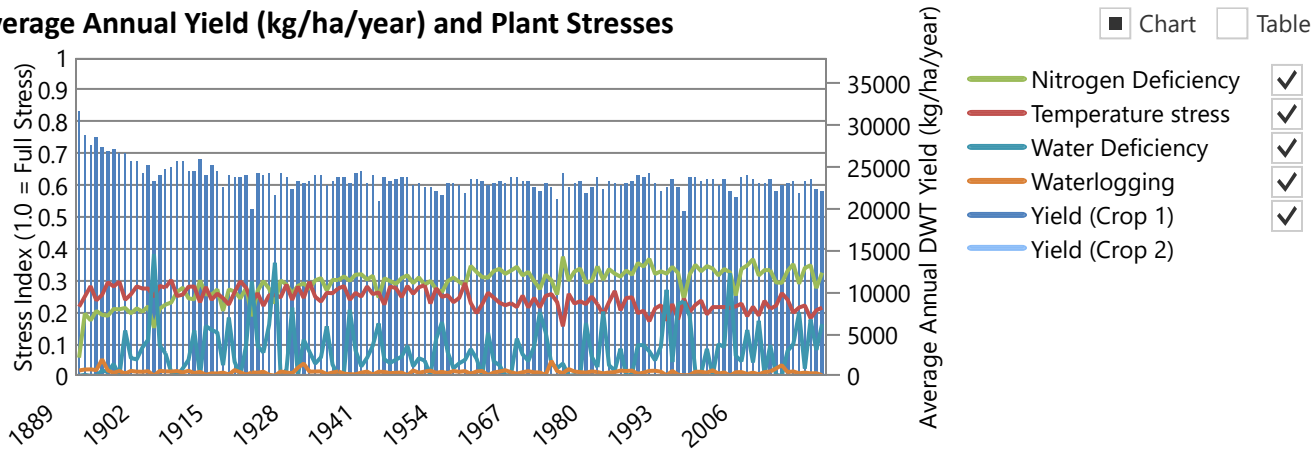
Nutrient Uptake (minimum - maximum):

Average annual net nitrogen removed by plant uptake (kg/ha/year)	476.03 (426.39 - 877.09)
Average annual net phosphorus removed by plant uptake (kg/ha/year)	70.88 (59.05 - 90.03)
Average annual shoot nitrogen concentration (fraction dwt)	0.02 (0.02 - 0.03)
Average annual shoot phosphorus concentration (fraction dwt)	0.003 (0.003 - 0.003)

Average Monthly Yield (kg/ha/year) and Plant Stresses



Average Annual Yield (kg/ha/year) and Plant Stresses



No. of harvests/year: 12.83 (normal), 0.04 (forced by crop death due to frosting (0.02), water stress (0.02))
No. days without crop/year (days/year): 0.19 due to frosting (0.05), water stress (0.15)

PERFORMANCE

Land Performance

Paddock: New Paddock, 2 ha **Soil Type**: Kalbar Low Permeability Red Brow

Plant: Continuous Lucerne (Winter Active) Pasture

Salt tolerance	Moderately sensitive
Salinity threshold EC sat. ext. (uS/cm)	1500.00
Proportion of yield decrease per dS/m increase (fraction/uS/cm)	0.00
No. years assumed for leaching to reach steady-state (years)	10.00

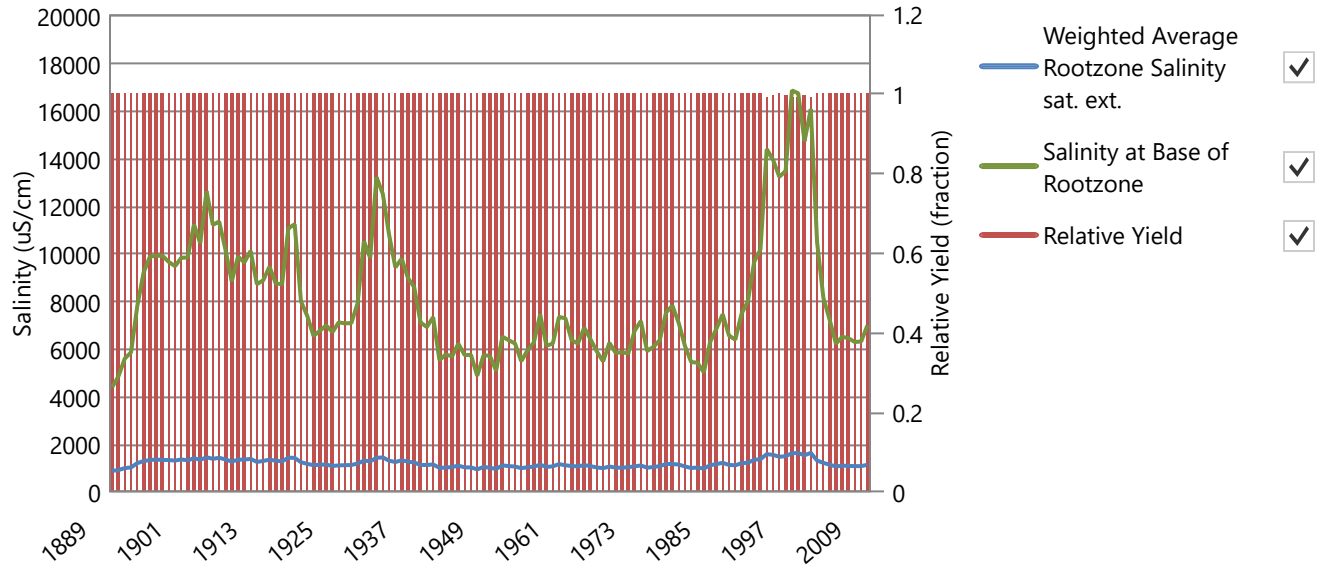
Soil Salinity:

Salinity of infiltrated water (Average salinity of rainwater = 0.03 dS/m) (uS/cm)	794.11
Salt added by rainfall (kg/ha/year)	149.57
Average annual effluent salt added & leached at steady state (kg/ha/year)	7629.66
Average leaching fraction based on 10 year running averages (fraction)	0.30
Average water-uptake-weighted rootzone salinity sat. ext. (uS/cm)	1213.62
Salinity of the soil solution (at drained upper limit) at base of rootzone (uS/cm)	8150.45
Relative crop yield expected due to salinity (fraction)	1.00
Proportion of years that crop yields would be expected to fall below 90% of potential due to salinity (fraction)	0.00

Average Annual Rootzone Salinity and Relative Yield:

Chart Table

All values based on 10 year running averages



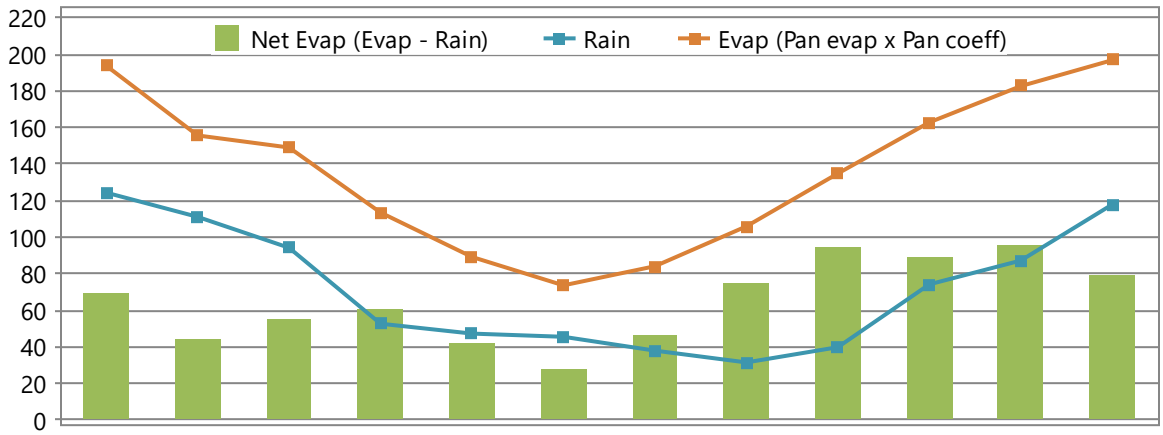
DIAGNOSTICS

Sustainability Diagnostics: Kalbar

Averaged Historical Climate Data Used in Simulation (mm)

Location: Kalbar, -27.95°, 152.62°

Run Period: 01/01/1889 to 31/12/2018 130 years, 0 days



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	124.4	111.1	94.2	52.7	47.3	45.5	38.0	31.5	39.8	74.2	87.2	117.9	863.8
Evap	193.8	155.6	149.0	113.5	89.2	73.7	84.1	105.9	134.8	162.8	182.6	196.8	1642.0
Net Evap	69.4	44.5	54.8	60.8	41.9	28.1	46.2	74.4	95.0	88.6	95.4	78.9	778.2
Net Evap/day	2.2	1.6	1.8	2.0	1.4	0.9	1.5	2.4	3.2	2.9	3.2	2.5	2.1

DIAGNOSTICS

Sustainability Diagnostics: Kalbar

Pond System: 1 closed storage tank

New Generic System - 14609.54 kL/year or 40.00 kL/day generated on average

Effluent entering pond system after any pretreatment and recycling

Average (Minimum-Maximum) influent quality calculated for 365.24 non-zero flow days, after any pretreatment and recycling.

Constituent	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	60.00 (60.00 - 60.00)	876.57 (876.00 - 878.40)
Total Phosphorus	10.00 (10.00 - 10.00)	146.10 (146.00 - 146.40)
Total Dissolved Salts	1024.00 (1024.00 - 1024.00)	14960.17 (14950.40 - 14991.36)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

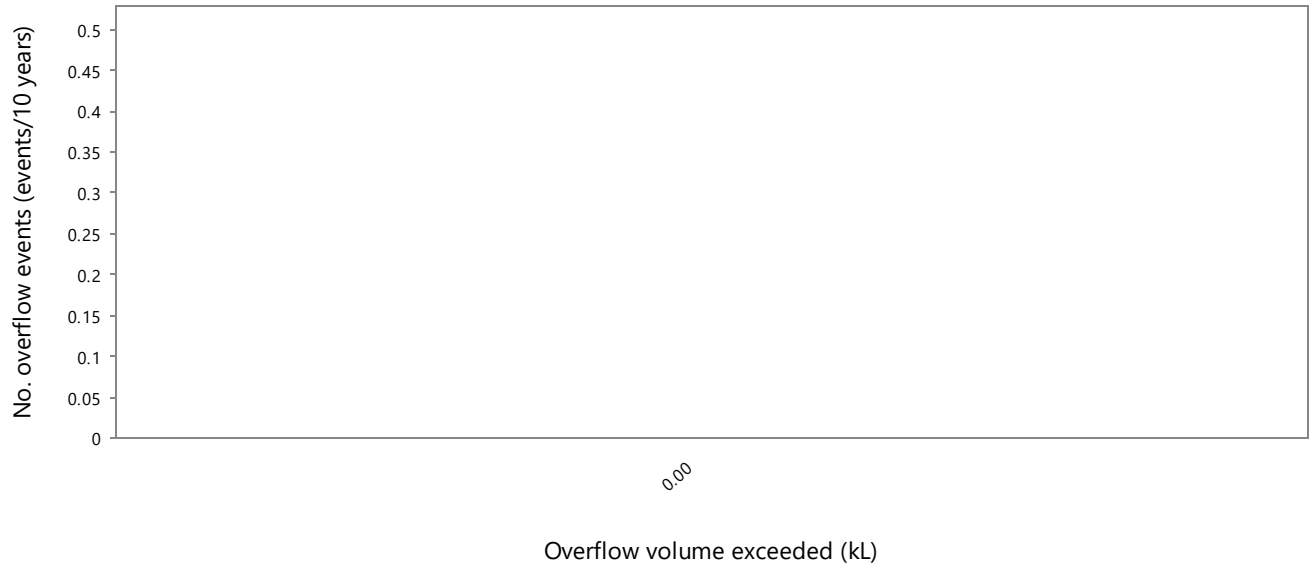
Last pond (Wet weather store): 200.00 kL

Theoretical hydraulic retention time (days)	5.00
Average volume of overflow (kL/year)	0.00
No. overflow events per year exceeding threshold* of 0.03 kL (no./year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	1.00
Probability of at least 90% effluent reuse (fraction)	1.00
Average salinity of last pond (uS/cm)	1600.00
Salinity of last pond on final day of simulation (uS/cm)	1600.00
Ammonia loss from pond system water area (kg/m2/year)	0.00

* The threshold is the volume equivalent to the top 1 mm depth of water of a full pond

Overflow exceedance:

Chart Table



Export plot

DIAGNOSTICS

Sustainability Diagnostics: Kalbar

Irrigation Information

Irrigation: 2 ha total area (assumed 100% irrigation efficiency)

	Quantity/year	Quantity/ha/year
Total irrigation applied (kL)	14609.54	7304.77
Total nitrogen applied (kg)	876.57	438.29
Total phosphorus applied (kg)	146.10	73.05
Total salts applied (kg)	14960.17	7480.08

Shandying

Annual allocation of fresh water for shandying (kL/year)	0.00
Average Shandy water irrigation (kL/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Average exceedance as a proportion of annual shandy water allocation (% of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Minimum shandy water is used	False

Irrigation Issues

Proportion of Days irrigation occurs (fraction)	1.00

DIAGNOSTICS

Sustainability Diagnostics: Kalbar

Paddock Land: New Paddock: 2 ha

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Irrigation triggered every 1 days
Irrigate a fixed amount of 5.00 mm each day
Irrigation window from 1/1 to 31/12 including the days specified
A minimum of 0 days must be skipped between irrigation events

Soil Water Balance (mm): Kalbar Low Permeability Red Brow, 146.50 mm PAWC at maximum root depth

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	124.4	111.1	94.2	52.7	47.3	45.5	38.0	31.5	39.8	74.2	87.2	117.9	863.8
Irrigation	62.0	56.5	62.0	60.0	62.0	60.0	62.0	62.0	60.0	62.0	60.0	62.0	730.5
Soil Evap	48.2	39.1	37.3	28.3	22.3	18.4	20.9	26.4	34.2	41.0	45.8	49.3	411.2
Transpn.	103.5	85.7	86.5	66.5	53.8	45.7	52.5	65.8	82.2	93.4	96.8	103.3	935.6
Rain Runoff	14.4	15.9	10.2	5.7	5.7	6.9	3.9	1.7	1.6	5.3	4.6	8.9	84.8
Irr. Runoff	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Drainage	16.3	17.5	18.2	14.5	12.4	20.2	19.0	11.1	6.4	8.0	10.8	9.4	163.8
Delta	4.0	9.4	4.0	-2.3	15.2	14.3	3.6	-11.5	-24.5	-11.4	-10.8	9.1	-1.0

Soil Nitrogen Balance

Average annual effluent nitrogen added (kg/ha/year)	438.29
Average annual soil nitrogen removed by plant uptake (kg/ha/year)	476.03
Average annual soil nitrogen removed by denitrification (kg/ha/year)	0.01
Average annual soil nitrogen leached (kg/ha/year)	0.62
Average annual nitrate-N loading to groundwater (kg/ha/year)	0.62
Soil organic-N kg/ha (Initial - Final)	4752.00 - 7.56
	240.24 - 1.24
Average nitrate-N concentration of deep drainage (mg/L)	0.38
Max. annual nitrate-N concentration of deep drainage (mg/L)	14.84

Soil Phosphorus Balance

Average annual effluent phosphorus added (kg/ha/year)	73.05
Average annual soil phosphorus removed by plant uptake (kg/ha/year)	70.88
Average annual soil phosphorus leached (kg/ha/year)	0.07
Dissolved phosphorus (kg/ha) (Initial - Final)	0.50 - 1.16
Adsorbed phosphorus (kg/ha) (Initial - Final)	3201.01 - 3474.12
Average phosphate-P concentration in rootzone (mg/L)	0.18
Average phosphate-P concentration of deep drainage (mg/L)	0.04
Max. annual phosphate-P concentration of deep drainage (mg/L)	0.08
Design soil profile storage life based on average infiltrated water phosphorus concn. of 4.84 mg/L (years)	59.62

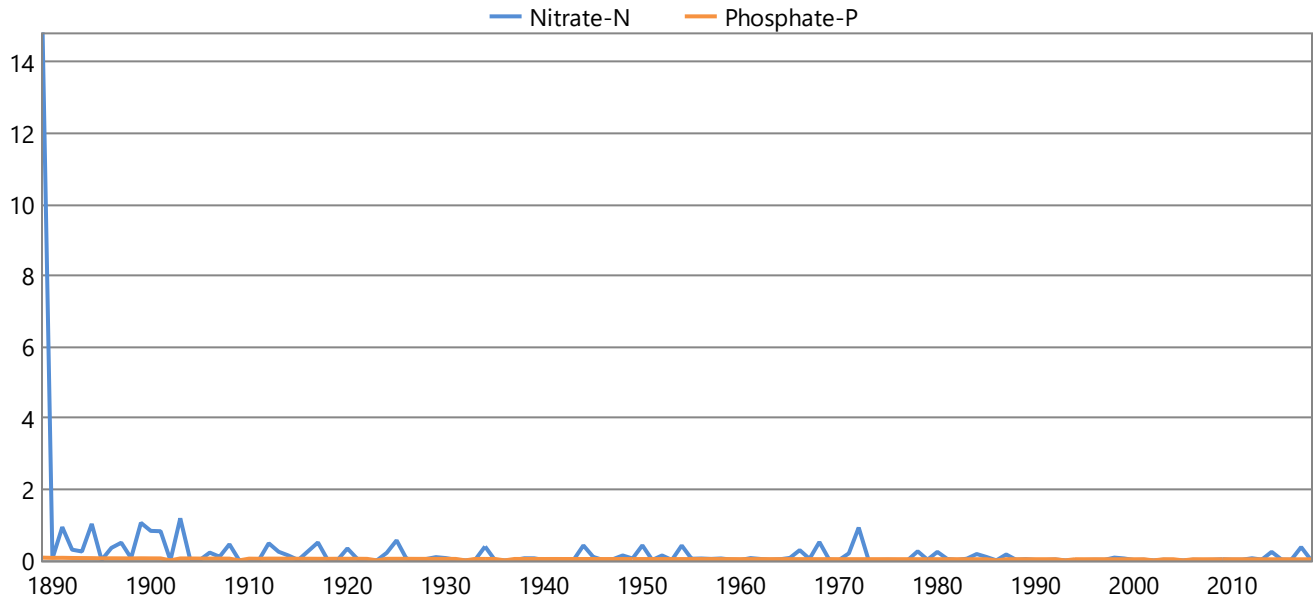
DIAGNOSTICS

Sustainability Diagnostics: Kalbar

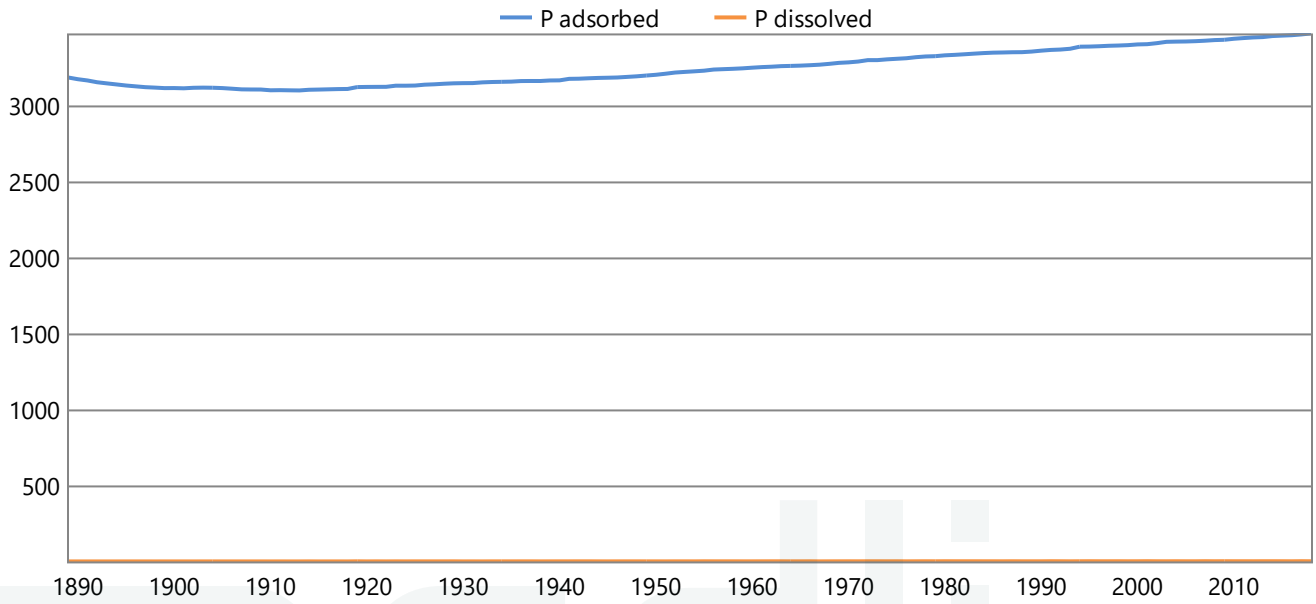
Paddock Land: New Paddock: 2 ha

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Annual nutrient leachate concentration (mg/L)



Annual Phosphate-P in soil (kg/ha)



DIAGNOSTICS

Sustainability Diagnostics: Kalbar

Paddock Plant Performance: New Paddock: 2 ha

Average Plant Performance (Minimum - Maximum): Continuous Lucerne (Winter Active) Pasture

Average annual shoot dry matter yield (kg/ha/year)	23697.39 (19783.96 - 31776.25)
Average monthly plant (green) cover (fraction)	0.71 (0.70 - 0.71)
Average monthly crop factor (fraction)	0.64 (0.63 - 0.64)
Total plant cover (both green and dead) left after harvest (fraction)	0.75
Average monthly root depth (mm)	1492.41 (1479.69 - 1500.00)
Average number of normal harvests per year (no./year)	12.83 (10.00 - 16.00)
Average number of normal harvests for last five years only (no./year)	12.20
Average number of crop deaths per year (no./year)	0.04 (0.00 - 1.00)
Average number of crop deaths for last five years only (no./year)	0.20
Average annual nitrogen deficiency index (0 = no stress, 1 = full stress) (coefficient)	0.29 (0.06 - 0.37)
Average January temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.01 (0.00 - 0.06)
Average July temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.73 (0.37 - 0.94)
Average monthly water stress index (0 = no stress, 1 = full stress) (coefficient)	0.08 (0.02 - 0.16)
Average monthly waterlogging index (0 = no stress, 1 = full stress) (coefficient)	0.01 (0.00 - 0.03)
No. days without crop/year (days)	0.19

Soil Salinity - Plant salinity tolerance: Moderately sensitive

Assumes 1.0 dS/m Electrical Conductivity = 640 mg/L Total Dissolved Salts

All values based on 10 year running averages

Salinity of infiltrated water (Average salinity of rainwater = 0.03 dS/m) (uS/cm)	794.11
Salt added by rainfall (kg/ha/year)	149.57
Average annual effluent salt added & leached at steady state (kg/ha/year)	7629.66
Average leaching fraction based on 10 year running averages (fraction)	0.30
Average water-uptake-weighted rootzone salinity sat. ext. (uS/cm)	1213.62
Salinity of the soil solution (at drained upper limit) at base of rootzone (uS/cm)	8150.45
Relative crop yield expected due to salinity (fraction)	1.00
Proportion of years that crop yields would be expected to fall below 90% of potential due to salinity (fraction)	0.00

DIAGNOSTICS

Run Messages

Messages generated when the scenario was run:

Full run chosen

MEDLI REPORT - FULL RUN

Enterprise: **Kalbar**

Description:
Rural Enterprise Precinct

Client: **Kalfresh**

MEDLI User: PRECISE-LAP02\Main

Scenario Details:

DESCRIPTION

Climate Data: Kalbar, -27.95°, 152.62°

Run Period: 01/01/1889 to 31/12/2018 130 years, 0 days

Climate Statistics:

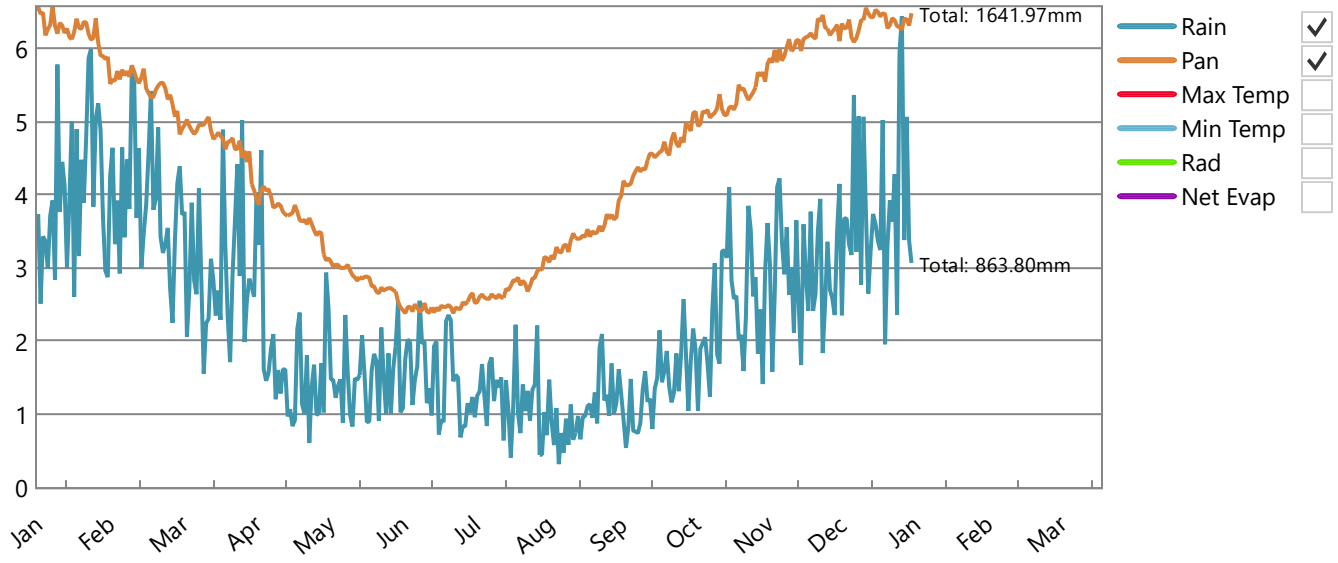
	5th Percentile	50th Percentile	95th Percentile
Rainfall (mm/year)	503	867	1219
Pan Evaporation (mm/year)	1483	1633	1804

Climate Data:

Chart Table

Monthly Daily

Daily Average Across Run Period

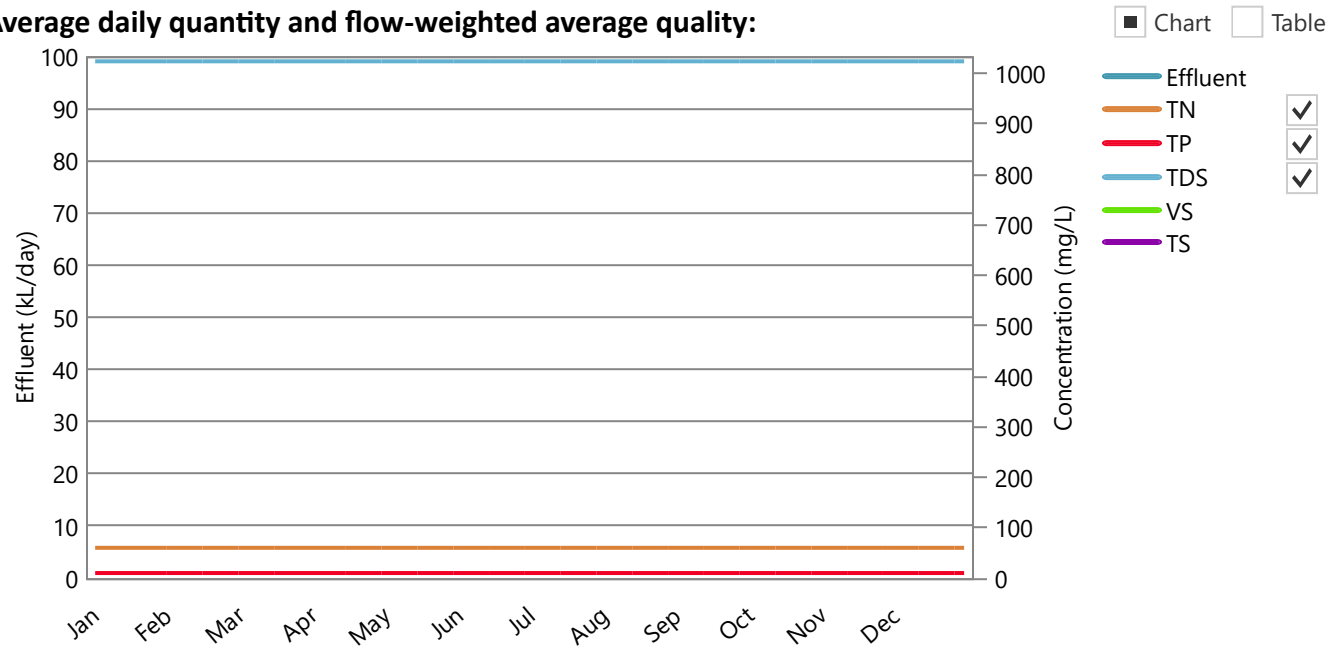


DESCRIPTION

Effluent type: New Generic System

Wastestream before any recycling or pretreatment

Average daily quantity and flow-weighted average quality:



Wastestream after any recycling and pretreatment if applicable

Effluent quantity: 0.00 kL/year or 0.00 kL/day (Min-Max: 0.00 - 0.00)

Flow-weighted average (minimum - maximum) daily effluent quality entering pond system:

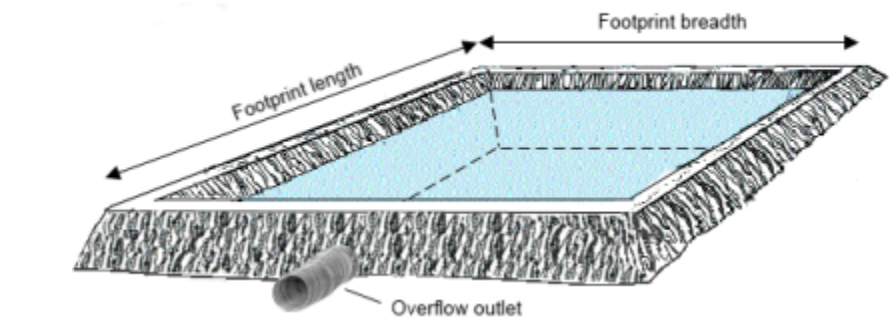
	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Phosphorus	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Dissolved Salts	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

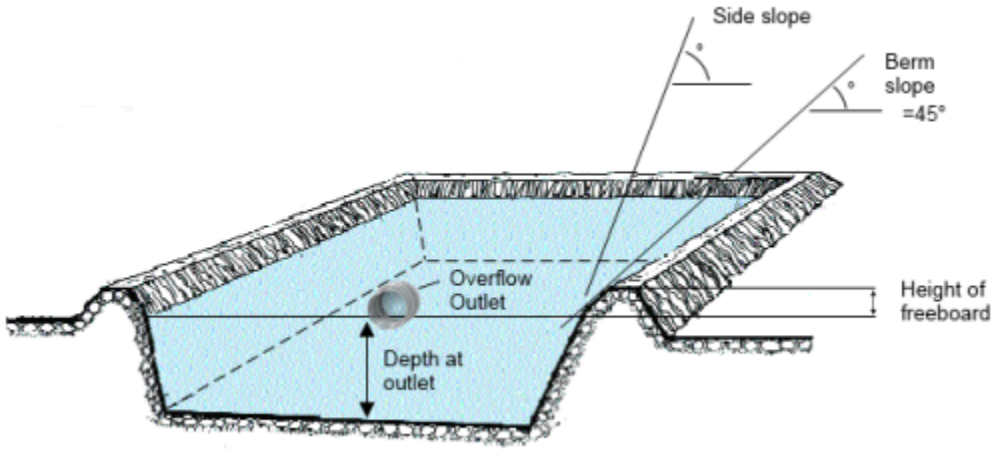
DESCRIPTION

Pond system: 1 closed storage tank

Pond system details:

	Pond 1
Maximum pond volume (kL)	200.00
Minimum allowable pond volume (kL)	0.00
Pond depth at overflow outlet (m)	6.00
Maximum water surface area (m2)	33.33
Pond footprint length (m)	5.77
Pond footprint width (m)	5.77
Pond catchment area (m2)	33.33
Average active volume (kL)	0.00





Irrigation pump limits:

Minimum pump rate limit (ML/day)	0.00
Maximum pump rate limit (ML/day)	1.00

Shandying water:

Annual allocation of fresh water available for shandying (kL/year)	0.00
Maximum rate of application of fresh water (ML/day)	0.00
Nitrogen concentration (mg/L)	0.00
Salinity (uS/cm)	0.00
Minimum shandy water is used	False

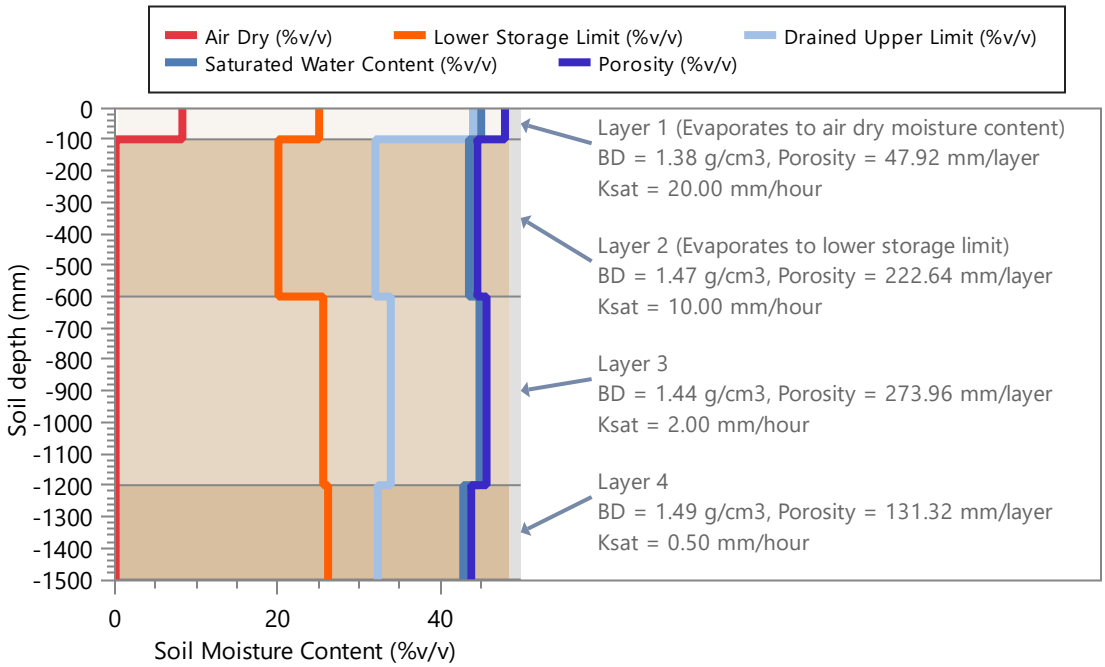
DESCRIPTION

Land: New Paddock

Area (ha): 2.00

Soil Type: Kalbar Low Permeability Red Brow, 1500.00 mm defined profile depth

Profile Porosity (mm)	675.85
Profile saturation water content (mm)	659.70
Profile drained upper limit (or field capacity) (mm)	504.30
Profile lower storage limit (or permanent wilting point) (mm)	357.80
Profile available water capacity (mm)	146.50
Profile limiting saturated hydraulic conductivity (mm/hour)	0.50
Surface saturated hydraulic conductivity (mm/hour)	20.00
Runoff curve number II (coefficient)	75.00
Soil evaporation U (mm)	10.00
Soil evaporation Cona (mm/sqrt day)	4.00



Plant Data: Continuous Lucerne (Winter Active) Pasture

Average monthly cover (fraction) (minimum - maximum)	0.36 (0.25 - 0.46)
Maximum crop factor at 100% cover (mm/mm) (Maximum crop coefficient 0.9 x Pan coefficient 1)	0.90
Total plant cover (both green and dead) left after harvest (fraction)	0.75
Maximum potential root depth in defined soil profile (mm)	1500.00
Salt tolerance	Moderately sensitive
Salinity threshold EC sat. ext. (uS/cm)	1500.00
Proportion of yield decrease per dS/m increase (fraction/uS/cm)	0.00

PERFORMANCE

Pond System Water Performance - Overflow: 1 closed storage tank

Capacity of wet weather storage pond: **200 kL**

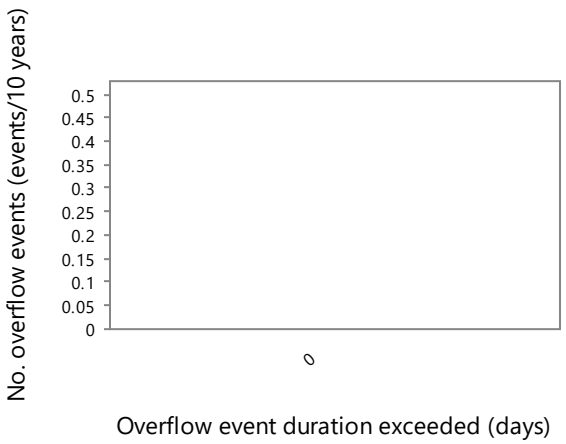
Pond System Water Balance (kL/year)

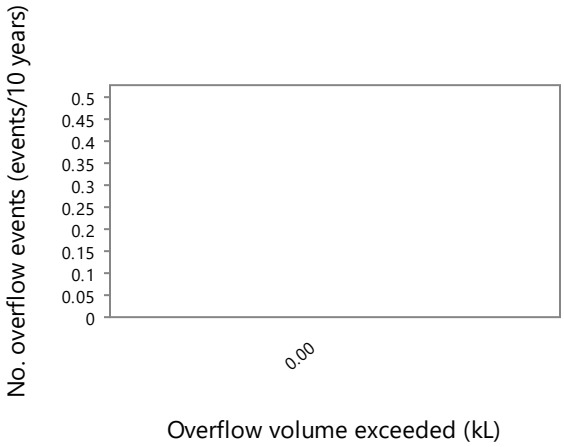
(no data available)

Name	Value
Rain	0.00
Inflow	0.00
Recycling	0.00
Evaporation	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

Overflow Diagnostics

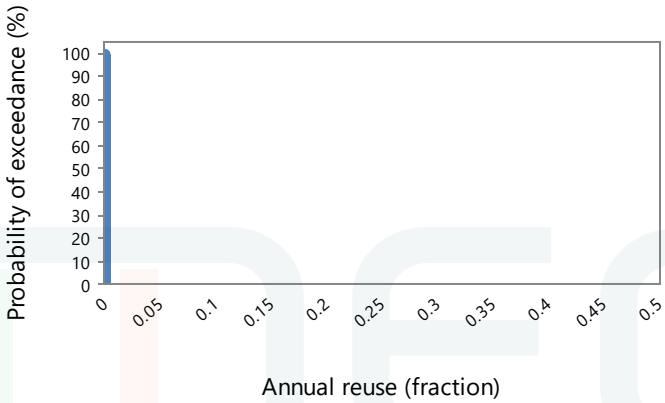
Volume of overflow (kL/year)	0.00
No. days pond overflows (days/year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	0.00
Probability of at least 90% reuse (fraction)	0.00





Export plot

Export plot



Export plot

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

Pond System Nutrients and Salt Balance:

Nitrogen Balance (kg/year)

(no data available)

Name	Value
Inflow	0.00
Recycling	0.00
Volatilisation	0.00
Sludge	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

Phosphorus Balance (kg/year)

(no data available)

Name	Value
Inflow	0.00
Recycling	0.00
Sludge	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

Salt Balance (kg/year)

(no data available)

Name	Value
Inflow	0.00
Recycling	0.00
Sludge*	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

* Salt removal in sludge is not calculated from the pond salt balance. However if salt could be assumed to be present in the sludge at the same concentration as in the pond supernatant (up to a maximum of salt added in inflow) - then salt accumulation in the sludge could be 0.00 kg/year

Pond System Sludge Accumulation: 0.00 kg dwt/year

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

Pond Nutrient Concentrations and Salinity:

Average across simulation period	Pond 1
Average nitrogen concentration of pond liquid (mg/L)	0.00
Average phosphorus concentration of pond liquid (mg/L)	0.00
Average salinity of pond liquid (uS/cm)	0.00

Value on final day of simulation period	Pond 1
Final nitrogen concentration of pond liquid (mg/L)	N.D.*
Final phosphorus concentration of pond liquid (mg/L)	N.D.*
Final salinity of pond liquid (uS/cm)	N.D.*

* Not determined. Pond is empty.

PERFORMANCE

Irrigation Performance:

Water Use: (assumes 100% Irrigation Efficiency)

Pond water irrigated (kL/year)	0.00
Average Shandy water irrigation (kL/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Total water irrigated (kL/year)	0.00
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Proportion of years shandying water allocation of 0 kL/year is exceeded (fraction of years)	0.00
Average exceedance as a proportion of annual shandy water allocation (fraction of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)

Irrigation Quality:

Average nitrogen concentration of irrigation water - before ammonia loss during irrigation (mg/L)	0.00
Average nitrogen concentration of irrigation water - after ammonia loss during irrigation (mg/L)	0.00
Average phosphorus concentration of irrigation water (mg/L)	0.00
Average salinity of irrigation water (uS/cm)	0.00

Irrigation Diagnostics (No effluent irrigation occurred!):

Proportion of Days pond volume below min. vol. for irrigation (fraction)	1.00 (Hence no irrigation!)
Proportion of Days irrigation occurs (fraction)	0.00

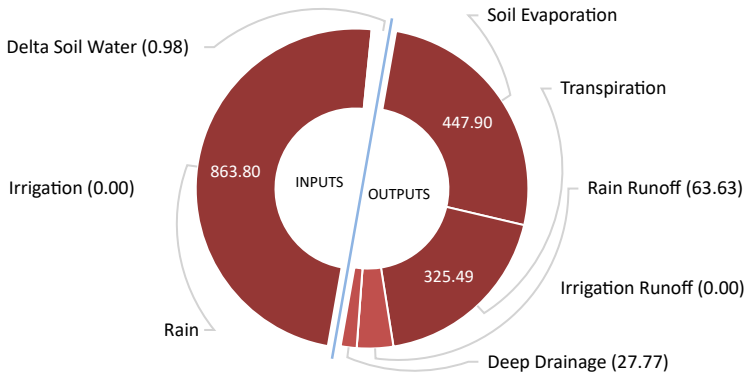
PERFORMANCE

Land Performance - Soil Water

Paddock: New Paddock, 2 ha
Soil Type: Kalbar Low Permeability Red Brow, 146.50 mm PAWC at maximum root depth

Land Water Balance (mm/year):

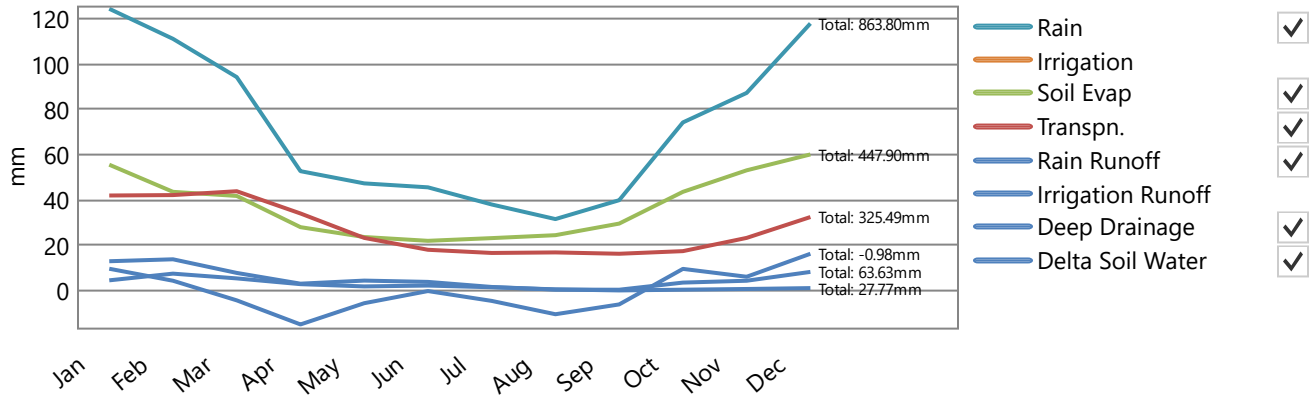
mm/year % Total inputs



Name	Value
Rain	863.80
Irrigation	0.00
Soil Evaporation	447.90
Transpiration	325.49
Rain Runoff	63.63
Irrigation Runoff	0.00
Deep Drainage	27.77
Delta Soil Water	-0.98

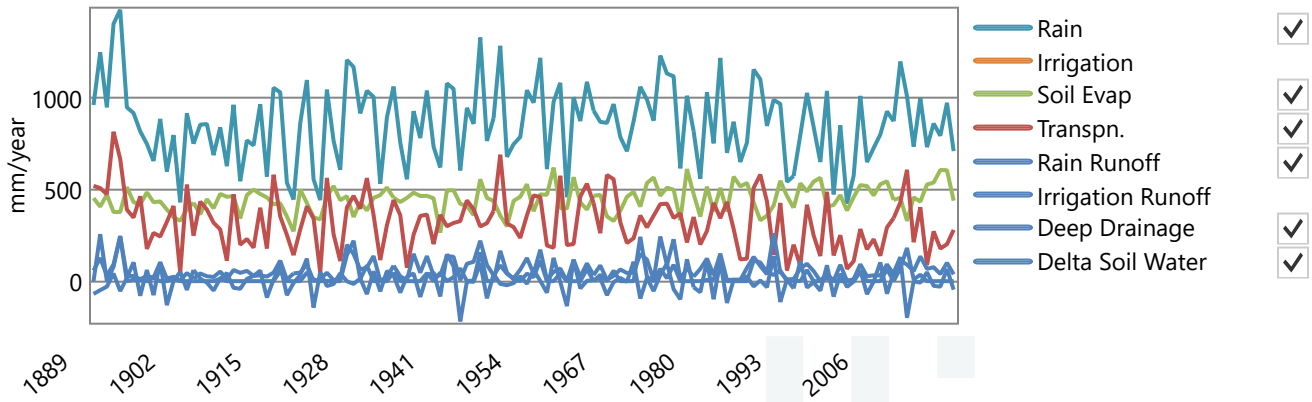
Average Monthly Totals (mm):

Chart Table



Average Annual Totals (mm/year):

Chart Table



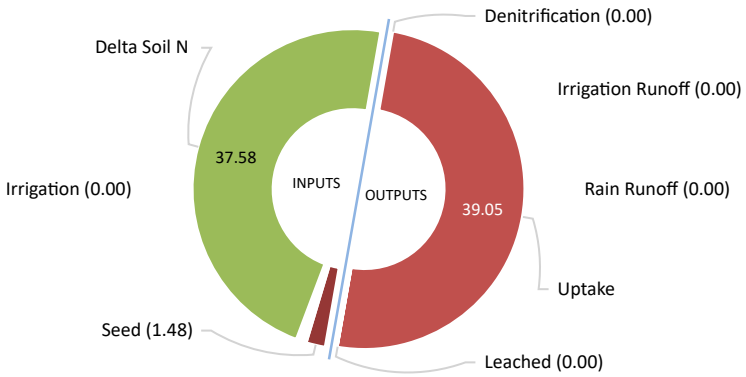
PERFORMANCE

Land Performance - Soil Nutrient

Paddock: New Paddock, 2 ha **Soil Type**: Kalbar Low Permeability Red Brow

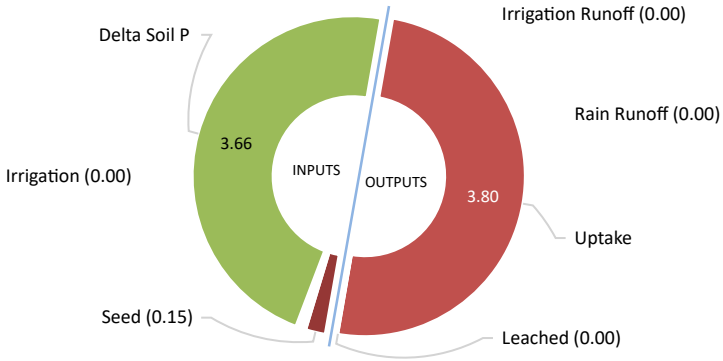
Irrigation ammonium volatilisation losses (kg/ha/year): 0.00
Proportion of total nitrogen in irrigated effluent as ammonium (fraction): 0.00

Land Nitrogen Balance (kg/ha/year)



Name	Value
Seed	1.48
Irrigation	0.00
Denitrification	1.30E-04
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	39.05
Leached	3.08E-03
Delta Soil N	-37.58

Land Phosphorus Balance (kg/ha/year)



Name	Value
Seed	0.15
Irrigation	0.00
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	3.80
Leached	4.70E-03
Delta Soil P	-3.66

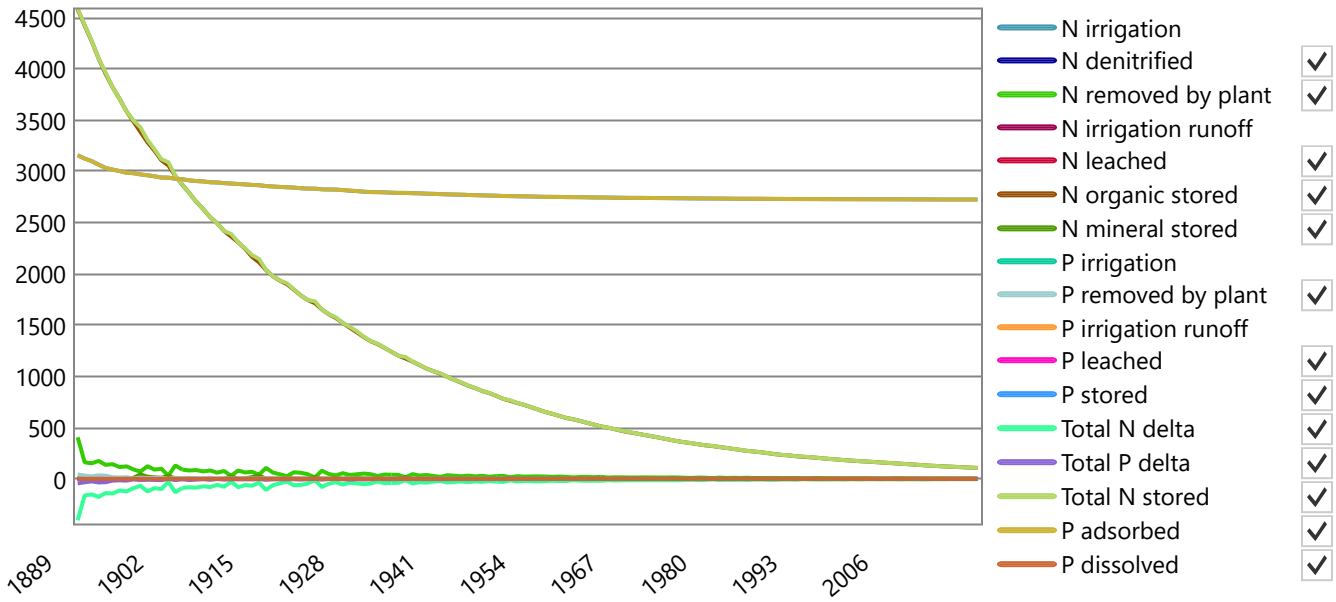
PERFORMANCE

Land Performance - Soil Nutrient

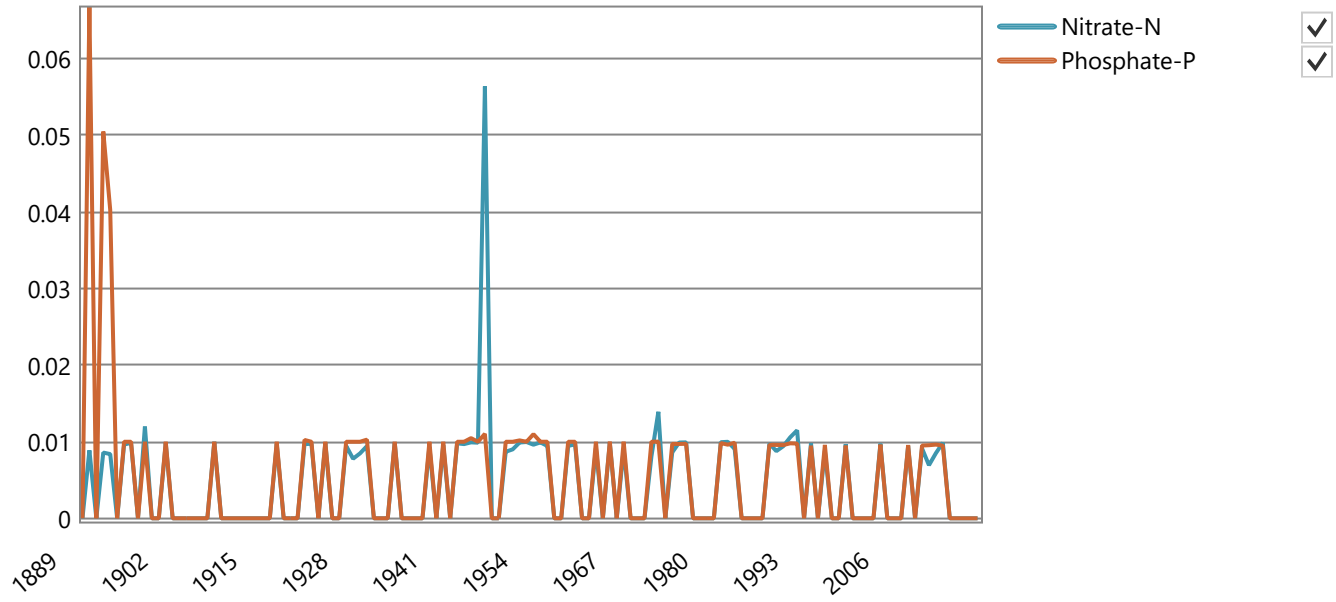
Paddock: New Paddock, 2 ha

Soil Type: Kalbar Low Permeability Red Brow

Annual Nutrient Totals (kg/ha):



Annual Nutrient Leaching Concentration (mg/L):



PERFORMANCE

Plant Performance and Nutrients

Paddock: New Paddock, 2 ha

Soil Type: Kalbar Low Permeability Red Brow

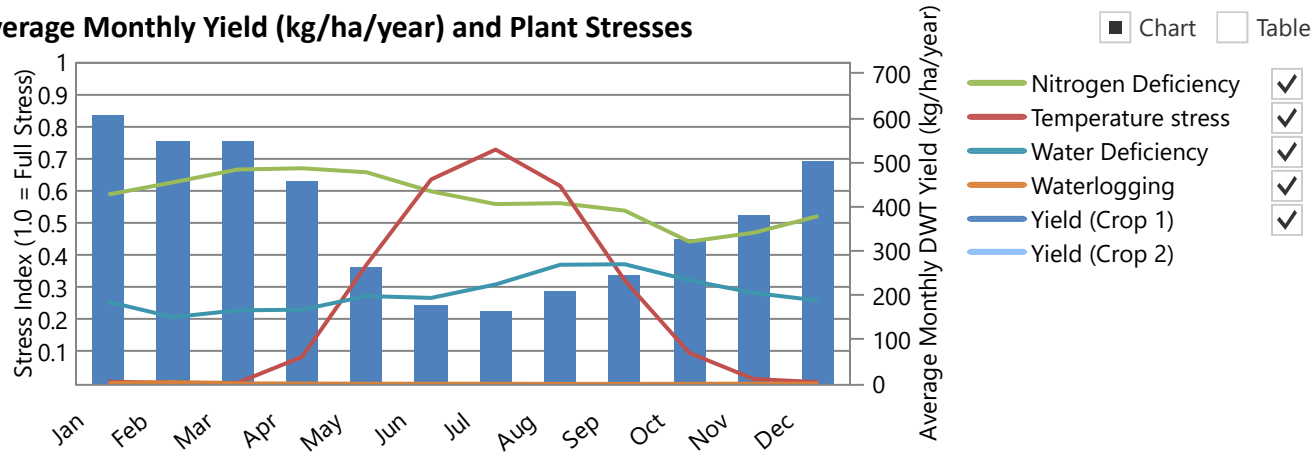
Plant: Continuous Lucerne (Winter Active) Pasture

Average annual shoot dry matter yield (kg/ha/year)	4478.37 (902.34 - 16833.03)
Average monthly plant (green) cover (fraction) (minimum - maximum)	0.36 (0.25 - 0.46)
Average monthly root depth (mm) (minimum - maximum)	956.26 (694.22 - 1182.84)

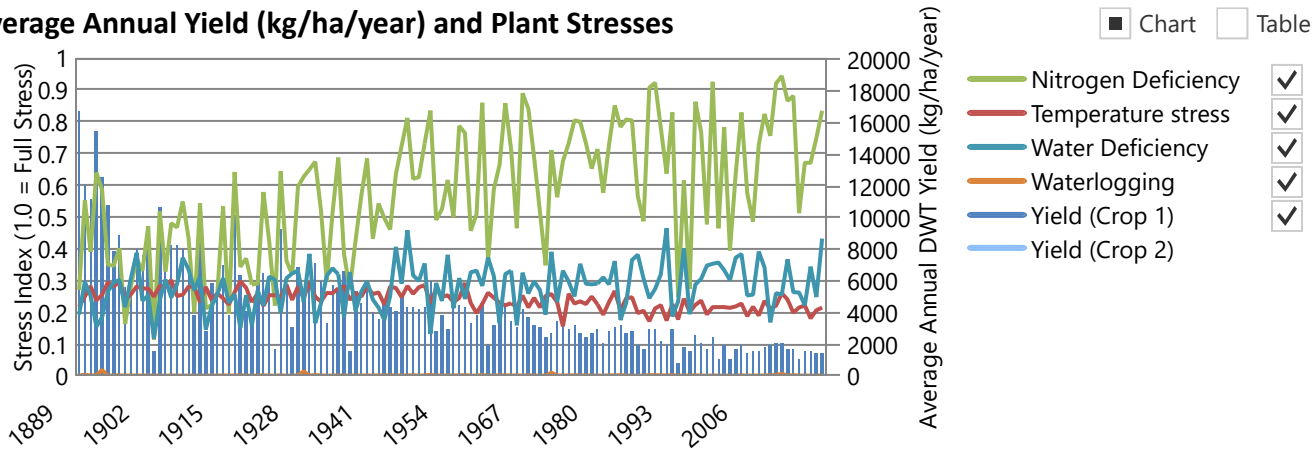
Nutrient Uptake (minimum - maximum):

Average annual net nitrogen removed by plant uptake (kg/ha/year)	39.05 (3.62 - 406.02)
Average annual net phosphorus removed by plant uptake (kg/ha/year)	3.80 (0.17 - 44.13)
Average annual shoot nitrogen concentration (fraction dwt)	0.01 (0.00 - 0.02)
Average annual shoot phosphorus concentration (fraction dwt)	0.001 (0.000 - 0.003)

Average Monthly Yield (kg/ha/year) and Plant Stresses



Average Annual Yield (kg/ha/year) and Plant Stresses



No. of harvests/year: 1.75 (normal), 1.64 (forced by crop death due to water stress (1.64))
No. days without crop/year (days/year): 58.31 due to frosting (1.38), temperature stress - not frost (0.39), water stress (56.54)

PERFORMANCE

Land Performance

Paddock: New Paddock, 2 ha **Soil Type**: Kalbar Low Permeability Red Brow

Plant: Continuous Lucerne (Winter Active) Pasture

Salt tolerance	Moderately sensitive
Salinity threshold EC sat. ext. (uS/cm)	1500.00
Proportion of yield decrease per dS/m increase (fraction/uS/cm)	0.00
No. years assumed for leaching to reach steady-state (years)	10.00

Soil Salinity:

Average Infiltrate Salinity (uS/cm)	30.00

Insufficient deep drainage to run steady state salinity calculations.

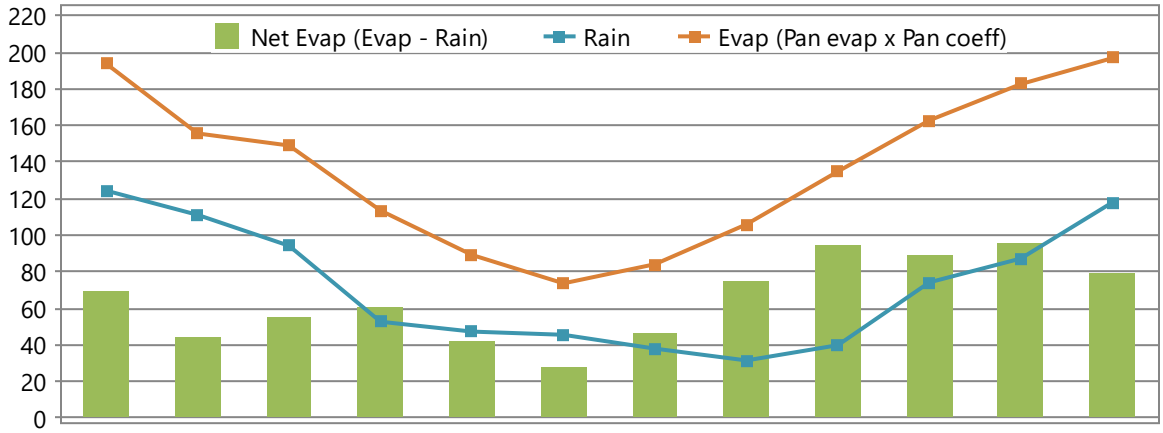
DIAGNOSTICS

Sustainability Diagnostics: Kalbar

Averaged Historical Climate Data Used in Simulation (mm)

Location: Kalbar, -27.95°, 152.62°

Run Period: 01/01/1889 to 31/12/2018 130 years, 0 days



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	124.4	111.1	94.2	52.7	47.3	45.5	38.0	31.5	39.8	74.2	87.2	117.9	863.8
Evap	193.8	155.6	149.0	113.5	89.2	73.7	84.1	105.9	134.8	162.8	182.6	196.8	1642.0
Net Evap	69.4	44.5	54.8	60.8	41.9	28.1	46.2	74.4	95.0	88.6	95.4	78.9	778.2
Net Evap/day	2.2	1.6	1.8	2.0	1.4	0.9	1.5	2.4	3.2	2.9	3.2	2.5	2.1

DIAGNOSTICS

Sustainability Diagnostics: Kalbar

Pond System: 1 closed storage tank

New Generic System - 0.00 kL/year or 0.00 kL/day generated on average

Effluent entering pond system after any pretreatment and recycling

Average (Minimum-Maximum) influent quality calculated for 0.00 non-zero flow days, after any pretreatment and recycling.

Constituent	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Phosphorus	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Dissolved Salts	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

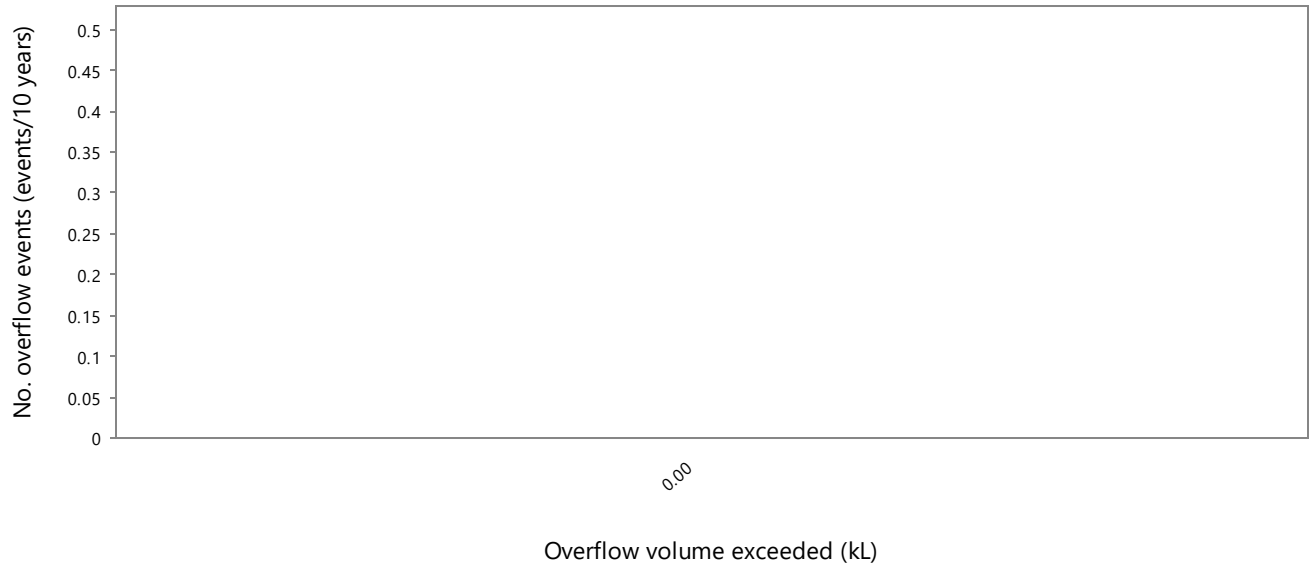
Last pond (Wet weather store): 200.00 kL

Theoretical hydraulic retention time (days)	0.00
Average volume of overflow (kL/year)	0.00
No. overflow events per year exceeding threshold* of 0.03 kL (no./year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	0.00
Probability of at least 90% effluent reuse (fraction)	0.00
Average salinity of last pond (uS/cm)	0.00
Salinity of last pond on final day of simulation (uS/cm)	0.00
Ammonia loss from pond system water area (kg/m2/year)	0.00

* The threshold is the volume equivalent to the top 1 mm depth of water of a full pond

Overflow exceedance:

Chart Table



Export plot

DIAGNOSTICS

Sustainability Diagnostics: Kalbar

Irrigation Information

Irrigation: 2 ha total area (assumed 100% irrigation efficiency)

	Quantity/year	Quantity/ha/year
Total irrigation applied (kL)	0.00	0.00
Total nitrogen applied (kg)	0.00	0.00
Total phosphorus applied (kg)	0.00	0.00
Total salts applied (kg)	0.00	0.00

Shandying

Annual allocation of fresh water for shandying (kL/year)	0.00
Average Shandy water irrigation (kL/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Average exceedance as a proportion of annual shandy water allocation (% of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Minimum shandy water is used	False

Irrigation Issues

Proportion of Days irrigation is prevented when triggered (fraction)	1.00

DIAGNOSTICS

Sustainability Diagnostics: Kalbar

Paddock Land: New Paddock: 2 ha

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Irrigation triggered every 1 days
Irrigate a fixed amount of 5.00 mm each day
Irrigation window from 1/1 to 31/12 including the days specified
A minimum of 0 days must be skipped between irrigation events

Soil Water Balance (mm): Kalbar Low Permeability Red Brow, 146.50 mm PAWC at maximum root depth

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	124.4	111.1	94.2	52.7	47.3	45.5	38.0	31.5	39.8	74.2	87.2	117.9	863.8
Irrigation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Soil Evap	55.5	43.5	41.7	27.9	23.6	21.9	23.1	24.4	29.5	43.5	53.0	60.1	447.9
Transpn.	41.9	42.1	43.8	34.0	23.2	18.0	16.5	16.8	16.2	17.4	23.2	32.4	325.5
Runoff	12.9	13.7	7.7	3.0	4.3	3.8	1.5	0.4	0.3	3.5	4.3	8.2	63.6
Drainage	4.5	7.4	5.3	2.8	1.8	2.2	1.4	0.5	0.0	0.3	0.6	1.0	27.8
Delta	9.6	4.3	-4.4	-15.0	-5.6	-0.3	-4.6	-10.5	-6.2	9.5	6.0	16.2	-1.0

Soil Nitrogen Balance

Average annual effluent nitrogen added (kg/ha/year)	0.00
Average annual soil nitrogen removed by plant uptake (kg/ha/year)	39.05
Average annual soil nitrogen removed by denitrification (kg/ha/year)	1.30E-04
Average annual soil nitrogen leached (kg/ha/year)	3.08E-03
Average annual nitrate-N loading to groundwater (kg/ha/year)	3.08E-03
Soil organic-N kg/ha (Initial - Final)	4752.00 - 107.31
	240.24 - 0.10
Average nitrate-N concentration of deep drainage (mg/L)	0.01
Max. annual nitrate-N concentration of deep drainage (mg/L)	0.06

Soil Phosphorus Balance

Average annual effluent phosphorus added (kg/ha/year)	0.00
Average annual soil phosphorus removed by plant uptake (kg/ha/year)	3.80
Average annual soil phosphorus leached (kg/ha/year)	4.70E-03
Dissolved phosphorus (kg/ha) (Initial - Final)	0.50 - 0.04
Adsorbed phosphorus (kg/ha) (Initial - Final)	3201.01 - 2725.51
Average phosphate-P concentration in rootzone (mg/L)	0.01
Average phosphate-P concentration of deep drainage (mg/L)	0.02
Max. annual phosphate-P concentration of deep drainage (mg/L)	0.07
Design soil profile storage life based on average infiltrated water phosphorus concn. of 0.00 mg/L (years)	0.00

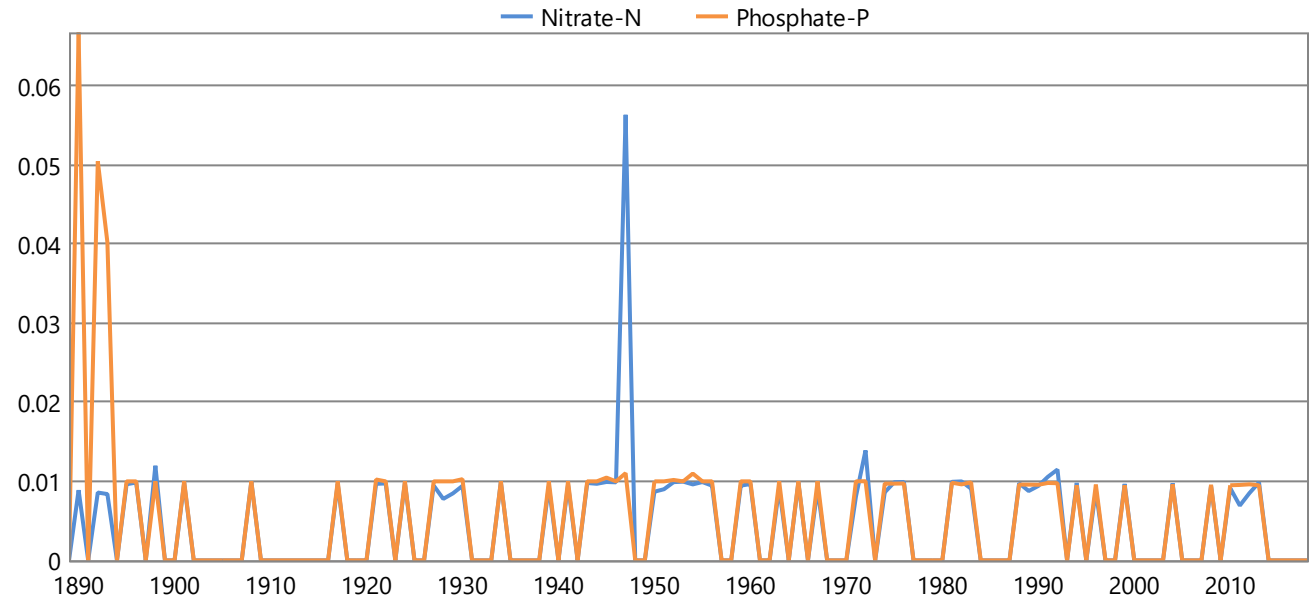
DIAGNOSTICS

Sustainability Diagnostics: Kalbar

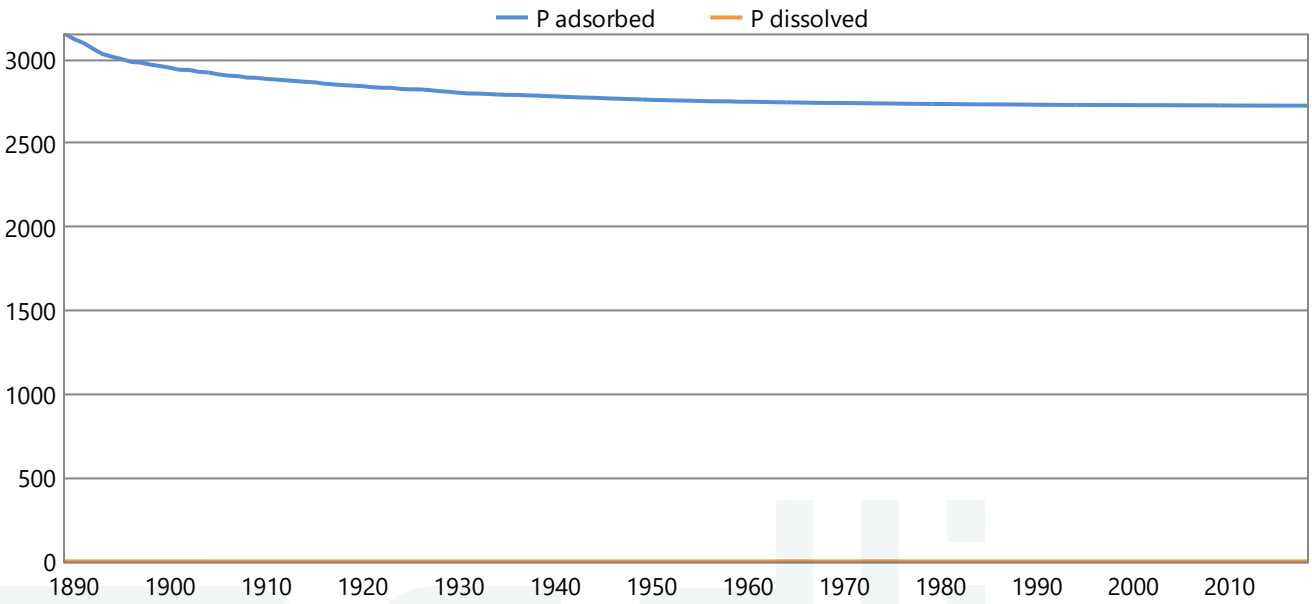
Paddock Land: New Paddock: 2 ha

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Annual nutrient leachate concentration (mg/L)



Annual Phosphate-P in soil (kg/ha)



DIAGNOSTICS

Sustainability Diagnostics: Kalbar

Paddock Plant Performance: New Paddock: 2 ha

Average Plant Performance (Minimum - Maximum): Continuous Lucerne (Winter Active) Pasture

Average annual shoot dry matter yield (kg/ha/year)	4478.37 (902.34 - 16833.03)
Average monthly plant (green) cover (fraction)	0.36 (0.25 - 0.46)
Average monthly crop factor (fraction)	0.33 (0.23 - 0.42)
Total plant cover (both green and dead) left after harvest (fraction)	0.75
Average monthly root depth (mm)	956.26 (694.22 - 1182.84)
Average number of normal harvests per year (no./year)	1.75 (0.00 - 8.00)
Average number of normal harvests for last five years only (no./year)	0.00
Average number of crop deaths per year (no./year)	1.64 (0.00 - 5.00)
Average number of crop deaths for last five years only (no./year)	1.60
Average annual nitrogen deficiency index (0 = no stress, 1 = full stress) (coefficient)	0.57 (0.11 - 0.94)
Average January temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.01 (0.00 - 0.06)
Average July temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.73 (0.37 - 0.94)
Average monthly water stress index (0 = no stress, 1 = full stress) (coefficient)	0.28 (0.21 - 0.37)
Average monthly waterlogging index (0 = no stress, 1 = full stress) (coefficient)	0.00 (0.00 - 0.01)
No. days without crop/year (days)	58.31

Soil Salinity - Plant salinity tolerance: Moderately sensitive

Assumes 1.0 dS/m Electrical Conductivity = 640 mg/L Total Dissolved Salts
All values based on 10 year running averages

Insufficient deep drainage to run steady state salinity calculations.

DIAGNOSTICS

Run Messages

Messages generated when the scenario was run:

This is a Dryland scenario
No effluent irrigation has occurred!
Full run chosen