Decision Report

Application for Licence

Division 3, Part V *Environmental Protection Act 1986*

Licence Number	L9215/2019/1
Applicant	Rocky Ridge Brewing Co Pty Ltd
ACN	605381520
File Number	DER2019/000251
Premises	Rocky Ridge Brewing Co Pty Ltd 665 Boallia Road, JINDONG, WA, 6280 Legal description - Lot 2370 on Deposited Plan 203036
Date of Report	17 June 2020
Status of Report	Final

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Definitions of terms and acronyms

In this Decision Report, the terms in Table 1 have the meanings defined.

Table 1: Definitions

Term	Definition
AACR	Annual Audit Compliance Report
ACN	Australian Company Number
AER	Annual Environment Report
Category/ Categories/ Cat.	Categories of Prescribed Premises as set out in Schedule 1 of the EP Regulations
CIP	Clean In Place
CS Act	*Contaminated Sites Act 2003* (WA)
Decision Report	refers to this document.
Delegated Officer	an officer under section 20 of the EP Act.
Department	means the department established under section 35 of the *Public Sector Management Act 1994* and designated as responsible for the administration of Part V, Division 3 of the EP Act.
DWER	Department of Water and Environmental Regulation
EPA	Environmental Protection Authority
EP Act	*Environmental Protection Act 1986* (WA)
EP Regulations	*Environmental Protection Regulations 1987* (WA)
Licence Holder	Rocky Ridge Brewing Company (RRBC)
m^3	cubic metres
mAHD	metres Australian Height Datum
mbgl	metres below ground level
Minister	the Minister responsible for the EP Act and associated regulations
Noise Regulations	*Environmental Protection (Noise) Regulations 1997* (WA)
Occupier	has the same meaning given to that term under the EP Act.
PBI	phosphorus buffer index
Prescribed Premises	has the same meaning given to that term under the EP Act.

Premises	refers to the premises to which this Decision Report applies, as specified at the front of this Decision Report
Risk Event	As described in *Guidance Statement: Risk Assessment*
RRBC	Rocky Ridge Brewing Co Pty Ltd
UDR	*Environmental Protection (Unauthorised Discharges) Regulations 2004* (WA)
µg/m^3	micrograms per cubic metre
µg/L	micrograms per litre

1. Purpose and scope of assessment

1.1 Purpose of the Decision Report

This decision report sets out the assessment and decision on the application for a licence (the Application) submitted by Rocky Ridge Brewing Company Pty Ltd (the Applicant) under Part V of the Environmental Protection Act 1986 (EP Act) on 12 April 2019.

The Application is for the operation of an existing wholesale beer processing facility that was not initially constructed and approved through a works approval. The guidance statements which inform the assessment of this application are listed in Appendix 1.

The assessment of this application has been undertaken in accordance with DWER's published Regulatory Framework. The scope of the assessment includes:

- the design of the proposed and existing infrastructure; and
- a risk-based assessment of the emission and discharges associated with the construction and operation of the brewery

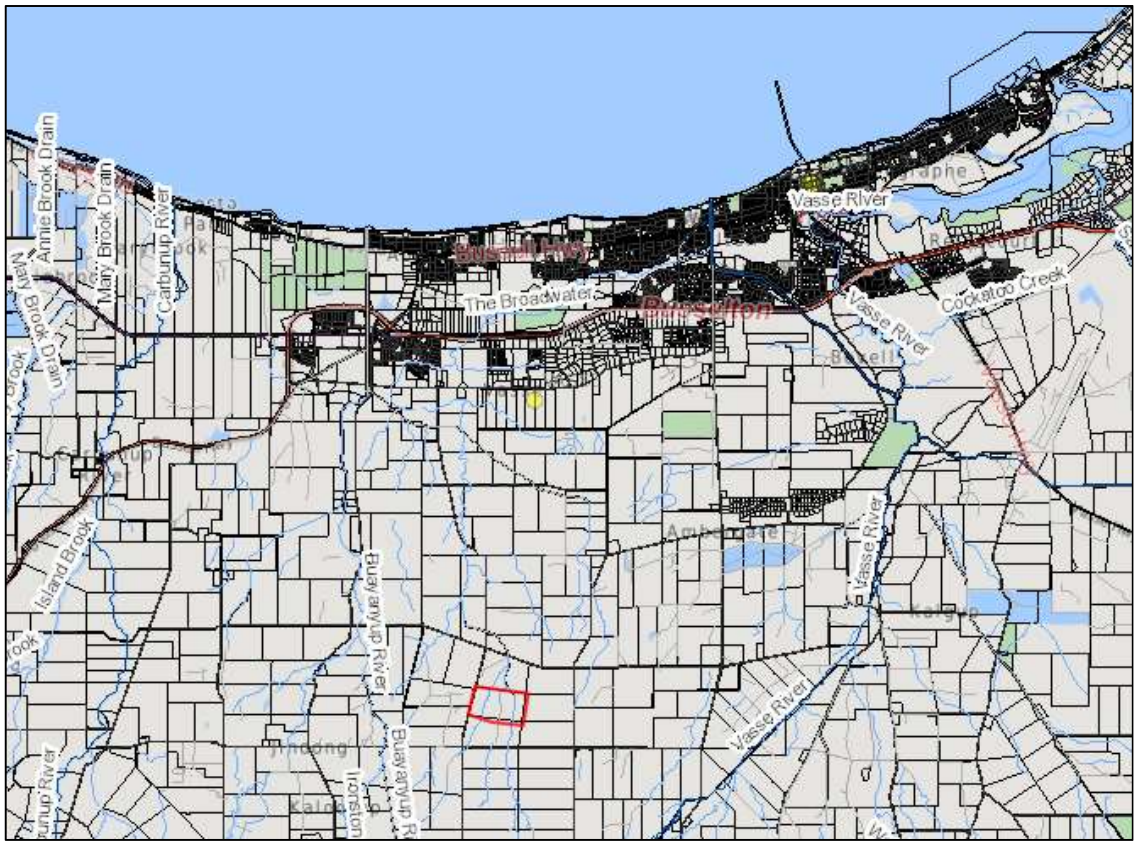


Figure 1: Premises Location – Outlined in red

1.2 Existing Unlicensed Brewery

The RRBC has operating since early 2017, is an existing operational brewery located in Jindong, approximately 13 kilometres (kms) south of Busselton (Figure 1). The Applicant does not hold an *Environmental Protection Act 1986* works approval or licence for current Category 25, Alcoholic beverage manufacturing prescribed operations

At the time of Application the Premises manufactured beer and disposed of wastewater from the brewing process to dairy pasture within Lot 2370.

2. Background

RRBC is a brewery situated on an active dairy farm. The Premises and dairy farm is owned by Peter Coates and the brewery owned and managed by Hamish Coates. Hamish has a lease agreement to operate a brewery and has full use of the Premises for an indefinite period with Peter Coates.

RRBC reported producing 208 kL of beer in the 2018/2019 financial year and plan to increase their production capacity to have nominated a throughput of up to 860 kL / year or beer for this licence application.

In 2018/19 the wastewater treatment system (WWTS) on the premises that treated both sewage and beer wastewater failed. This WWTS consisted of a 6000L Innotech septic system and 2 leach drains. The WWTS has now been replaced and only the brewery's single toilet unit uses the septic waste treatment system that has City of Busselton approval. The City of Busselton informed RRBC that using the septic system for brewery waste was not permitted.

The Department of Health received an application from the Applicant and City of Busselton for the wastewater treatment and disposal system for the brewery waste on 25 March 2020.

Table 2 lists the prescribed premises categories that have been applied for.

Table 2: Prescribed Premises Categories

Classification of Premises	Description	Approved Premises production or design capacity or throughput
Category 25	Alcohol beverage manufacturing: premises on which an alcoholic beverage is manufactured and from which liquid waste is or is to be discharged onto land or into waters.	< 860kL of beer produced per annual period

3. Information Submitted

Table 3 lists the documents submitted during the assessment process. Together these documents will be referred to as the Application.

Table 3: Documents and information submitted during the assessment process

Document/information description	Date received
Application Form Received (DWERDT162704) • RRBC Licence Application – Wastewater Treatment System • Nutrient Irrigation Management plan April 2019	12 April 2019
Email response to request for additional information from the applicant. (A1791729) • Application Form REVB • Wastewater Treatment System REVB May 2019 • Appendix 10.4 DWER Bore Info ID61030093	27 May 2019
Email from applicant: Providing further information (DWERDT188193) • Appendix 10.1 Farm Masterplan and Irrigation area • Appendix 10.2 Brewery Layout and wastewater Treatment system Schematic • Appendix 10.5 RRBC ASIC Extract • Appendix 10.3 Precipitation and evaporation data • Appendix10.6 Lease agreement • Appendix 10.7 Lab Results water testing • Appendix 10.8 Fees calculator • Appendix 10.4 DWER Bore Info • Wastewater Treatment System REVC July 2019 • Application Form REVC	12 August 2019

4. Overview of Premises

4.1 Infrastructure

The brewery facility infrastructure, as it relates to Category 25 activities, is detailed in Table 4 and with reference to the Site Plan Figure 2. The information in Table 4 has been provided by the Applicant.

Table 4 lists infrastructure associated with each prescribed premises category.

Table 4: Category 25 infrastructure

	Infrastructure	**Site Plan Reference**
	Prescribed Activity Category 25	
The design capacity of the brewery produces 860 kl/year of beer and processes the generated wastewater through a WWTP. This treated wastewater is irrigated onto 2.46 ha of pasture and drip irrigated to 0.92 ha of established eucalyptus trees.		
Existing		
1	Brewery production **Enclosed brewery, packaging and storage shed (15 * 30m) housing the following:** • Concrete floor and drainage sumps. • Eight fermenting tanks (3 x 6,000 L and 5x 3,000 L) tanks that can produce up 860 kl/yr of beer. • 3 stainless steel Bright tanks; • Stainless steel kettle • Keg Filler • Stainless steel Whirlpool • 4 x 200 L polyurethane tubs in the CIP system • Canning machine and labeller • 900L central drain • 2 000L confirm concrete collection sump, separating grate for solids and debris over 2mm. • Temporary spent grain store for cooling polyurethane vegetable bin Outside the brewery shed: • Grain silo holds 1200 bushels of grain • Three 220L compostable tanks, polyurethane, fully contained units	Brewery and packaging layout see Figure 2.
3	WWTP consisting of the following: • Wastewater flows from the collection sump via 2 inch PVC pipeline with a non-return valve to pH buffer tank. • Elevated 5 kL ph buffering settling tank (enclosed, fibreglass tank with polyurethane liner). • 97 kL aeration tank (colour bond with polyurethane liner with option to be open or closed). • Two connected 10 kL post settling and irrigation tanks (enclosed, polyurethane tanks with a combined 20 kL capacity) that are used as the irrigation and post settling tanks. • All tanks contained on a compacted hardstand. • Stormwater is directed away from the brewery and WWTP	WWTP Layout see Figure 2

	Infrastructure	Site Plan Reference
	infrastructure towards farm gardens.	
Proposed		
4	Wastewater irrigation area 2.46ha of pasture and 0.92 ha of tree lines. • Wastewater is pumped from the irrigation tank (one of the two connected 10kL post settling tanks as described above) and irrigated onto the paddock with a K line system, low pressure transportable pod sprinkler that disperses wastewater. • Irrigation of the eucalyptus tree line will be via inline drip irrigation.	Irrigation Layout see Figure 3

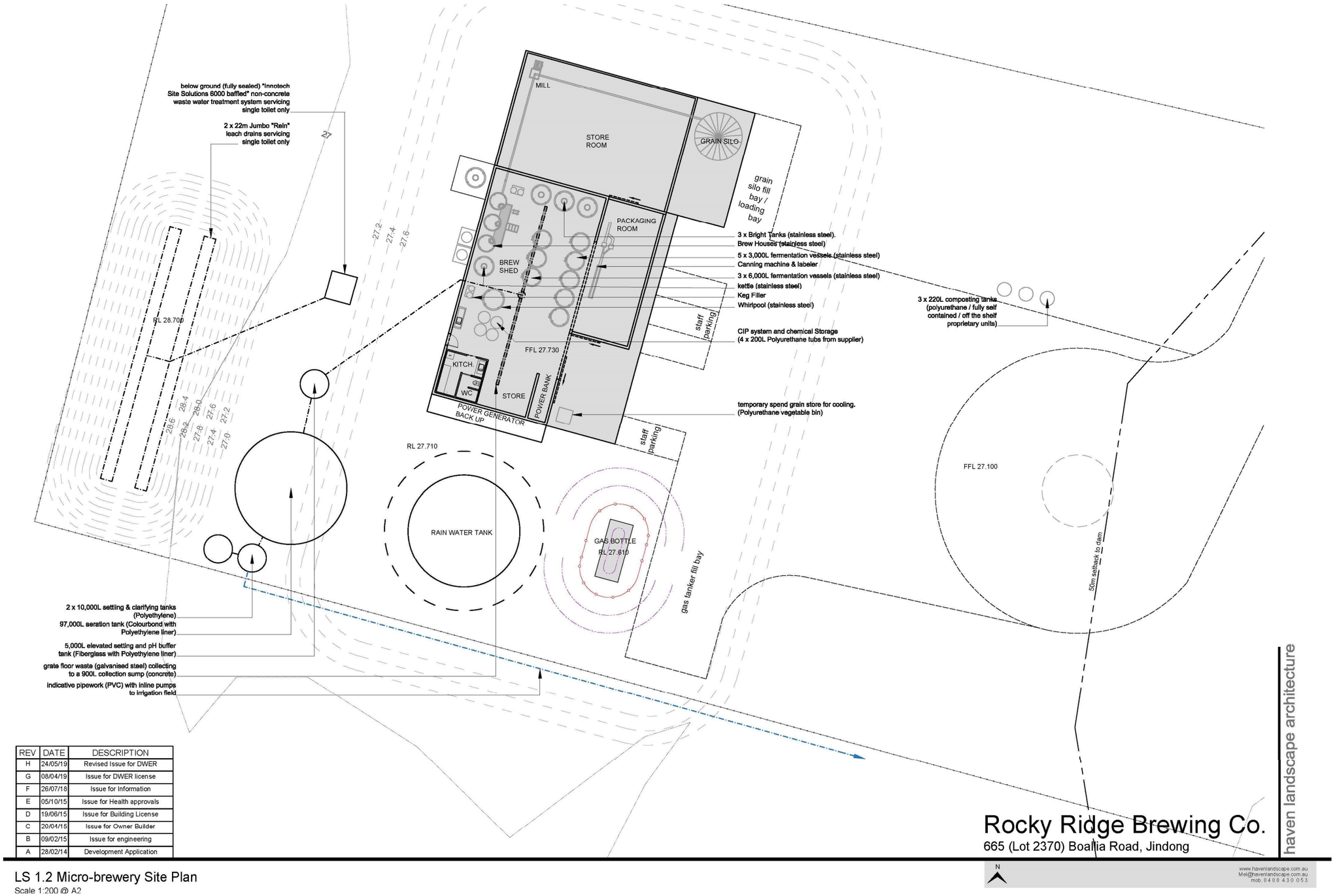


Figure 2: Rocky Ridge Brewing Company Brew Shed site plan.

Figure 3: Rocky Ridge Brewing Company Brew Shed and irrigation site plan. (Green area outlines pasture irrigated area, purple indicates tree irrigation area).

4.2 Operational Aspects (from Application)

The brewery that has a design capacity to produce up to 860 kL/year of beer based on a 14 day brewing turn around on a 33 kL fermentation tank capacity. The anticipated production throughput of the brewery is lower, as the Applicant operates on a 21 to 35 day turnover of tanks to produce their current range of beer. Based on their current brewing practices the actual production throughput is 240 kL/year. The Applicant is seeking the maximum design capacity (throughput of 860 kL/year) to ensure expandability of the business.

Brewery

The brewery is located within a roofed shed on a concrete hardstand and comprises of the store room, brew shed, packaging room, and utility room (kitchen / toilet). The grain silo and temporary storage (spent grain) areas are located outside on the shed hardpan, but not under the roof line. The silo has its own roof. Figure 1 illustrates the Premises location and Figure 2 outlines the Microbrewery site plan.

All brewing processes and operational controls are described in Table 5.

Table 5: Applicants brewery and WWTP operational controls.

Site infrastructure	Description	Applicant Operation details
All brewing processes are contained within the brew shed and consists of: • 8 stainless steel fermenting tanks (3 x 6,000 L and 5 x 3,000 L) tanks; • 3 stainless steel Bright tanks; • Stainless steel kettle • Keg Filler • Stainless steel Whirlpool • 4 x 200L polyurethane tubs in the CIP system • 900L central drain • 2kL collection sump	High concentrated solid wastes and spent yeast is manually collected from the fermentation tanks and placed within compost tumblers.	Compost contained within sealed compost tumblers and spread onto farm gardens.
	Four 200 L polyurethane vessels for chemical storage for washing.	Chemical are pumped and recycled within the brewery shed for reuse on a hard stand area.
	Wastewater from cleaning cycle used for reuse up to 4 times. Results in 75% reduction in chemical loading and water usage.	Wastewater from cleaning cycle used for reuse up to 4 times. Results in 75% reduction in chemical loading and water usage.
	Drain is fitted with a 2mm screen to trap solids	Filter basket is monitored and emptied once a week.
Grain silo	1200 bushels, self-enclosed	
WWTP Pipelines	All pipeline connection to wastewater treatment tanks and pumps are fitted with a 2 inch sealed PVC pipe with non-return valves.	
pH Tank	5 kL fibreglass polyurethane lined tank for settling	Sludge removed 4 times year by contractor. Tank is placed on a compacted hardstand.
Aeration tank	Aeration tank 97 kL colour bond with	Tank is placed on a compacted hardstand

Site infrastructure	Description	Applicant Operation details
	polyurethane liner.	
Storage tanks	Two interconnect 10 kL tanks consisting of a post settling and an irrigation tank.	Sludge removed once a year by contractor. Tank is placed on a compacted hardstand

The brewery uses malted barley, hops, water, spices, fruit and yeast that are stored uncovered in the brew shed within the grain silo area. The beer is created by the extraction of sugars from the barley (mashing) and fermentation to allow the yeast to convert the sugar into alcohol.

Side streaming is implemented in the brewery which involves the separation and collection of high concentration wastes at the source and through settling for repurposing or disposal. The remaining grains (barley) from the mashing and the yeast from the fermentation tanks are dried and cooled in polyurethane vegetable bins within the temporary storage area of the brew shed. Once cooled the product is used as supplement cattle feed for the dairy cows on the property. No barley or yeast products are disposed of to the WWTP.

All solid wastes other than above are composted using three 220 L polyurethane fully contained compost tumblers. Spent yeast and trub (sediments formed from the brewing process) are manually collected before cleaning and reused or directed to compost. Spent fruits and hop flowers are removed manually from the brewing process and composted. The compost tumblers are located outside of the brew shed. No leachate or runoff occurs in the compost area and the compost product is spread on the farm gardens as mulch.

The brewery cleaning operations are performed in stages. The eight fermenting tanks (3 x 6,000 L and 5 x 3000 L) are cleaned once a fortnight on a cyclic basis through the brewing process. The cleaning involves:

- pre-rinse: water is used to wash away the majority of the remnant product.
- caustic wash: sodium hydroxide (caustic) is used to break down all organic matter and is then captured to be used again.
- rinse: water is used to rinse a second time.
- acid wash: phosphoric acid is used to remove any scale from the fermenting process, the acid is captured for reuse.
- final rinse: water is used to rinse the tanks and is then drained.
- sanitation: peracetic acid (PAA) is used to sanitise and disinfect the tanks.

Wastewater from the cleaning cycle is recycled using the CIP system, whereby the cleaning and sanitation chemicals are recaptured and reused up to four times, before disposal into the WWTP.

The CIP system comprises of four 200 L polyurethane vessels for storing chemicals, two for caustic (one fresh and one recycled) and two for acid (one fresh and one recycled). The chemicals that are used for cleaning are pumped out of the initial vessel and into the tanks for cleaning. Following each clean, the chemicals are pumped out of the tanks and into the CIP recycled storage vessels.

Wastewater produced from the brewery wash-down steps are directed to a central drain located in the brew shed and gravity fed to a 2 kL concrete collection sump. The central drain is fitted with a 2 mm screen to trap solids. The filter basket is monitored and emptied once a week.

All stormwater that falls outside the hardstand clean area is directed to the farm gardens. All stormwater that falls on rooves are directed to a water tank for use in the brewery. Once emptied water is carted in as required to brewery use.

WWTP

For every one litre of beer produced approximately three litres of wastewater is created. With an annual production of 860 kL/year, it is expected that 2,580 kL/year of wastewater will be generated.

The WWTP operation controls are described in Table 5 and consist of the following:

- The collection sump is pumped via a 2 inch PVC pipeline with a non-return valve to an elevated 5 kL ph buffering settling tank (fibreglass tank with polyurethane liner). All sludge that settles out is removed by a registered waste controller, 4 times a year.
- Wastewater overflows into a 2 inch PVC non-return value pipe to a 97 kL aeration tank (colour bond with polyurethane liner). The aeration tank is fitted with a mechanical aerator unit to reduce BOD levels to 30 mg/l a day.
- Wastewater overflows via a 2 inch non return valve, PVC pipe, to two interconnected 10 kL post settling tank and irrigation tank (polyurethane tanks, 20 kL combined capacity). These tanks allow for winter storage capacity and further settling. Settled out material will be removed by a registered contractor once a year.
- Wastewater is then transferred to irrigation paddocks through a 2 inch irrigation line. A flow meter will be installed on this line. A pump will be installed on the outlet from the irrigation tank to this line.

All stormwater is directed away from the WWTP through paved surfaces and ground fall of the land towards garden beds.

The Applicants current interim storage and treatment facility is via the Department of Health previous approved system (leach drains) and by contractor removal as required (from Applicant).

Irrigation

The Applicant proposes to irrigate treated wastewater over two areas, a perennial paddock of 2.46 ha and two rows of planted eucalyptus tree lines covering an area of 0.92 ha (see figure 3 for irrigation area).

Irrigation within the paddock will use a Kline system, which is a low pressure transportable pod sprinkler to disperse wastewater. The application rate has been specified as 1 mm/day, where 1mm is equal to 1 L/ m^2. Irrigation of the tree line area will be via inline drip irrigation.
The flow meter connected to the irrigation line will be used to adjust length of irrigation to meet the 1L/m2 output.

Table 6 outlines the Applicant's operational controls for irrigation reduce impacts on the nearby surface and groundwater resources:

Table 6: Applicants irrigation operational controls.

Irrigation	Applicant Operational Controls
Kline sprinkler	• 80 m away from the nearest waterway; • not to be applied on days of more than 10mm rainfall; • wastewater will be distributed evenly;

Irrigation	Applicant Operational Controls
	• application rate 1mm/day; • irrigated area will be checked daily, and • irrigation will be applied to maintain healthy vegetation coverage.
Inline dripper	• 80 m away from the nearest waterway; • not to be applied on days of more than 10mm rainfall; • wastewater will be distributed evenly; • irrigated area will be checked daily, and • irrigation will be applied to maintain healthy vegetation coverage.

4.3 Exclusions to the Premises

This Decision Report does not consider the dairy sheds, dairy cows, the crops for barley, hops and fruit on the property, including any noise, light or water emissions associated with those activities in these areas and from traffic movements. Nor does the report consider the toilet facilities and the septic tank and leach drain system that supports the ablutions associated with the brewery operation.

5. Legislative context

Table 7 summarises approvals relevant to the assessment.

Table 7: Relevant approvals and tenure

Legislation	Number	Subsidiary	Approval
Rights in Water and Irrigation Act 1914	*GWL 170742*	*Colin Coates (Premises owner).*	Access to Leederville aquifer. Approval for 1350 kl for stock watering. This water licence is not for Brewery use.
Planning and Development Act 2005	No DA number was provided by the City of Busselton	Rocky Ridge Brewing Company	Lot 2370 on Plan 203036 is zoned Agriculture under the City of Busselton's Town Planning Scheme 11. The City granted development approval (no DA number provided) for the operation of the microbrewery on 7 May 2014 with a modification to the approved plans granted 29 July 2015. The approval was for effluent disposal via three leach drains. A condition of the approval required that prior to commencement of any works, information was to be supplied regarding details of the proposed effluent disposal system. The City of Busselton has received an application for development approval for the replacement of the effluent disposal system with a WWTP on 17 March 2020. (DWERDT227265).
Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974	Approval No. Not approved yet	Rocky Ridge Brewing Company	DoH received an application for the treatment of brewery wastewater from the Applicant through a referral from the City of Busselton 25/03/2020 (DWERDT268688). The DoH have not assessed nor have they approved to construct or install an apparatus for the

Legislation	Number	Subsidiary	Approval
			treatment of trade waste.

6. Modelling and monitoring data

6.1 Monitoring of discharges to land

Beer production is not seasonal, with wastewater production varying with housekeeping practices and sales rather than time of year. The Applicant however states that their business model for beer manufacturing is seasonal as it is based on access to fresh ingredients particularly hops. Therefore they experience a reduction in production of 50% in winter.

The wastewater treatment system is not in full production thus the Applicant is unable to provide more data to determine water quality of the wastewater. The Applicant has provided two samples; one of untreated wastewater from the brewery operation sampled on the 27 March 2019, the other a sample from treated wastewater from the aeration tank taken on 4 July 2019. Sample results are indicated in Table 8.

Table 8: Effluent quality from the untreated brewery wastewater

	pH	Conductivity (EC) dS/m)	Total Dissolved Salts (mg/L)	TSS (mg/L)	TDS (mg/L)	BOD (mg/L)	COD (mg/L)	TP (mg/L)	TN (mg/L)
[1]ANZECC 2000-Primary Industries	5.5-9.0	1.3-2.9 Moderate tolerant crops	<3	<40		<15	<40	0.8 – 12[a]	25-125[a]
WQPN 22 Risk Category A								0.6	9
Untreated wastewater 27 March 2019	4.47	1.845	1,255	960	2,285	3,090	5,400	105	90.8
Treated wastewater4 July 2019	5.9	1.308		480	1,300	850		34	20

[1] National Water Quality Management Strategy Paper No. 4 – Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 3 Primary Industries, 2000, ARMC and ANZECC.

[a]ANZECC 2000, Requires site specific assessment to determine actual value.

[2] WQPN 22 Irrigation with nutrient rich wastewater (DoW 2008). Risk Category A (sandy upper soil) based on 500kL/ha applied per week over 32 weeks/year.

Results from both samples indicate that water quality improved between the pre and post treated samples. Although it is noted that samples where not taken within the same time period, where other elements may also influence the sample results between the pre and post treated samples. The wastewater samples have been compared against ANZECC guidelines for primary industries (2000). ANZECC (2000) guidelines in assessing the suitability of waters for irrigation use, water quality characteristics that affect agriculture production, catchment condition and downstream water quality needs have be considered and evaluated. ANZECC (2000) guidelines for Primary Industries is considered a suitable guideline for irrigation water

quality as key issues concerning the effects on soil, plants and water resources have been taken into consideration. BOD, TSS, TDS and TP levels were considered high and exceeded criteria limits above the ANZECC (2000) guidelines.

Comparison of the TN and TP treated wastewater monitoring results to the nutrient application criteria to control eutrophication risk from Table 7 within WQPN22 (DoW 2008) shows both TN and TP concentration values in mg/L exceed Risk category A requirements, of TN: 9 mg/L and TP: 0.6 mg/L.

Key finding:

1. **Only two samples have been taken, one untreated wastewater sample (March 2019) and one treated wastewater sample (July 2019). The general characteristics of the wastewater samples and the effectiveness of the treatment cannot be established off one sample event. It is unknown if the wastewater treatment can be consistently achieved and be reproducible.**
2. **The treated wastewater has high nutrients, particular of phosphorus. The wastewater treatment on TDS and COD is unknown, as these parameters were not sampled in the post treatment sample.**

6.2 Hydraulic Loading of Irrigation Area

The Application included a water balance to assess the volume of proposed irrigation against the hydraulic output of the irrigation area and the volume of storage available. The Applicant used the following tools and assumptions in undertaking the water balance (from the Application):

- Storage volume included wastewater pre and post treatment tanks (including 5 kL pH tank, 97 kL aeration tank and two 10 kL irrigation / settling tanks.)
- Irrigation throughout the entire year.
- Used Irrigation Calculator (Department of Agriculture and Food).
- No irrigation on days over 10 mm (used the Bureau of Meteorology, Busselton station to calculate the average number of days per year).
- Irrigation not to exceed 1 mm per day (therefore assumed no runoff and no infiltration to groundwater).
- Minimum of 4 days storage per month

The water balance developed by the Applicant is shown in Figure 4 below.

	Month											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Estimated Wastewater volume (kL) 2580kl total	215	215	215	215	215	215	215	215	215	215	215	215
Days within month	31	28	31	30	31	30	31	31	30	31	30	31
Mean no. days receiving rainfall greater than 10mm	0.5	0	0.6	1.1	3.1	4.4	4.8	4.1	2.1	0.7	0.5	0.3
Volume of wastewater requiring storage during rain days (kL)	3.47	0	4.16	7.88	21.50	31.53	32.59	28.43	15.05	4.85	3.58	2.08
Remaining storage available 122kL (5Kl +97kl + 2 x 10kl)	118.53	122	117.84	114.12	100.50	90.47	89.41	88.57	106.95	117.15	118.42	119.92
Days of storage available	35	122	29	15	6	4	4	4	8	25	34	59

Figure 4: Applicant derived water balance for RRBC wastewater irrigation proposal (from Applicant).

Key findings:

1. **The water balance is calculated using the Department of Agriculture and Food (2014) (now DPIRD) Irrigation Calculator. This calculator is based on irrigation with clean water. The Applicant is irrigating with wastewater called fertigation. DoW (2008) WQPN 22 was used by the Applicant to calculate nutrient loading.**
2. **The water balance indicates that irrigation will occur during wet periods. When rainfall is naturally high, soil saturation occurs and the application of nutrient rich wastewater could result in the leaching of nutrients through the soil profile and / or exits the Premises through surface water runoff.**
3. **The water balance does not factor in wastewater storage requirements during the winter when rainfall exceeds evaporation and plant growth and water uptake is reduced.**
4. **The water balance includes the treatment tanks as storage (incudes 5 kL pH buffering tank and 97 kL aeration tank). The Applicant does not consider that using processing tanks as storage will reduce or stop brewery production.**

6.3 Nutrient Loading of Irrigation Area

The Applicant has calculated the expected nutrient loading rates for the irrigation area based on the limited monitoring data detailed in section 6.1 and on the assumption that 860 kL/year of beer is produced, producing 2580 kL per year (7.07 kL per day) of wastewater that would be irrigated to land, excluding days greater than 10 mm of rain.

The Applicant used WQPN 22 (DoW2008) and DWER (2018) Draft Guidance on the

establishment and management of irrigation schemes for the land disposal of wastewater (DWER draft guidance) to calculate nutrient loading rates.

The Applicant used the following assumptions and assessment methods:

- WQPN22 (DoW 2008) Risk category A.
- One water sample to determine loading rates (July 2019 treated wastewater sample).
- One harvest per year of either Lucerne Hay or Sorghum per year from the wastewater irrigated paddock.
- No cattle grazing on the land to be irrigated with wastewater.
- Calculated area requirements using DWER draft guidance to determine the land area required for a wastewater scheme.
- Calculated nitrogen uptake requirements using DWER draft guidance calculations for determining the land area required for the uptake of nitrogen by irrigated crops.
- Used 34 weeks irrigation period and 36 week irrigation period for the land area and nitrogen uptake calculations respectively.
- Winter highest groundwater was 1.17 mbgl of the irrigation areas.
- Wastewater irrigation would not occur over winter months.
- Ample storage capacity for the WWTP.

The Applicant outlined the following loading calculations in Table 9. Where yearly harvest has been calculated by the Applicant to demonstrate phosphorus removed from the system. This is based on a minimum of 2 kg of phosphorus is removed per tonne of hay/sorghum harvest, which equated to 17.5 kg of phosphorus removal per year.

Table 9: Loading calculations (from applicant)

	TN kg/ha/yr	**TP kg/ha/yr**	**BOD Kg/ha/day**
WQPN 22-Risk Category A	140	10	30
Applicants calculations	15.26	25.95 8.45[1]	1.77

[1] Phosphorus figure after harvesting.

The Applicant calculated land area required for a wastewater scheme and the required land area for nitrogen uptake by irrigated crops from DWER's draft Guidence (2018); they are outlined in Table 10. The Applicant's calculations and DWER's calculations have been listed.

Table 10: Calculations for determining land area and nitrogen uptake land area requirements

Weeks of irrigation	**Calculated land area required (ha)**
Land Area required for wastewater scheme	
36 weeks (Applicant calculation)	0.19
31 weeks (DWERs calculation)	0.208
Land Area required for nitrogen uptake by irrigated crop	
36 weeks (applicant calculation)	0.39
31 weeks (DWER's calculation)	0.456

The area required for irrigation is of suitable size for the irrigation volumes.

Key finding:

1. **The nutrient loadings and the land area calculations have been based on no winter irrigation. The water balance and storage outlined in section 6.2, are based on winter irrigation. The water balance and nutrient loading calculations have not shared the same assumptions.**
2. **The phosphorus levels are high for irrigation to land (25.95 kg/ha/yr) and exceed WQPN22 Risk Category A, maximum levels (10 kg/ha/yr). Harvesting of the irrigated area is an option to remove phosphorus from the land and allow a higher irrigation rate of phosphorus. However irrigation of land after harvest results in high levels of phosphorus being applied to the land and not being utilised through plant uptake.**

6.4 Monitoring of emissions to surface water

No monitoring of waterways up or down stream of the premises have been provided. The properties have three tributaries of Buayanup River running in a south to north direction through the property. Table 11 outlines ecological trigger values for lowland rivers in SW Australia. It is noted that the nature of the underlying geology indicated that the seasonally perched groundwater will seep towards the waterways. Monitoring of surface flows from the waterways for nutrients would be an option to monitor and detect leaching.

Table 11: Ecological trigger values for lowland rivers in SW Australia.

	pH	Conductivity (EC) microS/cm)	Saliniy (mg/L)	TP (mg/L)	TN (mg/L)	DO % saturation
NWQMS Surface water ecological triggers [1]	6-9	120 - 300	77 -192	0.065	1.2	80-120

[1] National Water Quality Management Strategy – Volume 1 The Guidelines, 2000 Ecological default trigger limits for lowland waterways in SW Australia, Table 3.36, 3.37.

6.5 Monitoring of discharges to groundwater

The Premises is entirely located on a multiple use palusplain, where perched groundwater levels from winter rainfall occurs. No monitoring bores have been installed on the premises. Groundwater monitoring data has been provided from the Applicant from DWER reference bore 61030093, Busselton Shallow Bore BN31S which is located 800 metres south west of the premises and monitors the Perth Swan Superficial Aquifer to a depth of 6 mbgl (see Figure 5 for location). The applicant provide data for the months of May and October only to determine groundwater levels. Their data provided a groundwater range between 2.95 and 0.79 mbgl.

The ground level of bore 61030093 lies at 29.288 mAHD and has records dating back to 1984, which demonstrate groundwater is within 0.5 to 1 m of the surface in winter -spring (see Figure 6). Groundwater falls to an average 2.5 mbgl in late summer/autumn. Table 12 lists the highest and lowest known groundwater levels for each month of the year where data exists. Examining all the bore data the maximum known season level is at surface.

The Premises proposed irrigation areas are located on 27 mAHD (subject to +/- 0.5 m). Without

groundwater levels from the premises, a conservative estimate could place the yearly groundwater movement between 0.5 to 2.5 mbgl.

Table 12: Busselton Shallow Groundwater Bore BN31S, highest and lowest known groundwater depth.

mbgl	January	February	March	April	May	June	July	August	September	October	November	December
Highest	No data	2.31	2.891	2.951	2.971	2.61	No data		1.081	1.79	1.84	1.95
Lowest		2.31	1.82	1.9	1.06	1.61			-0.4[1]	0.49	0.55	1.95

[1] Note negative value indicates groundwater at surface (groundwater had a positive head of pressure).

Groundwater from the superficial aquifer flows toward the three tributaries of the Buayanup River, in a north direction, see Figure 5.

Figure 5: Flow direction of groundwater and location of groundwater reference bore. Premises is outlined in orange.

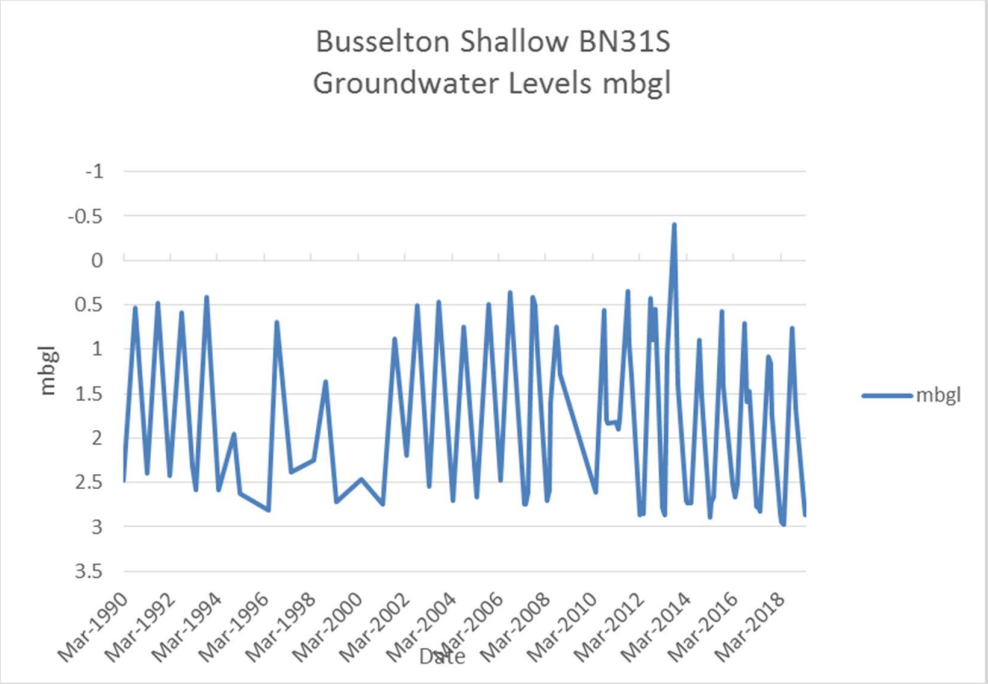


Figure 6: Busselton Shallow Groundwater Bore BN31S, groundwater levels from 1984 to 2018.

Key finding:

1. **The Premise has no baseline information on ground or surface water levels and water quality.**
2. **Based on DWER reference bore BN31S, groundwater is likely to be close to surface within 0.5mbgl in the winter – spring period of the proposed irrigation areas.**

7. Consultation

Advertisements were placed on the DWER internet page and in the Western Australian Newspaper, inviting public comment on the application. No public submissions were received during the 21 day advertising period.

The Delegated Officer referred the Application to the LGA (City of Busselton) on 30 August and 25 November 2019 advising of the Application and seeking comment.

The Application was referred to the Department of Health on 30 August 2019. The Department of Health replied on the 25 March 2020 indicating that the Applicant via the City of Busselton referral process had referred an application for approval of an apparatus for the treatment of trade waste.

8. Location and siting

8.1 Siting context

The premises is located in the agriculture area of Jindong on the Swan Coastal Plain within the City of Busselton. The premises is bound by Boallia Road, with rural properties in all directions.

The entire premise is located within a multiple use palusplain wetland, with three seasonal flowing tributaries of Buayanup River transverse through the property, flowing south to north.

The premises is located within Lot 2370 and occupies an area consisting of homestead, operating dairy, machinery/storage sheds and associated tanks located on the north western corner of the property. The two wastewater irrigation areas are located in the southern portion of the lot between two tributaries consisting of a perennial grass paddock 2.46 ha and eucalyptus tree lines of 0.92 ha (total irrigation area of 3.38 ha). The premise is zoned under the Busselton Town Planning Scheme 11 as agriculture.

8.2 Residential and sensitive Premises

The distances to residential and sensitive receptors are detailed in Table 13.

Table 13: Receptors and distance from activity boundary

Sensitive Land Uses	Distance from Prescribed Activity
Farm Premises	*Five farmsteads are located 1 to 1.6 km from the edge of the proposed irrigation areas, in all directions.*

8.3 Specified ecosystems

Specified ecosystems are areas of high conservation value and special significance that may be impacted as a result of activities at or Emissions and Discharges from the Premises. The distances to specified ecosystems are shown in Table 14. Table 14 also identifies the distances to other relevant ecosystem values which do not fit the definition of a specified ecosystem.

The table has also been modified to align with the *Guidance Statement: Environmental Siting.*

Table 14: Environmental values

Specified ecosystems	Distance from the Premises
Geomorphic Wetlands	Premise is located entirely within a multiple use palusplain wetland. 1.2 km north of the property boundary is a conservation palusplain wetland. 1.7 km downstream of the property boundary on the Buayanup River is a conservation palusplain wetland.
Biological component	**Distance from the Premises**
Threatened/Priority Flora	Declared rare flora located 290 m south of the premises boundary on Boallia Road. Declared rare flora located 600 m north of the premises boundary on Doyle Road
Other relevant ecosystem values	**Distance from the Premises**
DTGW Bank Wood SCP	Potential groundwater dependent Banksia Woodlands of the Swan coastal plain ecological community are located within the premises on the eastern portion, along the Buayanup River waterways and western boundary.

8.4 Groundwater and water sources

The distances to groundwater and water sources are shown in Table 15.

Table 15: Groundwater and water sources

Groundwater and water sources	Distance from Premises	Environmental value
Major watercourses/waterbodies - Tributaries of Buayanup River	Three seasonal tributaries of Buayanup River run south to north through the Premises. Irrigation areas are 80 metres east and west of two watercourses.	Significant conservation wetlands located 1.7 km downstream from the northern boundary on the waterway. The tributary is used for recreational and agricultural use and discharges into Geographe Bay.
Buayanup River Catchment	The property lies within the Buayanup Catchment and the Vasse-Wonnerup Wetlands and Geographe Bay Water Quality Improvement Program (Geographe WQIP) 2010.	Surface water quality is a key issue in the Geographe catchment to protect the outstanding ecological, social and cultural values of Geograpghe Bay. Buayanup Catchment is classified as an Intervention area where preventing phosphorus rising and reducing nitrogen levels are required. Point source of nutrients contribute significant portions of the load.
Groundwater	The premises is located in the Busselton Capel Groundwater area proclaimed under the RIWI Act. Depth to groundwater encountered at approximately 0.5 m – 2.5 m (based on information from DWER Reference bore BN31S Busselton Shallow, Site ID 61030093, Perth Superficial aquifer). The bore is located 800 m to the south of the Premise boundary. Groundwater flow is generally south to north flowing towards the waterways that intersect the landscape. 911 m north GWL181512 Perth Superficial GWL 1700 m north GWL99410 Perth Superficial GWL 860 m south GWL62242 Perth Superficial GWL	Superficial groundwater system linked to surface water, due to the nature of the lithology (clay confining layer). Significant conservation wetlands located 1.7 km downstream on waterway. Groundwater is part of the Busselton Capel Groundwater Management Area where DWER licenses the superficial aquifer for use. Beneficial uses: • Non potable uses • Agriculture uses • Recreational uses.

8.5 Soil type

Table 16 details soil types and characteristics relevant to the assessment.

Table 16: Soil and sub-soil characteristics

Groundwater and water sources	Distance from Premises	Environmental Value
Abba Flats unit consists of flats and low rises with sandy grey brown duplex. Typically weathered sand over clay loam to hard laterite rubble.	Abba flats extend north and south of the Premises.	Soil type is prone to seasonal waterlogging, entire site is classified as a palusplain wetland.
Moderate to low risk ASS		

The soils beneath the irrigation area are weathered sands over clay loam to laterite rubble. No soil test pits have been provided to define the soil profile and the depths of the soil strata. The Applicant states that the sandy soil depths on the irrigation site range from 1.4 to over 2 m deep.

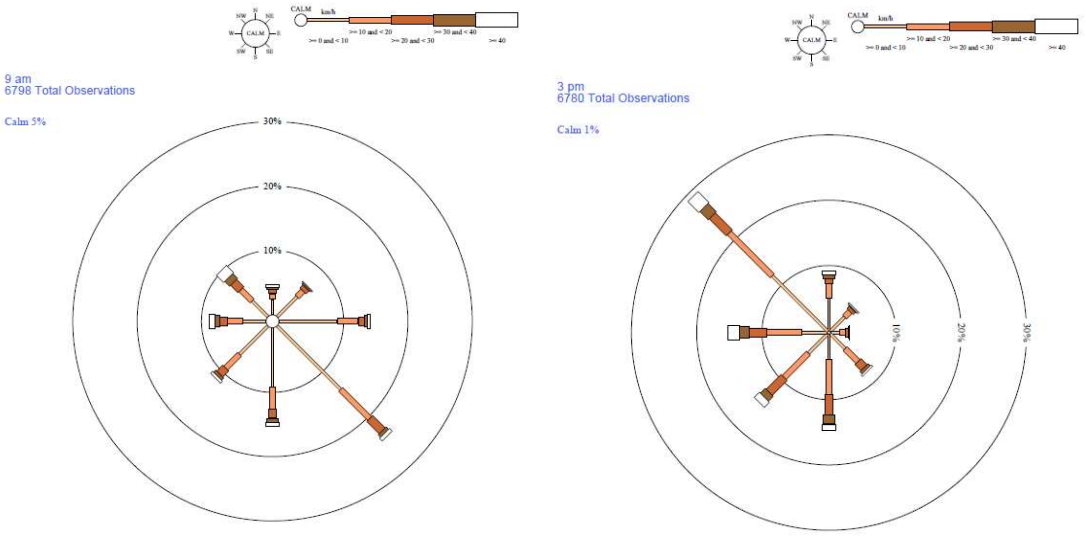
It is noted that the proposed irrigation area was used for crops in the past and may have nutrient residual levels. No PBI testing results have been provided by the Applicant. Residual nutrients levels in the soil have not been provided by the Applicant.

8.6 Meteorology

8.6.1 Wind direction and strength

Annual wind roses were produced for the Busselton area from Busselton weather station 009515.

Figure 7: shows the wind direction and strength for 9am and 3pm at Busselton Shire station (Site 009515).



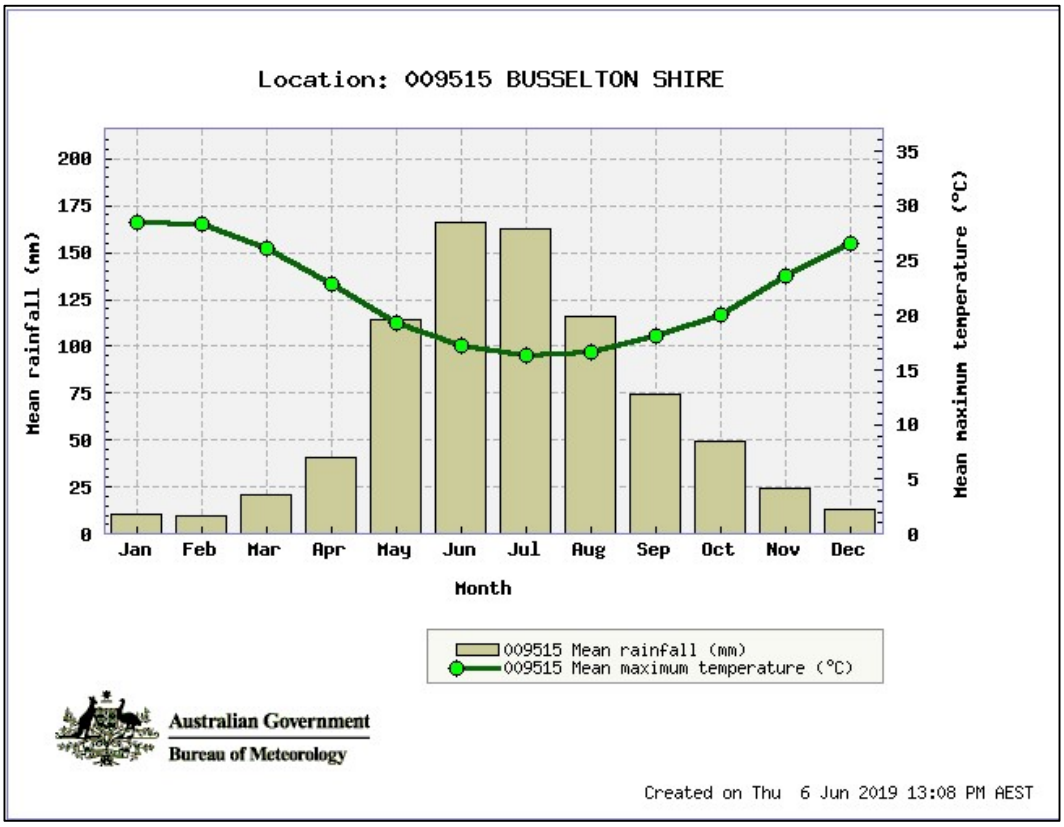
8.6.2 Regional climatic aspects

The region experiences cool, wet winters and warm dry summers. The nearest Bureau of Meteorology site is 13.1 km north east of the premises at the Busselton Shire site (009515) and Jindong (009978) estimated to be within 5 km of the site. It is noted that Jindong station only has rainfall data.

8.6.3 Rainfall and temperature

The average yearly rainfall and maximum temperature for Busselton (009515) weather station is shown in Figure 8. The highest temperatures occur between December to March with the average monthly temperatures ranging from 16.3^{o}C to 28.5^{0}C. Rainfall predominately occurs from May to October. The Bureau of Meteorology pan-evaporation levels for the Jindong region indicate that rainfall exceeds evaporation between May to September inclusive.

Figure 8: illustrated the rainfall and temperature for Busselton Shire station (Site 009515).



Jindong (009978) weather station is located closer to the premises but only has rainfall data. The total average annual rainfall is 775.70 mm. The Jindong rainfall data has been used to assess the water balance analysis in section 10.5.2. A statistical summary of Jindong rainfall station is outlined in Figure 9.

Figure 9: illustrates the rainfall at Jindong weather station for rainfall, 2002 to 2019.

Station: Jindong | Number: 9978 | Opened: 2002 | Now: Open
Lat: 33.76° S | Lon: 115.21° E | Elevation: 42 m | Details

No highlight

Key: Units are millimetres. *12.3* = Not quality controlled.
Period for calculating statistics: All years | 1961-1990

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Graph													
2002					111.4	116.2	149.6	137.6	68.8	66.6	20.4	0.0	
2003	3.6	2.2	0.2	0.2	112.6	124.2	137.0	119.8	135.8	36.4	22.2	1.2	695.4
2004	0.0	9.6	10.8	28.2	144.6	157.8	135.8	151.8	44.4	33.0	38.2	3.8	758.0
2005	0.6	1.0	29.2	69.0	160.6	226.6	102.4	126.0	112.6	81.6	32.0	15.4	957.0
2006	46.6	1.2	18.8	22.0	25.2	69.4	103.0	158.0	48.4	31.6	34.6	4.0	562.8
2007	18.2	15.0	31.8	49.6	46.0	114.4	247.2	155.4	134.6	57.0	6.6	28.0	903.8
2008	0.4	2.6	11.6	101.0	153.2	114.2	191.6	26.6	63.4	43.6	58.6	12.2	779.0
2009	0.6	5.2	9.6	1.8	83.8	278.6	192.4	104.2	133.8	10.0	79.0	1.0	900.0
2010	1.6	1.0	4.4	8.6	76.4	64.0	131.4	88.0	34.6	13.4	25.6	10.6	459.6
2011	52.0	0.0	0.4	68.0	65.0	118.4	147.2	116.6	101.4	27.2	49.6	12.6	758.4
2012	1.4	14.0	0.0	45.8	84.0	200.8	73.0	87.6	151.0	37.6	59.6	26.2	781.0
2013	3.4	1.2	20.2	36.2	204.0	87.4	164.4	169.2	156.2	20.8	42.8	2.2	908.0
2014	2.2	0.4	23.2	8.8	135.2	105.8	151.2	115.0	78.2	16.6		0.0	
2015	0.0	0.0		77.2	175.0	122.8	142.4	92.8			5.6	5.4	
2016	0.0	2.4	32.8	43.4	147.8	127.4	204.2	182.0	82.4	47.8	5.4	22.2	897.8
2017	1.6	26.2	63.8	0.4	65.2	70.6			80.6	37.2	16.4	36.8	
2018	25.6	1.0	14.8	8.6	112.6	145.4	160.8	164.6	29.4	37.0	8.0	15.2	723.0
2019	30.0		23.4	27.6	35.2	245.2	109.0						

2002 Go View a year of daily data

Summary statistics for all years Information about climate statistics

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	11.0	5.2	18.4	35.1	107.7	138.3	149.6	124.7	91.0	37.3	31.5	11.6	775.7
Lowest	0.0	0.0	0.0	0.2	25.2	64.0	73.0	26.6	29.4	10.0	5.4	0.0	459.6
5th %ile	0.0	0.0	0.2	0.4	33.7	68.6	96.5	72.3	33.3	12.6	5.6	0.0	521.5
10th %ile	0.0	0.2	0.3	1.2	42.8	70.2	102.8	87.8	39.5	15.0	6.1	0.6	589.3
Median	1.6	1.7	16.8	28.2	112.0	120.6	147.2	122.9	81.5	36.7	28.8	10.6	779.0
90th %ile	36.6	14.5	32.3	72.3	164.9	232.2	197.1	166.9	143.4	61.8	59.1	26.9	907.2
95th %ile	47.7	17.8	40.5	82.0	179.4	250.2	212.8	172.4	152.3	70.3	64.4	29.8	927.6
Highest	52.0	26.2	63.8	101.0	204.0	278.6	247.2	182.0	156.2	81.6	79.0	36.8	957.0

9. Risk assessment

9.1 Determination of emission, pathway and receptor

In undertaking its risk assessment, DWER will identify all potential emissions pathways and potential receptors to establish whether there is a Risk Event which requires detailed risk assessment.

To establish a Risk Event there must be an emission, a receptor which may be exposed to that emission through an identified actual or likely pathway, and a potential adverse effect to the receptor from exposure to that emission. Where there is no actual or likely pathway and/or no receptor, the emission will be screened out and will not be considered as a Risk Event. In addition, where an emission has an actual or likely pathway and a receptor which may be adversely impacted, but that emission is regulated through other mechanisms such as Part IV of the EP Act, that emission will not be risk assessed further and will be screened out through Table 19.

The identification of the sources, pathways and receptors to determine Risk Events are set out in Tables 17 and 18 below.

Table 17. Identification of emissions, pathway and receptors *during construction*

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		**Potential emissions**	**Potential receptors**	**Potential pathway**	**Potential adverse impacts**		
Construction, mobilisation and positioning of infrastructure	Vehicle movements on access roads	Noise	Five farmsteads are located 1 to 1.6 km from the edge of the proposed irrigation areas, in all directions	Air / wind dispersion	None	No	The Delegated Officer considers that the separation distance between the source and potential receptors is sufficient. Noise and fugitive dust emissions from the construction of the WWTP and irrigation are not expected to be significant and will likely to be of short duration and are unlikely to cause any amenity impacts. The EP Noise Regulations apply to noise emissions.
		Dust			None	No	
	Construction of irrigation and wastewater treatment infrastructure	Noise		Air / wind dispersion	None	No	
		Dust			None	No	

Table 18: Identification of emissions, pathway and receptors during operation

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
Alcoholic beverage manufacturing	Beer manufacturing and packaging	Noise	Five farmsteads are located 1 to 1.6 km from the edge of the proposed irrigation areas, in all directions	Air / wind	Amenity impacts	No	The closest sensitive receptor is over 1 km away however the Delegated Officer considers that noise emissions produced by the brewery are not detectable outside of the brew house. The activities of beer production are housed within an enclosed shed with minimal noise being transmitted beyond the brew shed. DWER has not received any noise complaints regarding noise emissions during their two year operations.
		Odour				No	The closest receptor is over 1 km away from the brewery however the Delegated Officer considers that odour emissions produced by the brewery are not detectable outside of the brew house. The activities of beer production are housed within an enclosed shed with sufficient airflow and ventilation. DWER has not received any odour complaints regarding odour emissions during their two year operations.

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
		Contaminated stormwater and leachate from solid brewery waste	Tributaries of the Buayanup River located 95 m from brewery shed and supporting tanks. Groundwater beneath the premises has not been verified. Groundwater may fluctuate between 0.5 – 2.5 mbgl (see 6.5)	Direct infiltration through soils to groundwater Overland flow to Buayanup River.	Amenity and health impacts to groundwater users, groundwater dependent ecosystems and deterioration of local groundwater and quality of multiple use wetland. Contamination of water in Buayanup river and associated impacts on flora and fauna and conservation wetland ecosystems downstream.	No	Brewery is designed to prevent stormwater entering the facility. Waste is stored within the brewing shed on a raised concrete floor. Waste is stored under cover until removed for cattle feed or placed outside into compost bins. Wastewater drainage within the shed is directed to a drain and collection sump for transfer to the WWTP.
		Spills and leaks of beer from processing and packing	Tributaries of the Buayanup River located 95 m from brewery shed and supporting tanks. Groundwater beneath the premises has not been verified. Groundwater may fluctuate between 0.5 – 2.5 mbgl (see 6.5)	Direct infiltration through soils to groundwater Overland flow to Buayanup River.	Amenity and health impacts to groundwater users, groundwater dependent ecosystems and deterioration of local groundwater and quality of multiple use wetland. Contamination of water in Buayanup River.	No	Brewery is designed to prevent contaminated wastewater from exiting the facility. Waste is stored within the brewing shed on a raised concrete floor. Waste is stored under cover until removed for cattle feed or placed outside into compost bins. Wastewater within the shed drains into the main drainage channel and collected into the sump for transfer to the WWTP.

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
Storage and treatment of wastewater and disposal of treated wastewater and solids	Treatment of brewery wastewater	Odour	Owner's residence is within 260 m of the irrigation site. No other external residences or other sensitive receptors in close proximity. (Five farmsteads are located 1 to 1.6 km from the edge of the proposed irrigation areas, in all directions.)	Air / wind dispersion	Amenity	No	No receptor present
		Storage and treatment of wastewater from the brewery including rupture of pipes, overtopping of holding tanks and disposal of solids generated from wastewater.	Vegetation adjacent to discharge area. Tributaries of the Buayanup River located 95 m from brewery shed and supporting tanks. Groundwater beneath the premises has not been verified. Groundwater may fluctuate between 0.5 – 2.5 mbgl (see 6.5)	Direct infiltration through soils to groundwater Overland flow to Buayanup River	Amenity and health impacts to groundwater users, groundwater dependent ecosystems and deterioration of local groundwater and quality of multiple use wetland. Contamination of water in Buayanup River.	No	Brewery is designed to prevent contaminated wastewater from exiting the facility. Waste is stored within the brewing shed on a raised concrete floor. Waste is stored under cover until removed for cattle feed or placed outside into compost bins. Wastewater within the shed drains into the main drainage channel and collected into the sump for transfer to the WWTP. Wastewater tanks connecting pipes are fitted with 2 inch PVC pipelines with a non-return valves. Applicant controls are sufficient.

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
	Irrigation of treated wastewater	Treated wastewater to land	Groundwater dependent ecosystems Riparian ecosystems and water quality	Direct infiltration through soils to groundwater Overland flow to Buayanup River	Amenity and health impacts to groundwater users, groundwater dependent ecosystems and deterioration of local groundwater and quality of multiple use wetland. Contamination of water in Buayanup River and associated impacts on flora and fauna and conservation wetland ecosystems downstream.	Yes	See Sections 6.1, 6.2, 6.3, 6.4 and 6.5
	Compost of solids	Odour (from decomposing waste)	Owner's residence is within 260 m of the irrigation site. No other external residences or other sensitive receptors in close proximity. (Five farmsteads are located 1 to 1.6 km from the edge of the proposed irrigation areas, in all directions.)	Air / wind dispersion	Amenity	No	The closest receptor is over 1 km away from the brewery however the Delegated Officer considers that odour emissions produced by the compost are not detectable outside of the compost tumblers. The activities of composting are small and housed within an enclosed compost tumbler. DWER has not received any odour complaints regarding odour emissions during their two year operations.
		Nutrient rich solids / leachate from storage compost containers	Tributaries of the Buayanup River located 95 m from brewery shed and supporting tanks. Groundwater beneath the premises has not been verified. Groundwater may fluctuate between 0.5 – 2.5 mbgl (see section 6.5)	Direct discharge to land	Land and soil contamination. Contamination of surface water quality in the Buayanup River with elevated BOD and nutrients. Groundwater contamination	No	Compost will be placed into confined containers and a small volume of compost will be produced, minimising risk to the environment.

9.2 Consequence and likelihood of risk events

A risk rating will be determined for risk events in accordance with the risk rating matrix set out in Table 19 below.

Table 19: Risk rating matrix

Likelihood	Consequence				
	Slight	Minor	Moderate	Major	Severe
Almost certain	Medium	High	High	Extreme	Extreme
Likely	Medium	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	Extreme
Unlikely	Low	Medium	Medium	Medium	High
Rare	Low	Low	Medium	Medium	High

DWER will undertake an assessment of the consequence and likelihood of the Risk Event in accordance with Table 20 below.

Table 20: Risk criteria table

Likelihood		Consequence		
The following criteria has been used to determine the likelihood of the Risk Event occurring.		The following criteria has been used to determine the consequences of a Risk Event occurring:		
			Environment	Public health* and amenity (such as air and water quality, noise, and odour)
Almost Certain	The risk event is expected to occur in most circumstances	Severe	• **onsite impacts**: catastrophic • **offsite impacts local scale**: high level or above • **offsite impacts wider scale:** mid-level or above • Mid to long-term or permanent impact to an area of high conservation value or special significance^ • Specific Consequence Criteria (for environment) are significantly exceeded	• Loss of life • **Adverse health effects:** high level or ongoing medical treatment • Specific Consequence Criteria (for public health) are significantly exceeded • **Local scale impacts:** permanent loss of amenity
Likely	The risk event will probably occur in most circumstances	Major	• **onsite impacts**: high level • **offsite impacts local scale**: mid-level • **offsite impacts wider scale**: low level • Short-term impact to an area of high conservation value or special significance^ • Specific Consequence Criteria (for environment) are exceeded	• **Adverse health effects:** mid-level or frequent medical treatment • Specific Consequence Criteria (for public health) are exceeded • **Local scale impacts**: high level impact to amenity
Possible	The risk event could occur at some time	Moderate	• **onsite impacts**: mid-level • **offsite impacts local scale**: low level • **offsite impacts wider scale**: minimal • Specific Consequence Criteria (for environment) are at risk of not being met	• **Adverse health effects:** low level or occasional medical treatment • Specific Consequence Criteria (for public health) are at risk of not being met • **Local scale impacts:** mid-level impact to amenity
Unlikely	The risk event will probably not occur in most circumstances	Minor	• **onsite impacts**: low level • **offsite impacts local scale**: minimal • **offsite impacts wider scale**: not detectable • Specific Consequence Criteria (for environment) likely to be met	• Specific Consequence Criteria (for public health) are likely to be met • **Local scale impacts:** low level impact to amenity
Rare	The risk event may only occur in exceptional circumstances	Slight	• **onsite impact**: minimal • Specific Consequence Criteria (for environment) met	• **Local scale**: minimal to amenity • Specific Consequence Criteria (for public health) met

^ Determination of areas of high conservation value or special significance should be informed by the *Guidance Statement: Environmental Siting.*

* In applying public health criteria, DWER may have regard to the Department of Health's *Health Risk Assessment (Scoping) Guidelines.*

"onsite" means within the Prescribed Premises boundary.

9.3 Acceptability and treatment of Risk Event

DWER will determine the acceptability and treatment of Risk Events in accordance with the Risk treatment table 21 below:

Table 21: Risk treatment table

Rating of Risk Event	Acceptability	Treatment
Extreme	Unacceptable.	Risk Event will not be tolerated. DWER may refuse application.
High	May be acceptable. Subject to multiple regulatory controls.	Risk Event may be tolerated and may be subject to multiple regulatory controls. This may include both outcome-based and management conditions.
Medium	Acceptable, generally subject to regulatory controls.	Risk Event is tolerable and is likely to be subject to some regulatory controls. A preference for outcome-based conditions where practical and appropriate will be applied.
Low	Acceptable, generally not controlled.	Risk Event is acceptable and will generally not be subject to regulatory controls.

9.4 Risk Assessment – Irrigation of treated wastewater

9.4.1 Description of Emissions to Lands (wastewater irrigation)

Seepage / leaching of treated wastewater through the soil into the saturated zone of the seasonal aquifer below the site due to excessive irrigation. Once in the groundwater, contaminates migrate down the hydraulic gradient towards the Buayanup River tributaries.

Impacts and risks to receptors include amenity and health impacts to groundwater water and surface water users, contamination of local groundwater and deterioration of local surface water quality affecting ecosystem health at the premise and downstream of premise.

9.4.2 Identification and general characterisation of emission

There is potential for irrigated wastewater from the WWTP to enter the environment if the irrigation of the wastewater from nutrient enriched water and time of application is not managed to best management standards.

The applicant has applied for a theoretical production capacity of 860kL/year for beer production. Based on the applicant's wastewater recycle reduction, annual theoretical wastewater provided is 2,580.24 kL/year, or 7.07 kL per day.

The Applicant used WQPN 22 (DoW 2008) to evaluate nutrient management limits for irrigation. The applicant projected nutrient loading rates on the post treatment in comparison to DoW WQPN 22, they are as follows in Table 22.

Table 22: Projected nutrient loading rates from Applicant.

DoW 2008 WQPN 22 Risk Category A	Maximum reactive nitrogen addition loading rate	Maximum reactive phosphorus addition loading rate	
	140 kg/ha/yr	10 kg/ha/year	
Applicants Projected Rates	Nitrogen loading rate	Phosphorus loading rate	BOD loading rate
	15.26 kg/ha/year	25.95 kg/ha/year 8.45 kg/ha/yr[1]	1.77 kg/ha/year

[1] This loading rate is based on an annual harvest of lucerne hay or sorghum per year. Estimated 8.75tons/year, with 2 kg of phosphorus removed per ton, results in 17.57 g of phosphorus removed each year (25.95-17.57 =8.45).

The total phosphorus rate exceeds the WQPN22 phosphorus loading rate. The Applicant has calculated that an annual harvest of lucerne hay or sorghum will remove 17.57 kg of phosphorus per year. This is based on an 8.75 tonne harvest, where 2 kg of phosphorus is removed for every tonne. The department agrees that harvesting will removed phosphorus that is applied to the crop. However, this is dependent on nutrients in the wastewater being applied at the time of plant growth for maximum absorption and that the residue phosphorus in the soil has been accounted for. The applicant irrigation scheme is based on daily irrigation, other than days where rainfall is above 10 mm. The proposed irrigation schedule will be applied at times when the crop is not growing and when rainfall exceeds evaporation allowing unused nutrients to be leached through the soil profile. Additionally no soil testing for nutrient residual levels has been provided for the irrigation area. This should be considered as the irrigation area has been a cropping paddock for a long period (from Applicant) and is likely to have residue nutrient levels within the soil available for plant growth.

The Applicant has provided calculations for determining the land area required for wastewater scheme and for determining the land area required for the uptake of nitrogen by irrigated crops from the Draft Guidance on the Establishment and Management of Irrigation Schemes for the Land Disposal of Wastewater (DWER 2018). Results were 0.19 ha and 0.39 ha and calculated on a 34 and 36 week irrigation schedule respectively. The department's water balance review recommends a 31 week irrigation schedule and calculates 0.208ha and 0.456 ha (respectively). The Applicant has 3.38 ha for irrigation (2.26 ha for paddock irrigation and 0.92 ha tree line irrigation). See Appendix 4 for the departments water balance.

The Applicants water balance was based on the following theory "*appropriately 99% of the water absorbed by plants is equal to the evaporation from the plants surface*. *The water requirements for crops is equal to the evapotranspiration requirement.*" The Applicant used this theory and the Irrigation Calculator from the Department of Primary Industries and Regional Development (DPIRD) to develop RRBC water balance. Key elements of the applicant's water balance that are subject to inaccuracy are:

- The Applicant used the DPIRD irrigation calculator which is based on clean water irrigation, not irrigation of wastewater (fertigation) as is the case. Nutrient seepage through the soil profile and growth rates of plants need to be considered for fertigation as outlined by DWERs water balance and fertigation calculation methods (see WQPN 22 and DWER's fertigation guideline).
- The irrigate schedule is based on all year irrigation of wastewater, other than days that receive over 10 mm of rainfall. Seepage of nutrients in saturated soils when rainfall exceeds evaporation should be considered. Data collected from the Busselton and Jindong Bureau of Meteorology weather stations (see section 8.6.3), demonstrate that evaporation exceeds rainfall for the months October to April inclusive.

- The Applicants water balance storage requirements comprised of 122 kL consisting of 5 kL pH buffer tank, 97 kL aeration tank and 20 kL storage tanks. The Applicants available storage included the treatment tanks (5 kL pH buffer tank and 97 kL aeration tank), therefore including treated and untreated wastewater as storage. Including the treated and untreated tanks for storage will impact on production capacity as beer product could only be produced when the tanks were not in use for storage.
- The irrigation schedule is based on winter and early spring irrigation when the groundwater table is likely to be high. DWERs Bore 61030093 (see section 6.5) indicates that groundwater is likely to have a seasonal movement between 0.5 to 2.5 mbgl at the irrigation sites. No soil test pits or piezometers at the irrigation sites have been established to validate soil depths and groundwater movements. It is noted that WQPN 22 (DoW 2008) states that irrigation should not occur on land that has a minimum two metre vertical separation (recommendation 17). Furthermore, the entire Premises is located on a classified multiple use palusplain. Palusplain's are a type of wetland located on an area of flat land that is seasonally waterlogged (DWER 2019).

Irrigation of wastewater should be limited in areas that have perched groundwater tables and be limited to ensure that a minimum groundwater depth is maintained to protect aerobic conditions in the soil and prevent waterlogging (DoW 2010).

The water balance and storage of the WWTP should be calculated based on no winter irrigation and when groundwater has sufficiently fallen to limit negative effects on soil microbial conditions. Based on DWER reference bore 61030093 (see section 6.5) groundwater can remain high up to 0.5mbgl and fall below 1.5 mbgl between October to December.

DWER has calculated a water balance for RRBC based on the Applicants request for assessment at 860 kL design production capacity (see Appendix 4 for water balance). Storage volume requirement was 5,350 kL. Furthermore the department has calculated a water balance on their current usage of 240 kL/year, the storage requirements was 5,040 kL.

9.4.3 Description of potential adverse impact from the emission

High levels of nutrients (including nitrogen and phosphorus), chemicals, organic content, BOD, TDS, TSS and low pH in wash down water, wastewater or contaminated stormwater could lead to contamination of land, soil, groundwater and surface water and potentially affect wetland native vegetation adjacent to the Premises and the water quality in the Buayanup River including downstream conservation wetlands.

The two proposed irrigation sites are between two Buayanup River tributaries, they are located 90 m east and 85 m west of the irrigation areas. The Busselton Superficial Groundwater Aquifer is a proclaimed groundwater area under the RIWI Act 1914 and is seasonally high on the premises. All surface and groundwater runoff will head towards the Buayanup River tributaries due to the nature of the sites hydrogeology. The entire premise including the irrigation sites are classified as a multiple use palusplain wetland. Indicating that groundwater is seasonally perched. There are conservation palusplain wetlands along Buayanup River 1.7 km and 1.3 km downstream. Depth to groundwater at the premises ranges from 0.5 to 2.5 mbgl and is considered to be waterlogged for winter irrigation purposes. See sections 6.2, 6.3 and 6.4 for further information.

The Vasse Wonnerup Water Quality Improvement Plan (DoW 2010), lists the Buayanup River as an Intervention water quality catchment. Water quality objectives are to prevent increases in phosphorus levels from rising and to reduce current nitrogen loading levels. Irrigation of nutrient enriched wastewater in winter and / or at times when active plants are not growing, will allow nitrogen and phosphorus to leach below the root zone and leach into the groundwater and surface waters of the Buayanup River tributaries and therefore increasing nitrogen and phosphorus loads into Buayanup River and its discharge point Geographe Bay.

9.4.4 Criteria for assessment

The wastewater quality for ANZECC (2000) guidelines for primary industries are considered appropriate assessment criteria to determine the acceptability of the quality of wastewater used for disposal to the irrigated lands. Table 23 outlines the criteria for assessment.

Table 23: Criteria for assessment, ANZECC (2000) guidelines for primary industries.

	pH	Conductivity (EC) dS/m)	Total Dissolved Salts (mg/L)	TSS (mg/L)	TDS (mg/L)	BOD (mg/L)	COD (mg/L)	TP (mg/L)	TN (mg/L)
[1]ANZECC 2000-Primary Industries	5.5-9.0	1.3-2.9 Moderate tolerant crops	<3	<40		<15	<40	0.8 – 12[a]	25-125[a]

[1] National Water Quality Management Strategy Paper No. 4 – Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 3 Primary Industries, 2000, ARMC and ANZECC. (Recommended values for irrigation to maintain soil health, maximise plant growth and minimise effects on the environment.)

[a]ANZECC 2000, Requires site specific assessment to determine actual value.

9.4.5 Applicant controls

This assessment has reviewed the controls set out in Table 24 below.

Table 24: Applicant's proposed controls for Wastewater Irrigation

Site infrastructure	Description	Operation details	Reference to issued licence plan
Controls for Emissions to Land Effluent Irrigation			
Irrigation of treated wastewater	Irrigation is via a K Line pod sprinkler and inline drip irrigation	Low pressure transportable sprinkler Sprinkler delivery of 1 mm hour Sprinkler checked once a day No irrigation on days with over 10 mm rainfall events 80 m away from the nearest waterway Wastewater will be distributed evenly Irrigation will be applied to maintain healthy vegetation coverage	*Figure 3 Farm Master Plan*

9.4.6 Key findings

The Delegated Officer has reviewed the information regarding Emission to Lands Wastewater Irrigation and has found:

1. **The irrigation areas are located on a multiple use palusplain, which is likely to have a high water table during the winter to spring months (see section 6.3). Leaching of nutrients beyond the root zone, through the soil profile and into the groundwater and surface water is likely.**
2. **The Applicant proposes to irrigate wastewater throughout the course of the year, excluding days with greater than 10mm rainfall. Therefore intending to irrigate when rainfall exceeds evaporation.**
3. **The Applicant does not demonstrate how irrigation of the wastewater will be carried out in a manner that ensures the nutrients applied match the seasonal growth needs to the irrigated crop. The application of nutrients in exceedance of vegetation growth needs, leads to the loss of nutrients to the surrounding environment.**
4. **In accordance with WQPN 22 and DWER guideline (2018) wastewater irrigation should not occur at times when plants cannot effectively use available nutrients. This includes during seasonal rainfall periods, dormancy periods or when key soil trace elements are low. These factors have not been considered in the proposed irrigation schedule.**
5. **The Applicant has insufficient storage facility to manage and store wastewater during wet winter periods when irrigation is not possible. The applicant has a current storage capability of 2.8 days when not irrigating.**

9.4.7 Consequence

If surface and groundwater contamination occurs due to irrigation, then the Delegated Officer has determined that local scale impacts could occur causing mid-level impacts to the beneficial users of the groundwater and eutrophication levels of the surface water. Specific criteria, Guidelines for Fresh and Marine Water Quality (2000) and Vasse Wonnerup Water Quality Improvement Plan (DoW 2010) may not be met. Therefore, the Delegated Officer considers the consequences of the Risk Event to be **Moderate**.

9.4.8 Likelihood of Risk Event

Taking into account the proximity to sensitive water resource receptors, the soil type, the irrigation area, the likely shallow seasonal groundwater level and the nutrient levels in the pre-treated wastewater. The Delegated Officer has determined that the likelihood or surface or groundwater nutrient contamination occurring due to irrigation of wastewater will probably occur in most circumstances. Therefore the Delegated Officer considers the likelihood of the risk event or each receptor type to be **Likely.**

9.4.9 Overall rating of Emission to Lands Wastewater Irrigation

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 18) and determined that the overall rating for the risk of surface and groundwater nutrient contamination due to irrigation is **High**.

9.5 Summary of acceptability and treatment of Risk Events

A summary of the risk assessment and the acceptability or unacceptability of the risk events set out above, with the appropriate treatment and control, are set out in Table 25 below. Controls are described further in section 10.

Table 25: Risk assessment summary

	Description of Risk Event			Applicant controls	Risk rating	Acceptability with controls (conditions on instrument)
	Emission	**Source**	**Pathway/ Receptor (Impact)**			
1..	**Nutrient rich wastewater**	Irrigation of wastewater to land (pasture)	Infiltration through soil and overland runoff causing ground and surface water contamination and palusplain wetland eutrophication.	See Table 24	Moderate consequence Likely **High risk**	Acceptable subject to proponent controls conditioned and regulatory controls conditioned

10. Regulatory controls

10.1 Licence controls

The Delegated Officer intends to grant the Licence, although specifically exclude the irrigation of brewery wastewater to land via irrigation in winter as proposed by the Applicant.

10.1.1 Works installation of groundwater monitoring bores

Two new groundwater monitoring bores to be drilled to monitor nutrient movements through the superficial groundwater to monitor up and down gradient of the irrigation area (see Schedule 3, Figure 10).

The Delegated Officer considers that the monitoring of groundwater will provide compliance data for the Premises operation, including the management and maintenance of infrastructure controls and land application of wastewater.

The two new bores must be installed within Lot 2370 on Plan 203036 in accordance with the licence issue data. The new bores preferably be sited in accordance with ASTM D5092/D5092M-16: Standard practice for design and installation of groundwater monitoring bores.

The new groundwater monitoring bores must be installed to meet the requirements ASTM D5092/D5092M-16.

a. The new groundwater monitoring bores must be sited and installed as follows:
    i. MB1 and MB2 (superficial groundwater) have screened intervals from 0.5 to 3.0 mbgl.
    ii. MB1 and MB2 superficial bores are located up and down gradient of the irrigation area as indicated on Figure 10, Schedule 3.
    iii. all bores surveyed to Australian Height Datum.
    iv. bores MB1 and MB2 will require thorough bentonite clay compaction above the screening to the surface to ensure surface flow does not contaminate the bores.

Note: Requirements are derived from CEO requirements.

Grounds: The Delegated Officer considers that monitoring is an essential assessment of the effectiveness of control, to protect the environment.

Ground monitoring is considered essential to detect leaching of nutrients from the irrigation activities before nutrients enter the Buayanup River Tributaries. The detection of nutrient movements through the groundwater can assist in determining if nutrients are leaching beyond the root zones. Groundwater monitoring sites within the landscape are an effective tool that can reflect the nutrient contributions from the surrounding land use. The groundwater monitoring is key to demonstrating that any water quality spikes are reflective of the immediate land use and not from adjacent land use activities. Furthermore, the two bores located at either gradient end of the lot will assist in determining groundwater levels throughout the year. The monitoring of the bores are required to ensure that the land use activities are not polluting a water quality resource that is used by other stakeholders and licenced by DWER under the Rights to Water and Irrigation Act 1914.

10.1.2 Works installation of volumetric flow meter

A volumetric flow meter is required to be placed on the outgoing pipe from the irrigation tank (the second 10 kL storage tank) to the irrigation paddock.

Note: Requirements are derived from CEO requirements.

Grounds: The Delegated Officer considers that volumetric flow meter is an essential infrastructure component to accurately determine and verify irrigation volumes, to calculate contaminant loading rates for annual fees and to facilitate determination of compliance with nutrient loading rate limits.

10.1.3 Wastewater irrigation infrastructure, operation and equipment

The following environmental controls, infrastructure and equipment should be maintained and operated onsite for irrigation management:

Table 26: infrastructure and equipment requirements

Site infrastructure and equipment	Specified requirements
Irrigation equipment including a K Line pod sprinkler and inline drip irrigation and two 10kL storage tanks (described as post settling tank and irrigation tank within licence).	(a) as from 30 April 2021, no irrigation over the months of June, July and August may occur; (b) wastewater must be treated in the wastewater treatment system, which includes pH buffering, aerobic treatment and settling, prior to discharge to land; (c) only treated wastewater from the final storage tank in the WWTP is irrigated; (d) no irrigation generated run-off, spray drift or discharge occurs beyond the boundary of the Premises; (e) irrigation is not undertaken when rainfall is imminent, during or immediately after a rainfall event; (f) wastewater is evenly distributed over the irrigation area and that no ponding or pooling occurs; (g) irrigation does not occur on land that is waterlogged; (h) there are daily visual inspections of the irrigation area; (i) no irrigation more than once in any 24hour period; (j) vegetation in the irrigation area A1 is harvested every 12 months; (k) no livestock is permitted to graze the irrigation area; (l) no soil erosion occurs, and

Site infrastructure and equipment	Specified requirements
	(m) vegetation cover is maintained over the irrigated area.

Note: Requirements are derived in part from the Application and CEO requirements.

Grounds: The Delegated Officer considers that the operation, management and maintenance of infrastructure are necessary to minimise the risk of discharges to land. (See Section 9.4 for further information.) Operational requirements have been included which are designed to ensure the capacity of the system is maintained and responsibility for preventing discharge from the system lies with the Applicant.

10.1.4 Winter irrigation management plan

A Winter Irrigation Management Plan be submitted by 28 February 2021 that considers the following criteria:

i. plans for additional wastewater storage and/or evaporation that will allow for wastewater to be stored for not less than 60 days when irrigation is not possible due to waterlogging conditions or when wastewater is in excess to the pasture or vegetation needs;

ii. details of proposed management measures to manage winter irrigation that considers environmental factors such as soil moisture, precipitation, pan evaporation and evapotranspiration data and crop factors;

iii. options for cropping or managing vegetation to increase water and nutrient uptake over winter;

iv. options for irrigation infrastructure to increase evaporation, provide even distribution and to avoid overwatering, and

v. measuring, monitoring and reporting in respect to the Winter Irrigation Management Plan.

Note: CEO requirements.

Grounds: The Delegated Officer considers that a Winter Irrigation Management Plan is essential to derive effective controls to protect the environment and to demonstrate compliance.

10.1.5 Monitoring reporting requirements

Monitoring and reporting of the volume of monthly beer production, wastewater production and irrigation is required. In addition monitoring of ground and surface water sites for the detection of leaching of nutrient and infrastructure and operational control compliance.

Note: CEO requirements.

Grounds: The Delegated Officer considers that clear presentation of data in monitoring reports is essential in the effectiveness of controls to protect the environment and to demonstrate compliance. Reporting the brewery inputs and outputs will validate the premises production volumes and controls.

11. Determination of Licence conditions

The conditions in the issued Licence in Attachment 1 have been determined in accordance with the *Guidance Statement: Setting Conditions*.

The *Guidance Statement: Licence Duration* has been applied and the issued licence expires in 20 years from date of issue.

DWER notes that it may review the appropriateness and adequacy of controls at any time and that, following a review, DWER may initiate amendments to the *licence* under the EP Act.

12. Applicant's comments

The Applicant provided comments on the draft decision report and licence on the 25 May and 5 June 2020. These comments with DWERs response has been summarised within Appendix 2-Summary of applicant's comments on risk assessment and draft conditions.

13. Conclusion

This assessment of the risks of activities on the Premises has been undertaken with due consideration of a number of factors, including the documents and policies specified in this Decision Report (summarised in Appendix 1).

Based on this assessment, it has been determined that the Issued Licence will be granted subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

Caron Goodbourn
Manager, Process Industries
Delegated Officer
under section 20 of the *Environmental Protection Act 1986*

Appendix 1: Key documents

	Document title	In text reference	Availability
1.	DoW, 2010. *Glossary: P* (Palusplain definition). Department of Water, Perth.	DWER 2019	Department of Water intranet: http://intranet.water.local/Office+tools/Manuals+and+handbooks/Glossary/P/default.aspx
2.	DER, July 2015. *Guidance Statement: Regulatory principles.* Department of Environment Regulation, Perth.	-	accessed at www.dwer.wa.gov.au
3.	DER, October 2015. *Guidance Statement: Setting conditions.* Department of Environment Regulation, Perth.		
4.	DER, February 2017. *Guidance Statement: Risk Assessments*. Department of Environment Regulation, Perth.		
5.	DWER, June 2019. *Guidance Statement: Decision Making*. Department of Water and Environmental Regulation, Perth.		
6.	National Water Quality Management Strategy Paper No. 4 – Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 3 Primary Industries, 2000, ARMC and ANZECC	ANZECC 2000	https://www.waterquality.gov.au/anz-guidelines/resources/previous-guidelines/anzecc-armcanz-2000
7.	Vasse Wonnerup Water Quality Improvement Plan (DoW 2010)	DoW 2010	https://www.water.wa.gov.au/__data/assets/pdf_file/0017/3329/92284.pdf
8.	WQPN 22 Irrigation with nutrient rich wastewater (DoW 2008).	DoW 2008	https://www.water.wa.gov.au/__data/assets/pdf_file/0013/4045/82324.pdf
9.	WQPN 33 Nutrient and Irrigation Management Plans, DoW, 2010	DoW 2010	https://www.water.wa.gov.au/__data/assets/pdf_file/0019/4078/93694.pdf

Appendix 2: Summary of applicant's comments on risk assessment and draft conditions

Condition	Summary of Licence Holder comments 25.05.2020	DWER response	Summary of Licence Holders Response 05.06.2020	DWER response
Licence				
Condition 1, Table 1	The central strip drain holds 900L and the receiving sump holds 2000L, they are two separate items.	DWER notes the incorrect reference to the central drain and sump and agrees to this change.		
Condition 1, Table 1	Applicant states that the silo is not contained within the brewery shed so therefore cannot be maintained within the purpose built brewery shed.	DWER notes that the silo was not listed in the site infrastructure and equipment table (Table 1), therefore did not have an operational condition imposed on it to be maintained with the brewery shed. DWER has added an additional line item to Table 1 for the grain silo to be maintained outside the brewery shed.	This comment was a clarification of what is under the roof structure, the intention was not to add this to the infrastructure and equipment Table. *Can we please remove this from Table 1 as this is not an integral part of brewing production and may become redundant if we chose to replace silo storage with bags of grain.*	DWER agrees to remove the grain silo from the infrastructure and equipment table.
Condition1, Table 1	It is assumed that "WWTP shall be placed on an impermeable surface that is bunded to ensure leaks and spills can be captures and contained" is for all new infrastructure. Any existing infrastructure will remain as installed.	DWER agrees that the condition is for new infrastructure only and has added the words 'new infrastructure' to Table 1.		
Condition 1 Table 1 and Condition 2 Table 2	The Applicant considers the condition for 'No irrigation May to August (Inclusive)' to be unreasonable and detrimental to the profitability of their business. The Applicant states that	DWER notes the Applicants comments. The Applicant has not addressed the leaching of nutrients through the soil profile when applications are made in winter when	The Applicant stated that they have been, completing soil moisture monitoring, quantified plant growth and nutrient uptake rates and rainfall measuring in	DWER notes the Applicants response. DWER has adjusted the Licence to allow for irrigation during the month

Condition	Summary of Licence Holder comments 25.05.2020	DWER response	Summary of Licence Holders Response 05.06.2020	DWER response
	there controls consisting of no wastewater irrigation when: soils are saturated; groundwater is high and prior to rainfall, will limit risks to the environment. The applicant will provide further information on their Winter Irrigation Plan prior to 28th February 2021. Additionally the Applicant believes the inclusion of groundwater monitoring bores alleviates the risk with winter irrigation. The Applicant states that the irrigation limitation to be unreasonable at current production limits.	plant growth is limited. Leaching of nutrients beyond the root zone result in the plant not able to access the nutrients and the nutrients seeping through to the groundwater and local surface waterways. DWER will not remove the condition for 'no irrigation between May to August (inclusive)'. If the Applicant can demonstrate in the Winter Irrigation Plan that they can manage winter irrigation through a combination of flexible management and controls then DWER may consider modifying this condition. Management and controls can consist of, but not limited to, increased storage, soil moisture monitoring, quantifying plant growth and nutrient uptake rates, ground water level monitoring and rainfall measuring. Furthermore, the Applicant requested to be assessed at maximum production levels for their Licence. Therefore DWER has assessed the risk to receptors at the maximum production rate.	depth with DWER. Ground water monitoring will be implemented, as requested and in line with Licence Conditions. This information will be expanded upon further on this in the Winter Management Plan. The restriction of winter irrigation between May-September is unreasonable. The Applicant felt that they will be utilising nutrients year round through cropping. Therefore there will be no 'winter downtime' of uptake of nutrients. The Applicant will seek a formal written document from Dept. Ag to confirm our knowledge.	of May subject to conditions. The Applicant may apply for an amendment to the Licence to allow for some degree of irrigation over winter after the winter irrigation management plan has been submitted
Condition 2 Table 2	The Applicants states that points G and M are the same and to remove one for clarity.	DWER agrees with the Applicant and has made the changes in the Licence and removed point M.		
Condition 3 Table 3	That Applicant sort out clarity that the phosphorus loading rate would include for harvesting removal of	DWER confirms that this is correct. The maximum annual loading rate for phosphorus is 10kg/ha/yr. The yearly harvesting of lucerne hay/sorghum		

Condition	Summary of Licence Holder comments 25.05.2020	DWER response	Summary of Licence Holders Response 05.06.2020	DWER response
	phosphorus.	will remove 17.5kg of phosphorus and this can be deducted from the loading rate applied each year. To ensure that the total loading rate does not exceed 10kg/ha/yr.		
Conditions 4 and 5	The Applicant states in regard to the submission of a winter irrigation plan, their current production is 240kL/year, with a 50% reduction in production over winter. Therefore the 60 days storage of wastewater over winter at current production levels is 78kL. The wastewater system can store 124kL, thus they have sufficient storage at this time. As production grows to 860kL/year additional storage tanks will be added. The 860kL production is possible with their fermentation size (DWERs governing factor) but the output is not possible without significant facility upgrades.	DWER notes the Applicants comments. However the Applicant requested to be assessed at the maximum production capacity of 860kL and not at their current production levels. The Applicant includes the wastewater treatment tanks (pH buffer and aerobic tanks) as part of their storage capacity. Storage is for treated wastewater. Thus the Applicant has 20kL of storage, as using treatment tanks for storage prevents production and is unviable. Furthermore storage consideration needs to be considered from May – August. This is 123 days not 60 as stated by the Applicant. The Applicant currently does not have sufficient storage.	DWER stated the 60 days, this was not formulated by the Applicant. Please confirm if storage is required for 60 days or 123 days as both are referred to? Please clarify why untreated effluent cannot be stored prior to being treated? The risk is associated with application of wastewater to land, if the water if not applied to land, why does it matter if it is stored pre-treatment or post treatment, so long as the BOD and COD levels are acceptable prior to irrigation, when that occurs?	The 60 days storage is from the Licence condition for the submission of the winter irrigation management plan to be used as guidance. The figure is a minimum storage requirement subject to demonstration of environmental factors specified in the winter management plan condition. DWER will allow irrigation in May, subject to conditions, thus the storage requirement is now 92 days. Ultimately the Applicant is required to demonstrate they have access to a storage facility for wastewater for the entire months June to August inclusive and provide details of sufficient storage for any roll over storage requirements from the month of May.

Condition	Summary of Licence Holder comments 25.05.2020	DWER response	Summary of Licence Holders Response 05.06.2020	DWER response
Condition18, Table 10	The Applicant seeks explanation of the following: i. What QA/QC means? ii. Clarify how we would undertake an assessment of the reliability of field procedures and monitoring results? iii. Groundwater level contours will be assumed on bore water levels readings and extrapolated as even grade contours between 2 bores. No allowances will be made for external consultants to depicted groundwater levels, aside from the readings provided at the 2 monitoring bores. iv. Only 'other potential sources of contamination" that exist within the property boundaries will be depicted on any mapping. No external data will be included unless provided to the Applicant from DWER free of charge to the applicant. v. All reporting summaries will be completed by the Applicant, aside from NATA laboratories and water	DWER provides the following clarification: i. QA/QC is the combination of **quality assuranc**e, the process or set of processes used to measure and assure the quality of a product, and **quality control**, the process of ensuring products and services meet consumer expectations. ii. Have they been taken by qualified professional, what are their qualifications, have they been undertaken to Australian Standards. iii. This will be acceptable as the area has a 1m fall. iv. That is acceptable. v. That is acceptable.	ii. Where possible, all field work will be completed in house to suit budget constraints. Our Team contains a Tertiary Qualified Landscape Architect (with environmental science background) and a Tertiary Qualified Geologist. Where required external consultants / facilities will be engaged and certified in their relevant industries.	DWER notes the Applicants response and determines that Australia standards will need to be adhered by.

Condition	Summary of Licence Holder comments 25.05.2020	DWER response	Summary of Licence Holders Response 05.06.2020	DWER response
	sample testing.			
Schedule 1 Figure 2, Site Plan Map	Applicant requested clarification on the scale and size of the Site Plan	DWER notes this and no longer needs an additional site plan as a clearer copy has been generated through internal software.		
Schedule 1 Figure 3	Incorrect labels for irrigation and post settling tank. They should be amended from 5 to 10kL.	DWER agrees to amend the labels from 5 to10KL.		
Decision Report				
Section 4.1, Table 4	The Applicant provided the following information: i. The central strip drain holds 900L and the receiving sump holds 2000L, they are two separate items. ii. The grain silo holds 1200 bushels of grain. iii. All tanks are enclosed, except the Aeration tank that has the option to be open or closed. iv. The substrate of the WWTP is compacted hardstand. v. All stormwater is directed away from the brewery and WWTP infrastructure towards farm gardens vi. Irrigation areas are 2.46ha of pasture and 0.92ha of tree	DWER notes points of clarifications and have provide the correct information within the decision report.		

Condition	Summary of Licence Holder comments 25.05.2020	DWER response	Summary of Licence Holders Response 05.06.2020	DWER response
	lines.			
Section 4.1, Table 4	The Applicant provided information on the tanks and that all spills within the brewery shed are directed to the central drain with no external runoff. The Applicant provided comments that they had provided information and wanted to know what additional information is required.	DWER noted the Applicants response and has inserted the details within the decision report. The following information is required. i. The dimensions of the brewery shed including the brewery, packing and storage shed. ii. What are the controls used to divert stormwater away from the WWTP.	Shed: 15m x 30m. Stormwater is directed away through paving/ground falls.	DWER notes points of clarifications and have provide the correct information within the decision report.
Figure 2, Site Plan Map	Applicant requested clarification on the scale and size of the Site Plan	DWER notes this and no longer needs an additional site plan as a clearer copy has been generated through internal software.		
Figure 3, Irrigation Area Plan	The Applicant stated that the pasture are was not treed.	DWER notes this response. The 0.92ha treed irrigation area has cleared areas within it. To clarify the question. What portion of the treed irrigation area is not under trees?	0.92ha is treed. The whole area has been revegetated since this image. None of the treed irrigation area is not under trees.	DWER notes points of clarifications and have provide the correct information within the decision report.
4.2 Operational aspects Brewery and WWTP	The Applicant provided the following information: • The silo is not located within the shed roof but is located on the shed floor. The WWTP tanks are installed on compacted hardstands. • The compost tumblers are self-contained and moveable, so cannot be	DWER notes and has updated this information into the decision report.		

Condition	Summary of Licence Holder comments 25.05.2020	DWER response	Summary of Licence Holders Response 05.06.2020	DWER response
	guaranteed to be 20m from brew shed and is self-contained. • Water for brewing is stored in the brewery's water tank. Water is captured from farm shed rooves. If additional water is required it is carted in to fill the tank. • Water is pumped by a 2 inch irrigation line to the irrigation areas. A flow meter will be installed on this line. The pump is located at the outlet from the irrigation tank and is a standard off the shelf pump sized to the irrigation areas.			
4.2 Operational aspects WWTP	The Applicant requested what additional information for the "interim treatment facility/"	DWER request details on how the wastewater is being treated and disposed of currently.	As per our previously DOH approved system and by contractor removal, as required.	DWER notes points of clarifications and have provide the correct information within the decision report.
4.2 Operational aspects Irrigation	The Applicant provided the following comments: • The K line sprinkler is designed to facilitate even distribution of irrigation. • The flow meter will inform volume being pumped through the pipework. This will be used to adjust the sprinkler application rate of 1L/m^2.	DWER notes and has updated this information into the decision report.		

Condition	Summary of Licence Holder comments 25.05.2020	DWER response	Summary of Licence Holders Response 05.06.2020	DWER response
	• Eucalypt tree line is irrigated by standard off the shelf drip line. The flow meter will inform the volume being pumped through the pipework to the irrigation area and length of irrigation to adjust the volume resulting in 1L/m^2.			
Modelling and Monitoring Data	The Applicant states 'that beer production is not seasonal" is incorrect. The Premises traditionally dips 50% in winter compared to summer.	DWER notes the Applicants comments. However the comments reinforce DWERs original statement 'Beer production is not seasonal, with wastewater production varying with housekeeping practices and sales rather than time of year.' This variation in sales covers the winter dip described by the Applicant. If demand was available in winter, then the beer manufacturing would continue at a high level. As beer is not reliant on seasonal harvesting like wine making.	The Applicant stated that their facility design does not allow for the maximum production all year but a 50% drop in winter. The beer they manufacture is seasonal as far as ingredient availability. Hops is only available fresh in summer. Their business model revolves around utilising fresh ingredients, rather than stored bagged/frozen product, so winter is their downturn as these fresh ingredients become unavailable. Hence the 50% drop in production in winter.	DWER notes points of clarifications and have provide the correct information within the decision report.
Section 6, Key Findings	The Applicant stated that they will have a continual supply of wastewater and will continually seed the paddock, in winter and summer. This allows for the pasture to grow and continually take up nutrients across the irrigation area irrelevant of the season. The only time irrigation will not occur is when soils are	DWER notes the Applicants comments. However the Applicant has failed to demonstrate the plant growth and water requirements for twice harvesting in winter and summer. Nor has the applicant provided detailed information on increased irrigation rates required to sustain a summer harvest. In	The Applicant requested clarification on what information DWER requires. The Applicant sought confirmation on what 'plant growth and water requirements' DWER required. The Applicant reiterated their objections to the proposed no	DWER notes points of clarifications. The Applicant is required to demonstrate that they have a water and nutrient budget for growth requirements of the specified crop(s) for all harvests throughout the

Condition	Summary of Licence Holder comments 25.05.2020	DWER response	Summary of Licence Holders Response 05.06.2020	DWER response
	saturated and rainfall imminent. It was re-stated by the Applicant in regard to the submission of a winter irrigation plan, that their current production is 240kL/year, with a 50% reduction in production over winter. Therefore the 60 days storage of wastewater over winter at current production levels is 78kL. The wastewater system can store 124kL, thus they have sufficient storage at this time. As production grows to 860kL/year additional storage tanks will be added. The 860kL production is possible with their fermentation size (DWERs governing factor) but the output is not possible without significant facility upgrades.	addition, the Applicant has not demonstrated that plants will grow 365 days a year and the seasonal nutrient and moisture adjustments to demonstrate viability. Furthermore, the Applicant requested to be assessed at the maximum production capacity of 860kL and not at their current production levels. The Applicant includes the wastewater treatment tanks (pH buffer and aerobic tanks) as part of their storage capacity. Storage is for treated wastewater. Thus the Applicant has 20kL of storage, as using treatment tanks for storage prevents production and is unviable. Furthermore storage consideration needs to be considered from May – August. This is 123 days not 60 as stated by the Applicant. The Applicant currently does not have sufficient storage.	winter irrigation, why untreated effluent cannot be stored.	year. Noting that the Applicant specified one harvest per year in documentation provided to the department. However, DWER encourages multiple harvests per year. Noting that the choice of crop(s) that the Applicant grows, lies with the Applicant. Intensive horticulture requires varied water and nutrient requirements throughout the year to maintain optimum growth. The Applicant has not provided a water/nutrient monthly budget to demonstrate healthy plant growth throughout the year to support multiple crops. Noting that fertigation is based on recycling nutrient enriched water as a supplement to water resources for horticulture development.
10.1.1Regulatory Controls	The Applicant requests the date for bore installation be aligned. As the two new bores are to be installed by 31st December 2020 in the licence, whereas the decision report states within six months of the issue of the	DWER notes the Applicants comments and has aligned the Decision Report to reflect the Licence.		

Condition	Summary of Licence Holder comments 25.05.2020	DWER response	Summary of Licence Holders Response 05.06.2020	DWER response
	licence.			
10.1.3 Wastewater Irrigation infrastructure, Table 26.	The Applicant outlines the viability for irrigation during the winter months and states that they provided information to explain how there will be no added risk for winter fertigation. This condition of no irrigation between May – August should have a common sense approach, especially that the inclusion of monitoring bores will alleviate any risk associated with winter irrigation applications.	DWER notes the Applicants comments. The Applicant has not addressed the leaching of nutrients through the soil profile when applications are made in winter when plant growth is limited. As plant have a slower growth rate and nutritional requirement. Leaching of nutrients beyond the root zone result in the plant not able to access the nutrients and the nutrients seeping through to the groundwater and local surface waterways. DWER will not remove the condition for 'no irrigation between May to August (inclusive)'. If the Applicant can demonstrate in the Winter Irrigation Plan that they can manage winter irrigation through a combination of flexible management and controls then DWER may consider modifying this condition. Management and controls can consist of, but not limited to, increased storage, soil moisture monitoring, quantifying plant growth and nutrient uptake rates, ground water level monitoring and rainfall measuring. The monitoring bores are in place to monitor controls and to evaluate risks to the environment.	The Applicant stated that they have established that there will be no reduced nutrient uptake of the plants with the staged cropping technique. The Applicant stated that they will seek a formal written document from Dept. Ag to confirm their knowledge.	DWER notes the Applicants response is allowing for irrigation in the month of May subject to conditions.
10.1.3 Wastewater	The Applicant request that bunding and cut off drains be removed as	DWER notes the Applicants comments and has removed		

Condition	Summary of Licence Holder comments 25.05.2020	DWER response	Summary of Licence Holders Response 05.06.2020	DWER response
Irrigation infrastructure, Table 26.	application rates will not create surface water runoff. The Applicant seeks clarity on specified requirements 'g' and 'm' indicating that they are similar and only one is required.	specified requirement for bunding and has removed 'm'.		
10.1.5 Monitoring reporting requirement	The Applicant assumes that standard excising reports for government taxes will suffice to ascertain beer outputs.	DWER accepts excise tax beer outputs for monitoring purposes.		

Appendix 3 Monitoring Locations Map

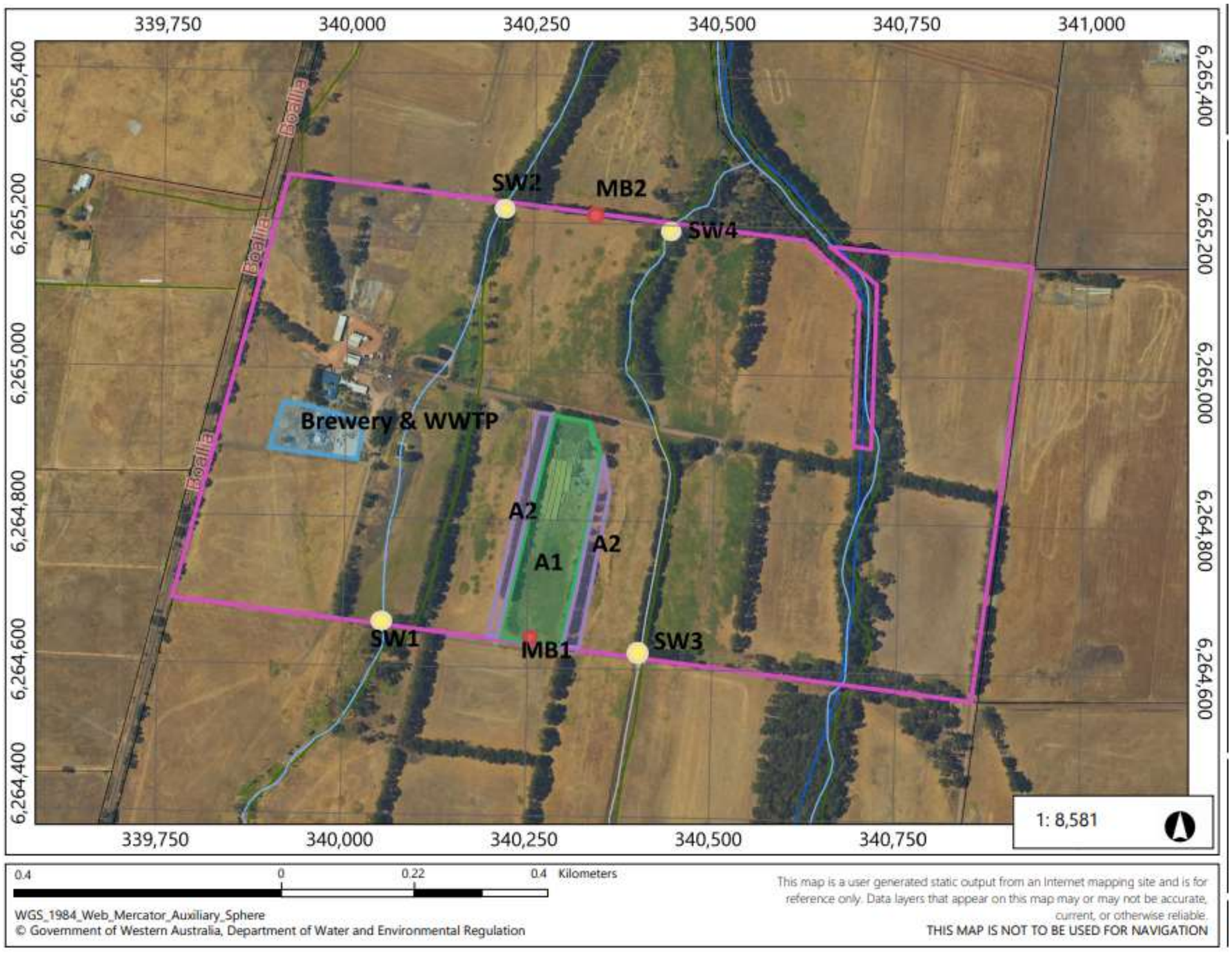


Figure 10. Monitoring Locations. A1 is the Irrigated paddock (oulined in green), A2 is the irrigated trees (outlined in purple), MB1 is the ungradient groundwater bore, MB2 is the down gradient monitoring bore (shown as red circles). SW1 and SW3 are the upstream monitoring points SW2 and SW4 are the downstream monitoring locations on the Buayanup River Tributaries (shown as yellow circles).

Appendix 4: DWER's Water Balance

Table 27: DWER Water Balance calculations for design capacity 860kl/yr and actual throughput 240kL/yr

Production 860kL/yr beer		Jindong 9978 BoM																					
Design wastewater flow	(Q)	l/day	7068.5																				
Design Percolation rate	R	mm/week	5	(removal of salt in root zone)																			
Land area	L	m2	33800.00																				
Parameter	**Symbol**	**Formula**	**Units**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**								
Days in month	D		days	31	28	31	30	31	30	31	31	30	31	30	31								
Precipitation	P		mm/month		5.2	18.4	35.1	107.7	138.3	149.6	124.7	91	37.3	31.5	11.6		Jindong 9978						
Evaporation	E		mm/month	200	175	150	90	60	50	50	60	80	100	175	175								
Crop factor	C			0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7								
Inputs																							
Precipitation (90%)	P		mm/month	0	4.68	16.56	31.59	96.93	124.47	134.64	112.23	81.9	33.57	28.35	10.44								
Effluent irrigation	W	(QxD)/L	mm/month	6	6	6	6	6	6	6	6	6	6	6	6								
Total input		(P+W)	mm/month	6	11	23	38	103	131	141	119	88	40	35	17	Input exceeds output - storage is needed in these months (whole year)							
Outputs																							
Evapotranspiration	ET	(E*C)	mm/month	140	123	105	63	42	35	35	42	56	70	123	123								
Percolation to remove salt	B	(R/7) x D	mm/month	22	20	22	21	22	21	22	22	21	22	21	22								
Total output		(ET+B)	mm/month	162	143	127	84	64	56	57	64	77	92	144	145								
Storage	S	(P+W)-(ET+B)	mm/month	-156	-132	-104	-47	39	74	84	55	11	-52	-109	-128								
(i.e. excess water)																							
Cumulative storage			mm/month	0	0	0	0	0	114	158	139	65	0	0	0								
Maximum storage	V		mm	158																			
Storage volume required		(V x I)/1000	m3	**5,350**																			
			kL	5,350																			
Production 240kL/yr beer																							

Demonstrates that Precipitation exceeds the Evaporation and Percolation for salt requirements. Rainfall exceeds growth requirements for plants. Irrigation is not required to sustain plant growth.

Design wastewater flow	(Q)	l/day	1972.6																				
Design Percolation rate	R	mm/week	5	(removal of salt in root zone)																			
Land area	L	m2	33800.00																				
Parameter	**Symbol**	**Formula**	**Units**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**								
Days in month	D		days	31	28	31	30	31	30	31	31	30	31	30	31								
Precipitation	P		mm/month	11	5.2	18.4	35.1	107.7	138.3	149.6	124.7	91	37.3	31.5	11.6								
Evaporation	E		mm/month	200	175	150	90	60	50	50	60	80	100	175	175								
Crop factor	C			0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7								
Inputs																							
Precipitation (90%)	P		mm/month	9.9	4.68	16.56	31.59	96.93	124.47	134.64	112.23	81.9	33.57	28.35	10.44								
Effluent irrigation	W	(QxD)/L	mm/month	2	2	2	2	2	2	2	2	2	2	2	2								
Total input		(P+W)	mm/month	12	6	18	33	99	126	136	114	84	35	30	12	Input exceeds output - storage is needed in these months (whole year)							
Outputs																							
Evapotranspiration	ET	(E*C)	mm/month	140	123	105	63	42	35	35	42	56	70	123	123								
Percolation to remove salt	B	(R/7) x D	mm/month	22	20	22	21	22	21	22	22	21	22	21	22								
Total output		(ET+B)	mm/month	162	143	127	84	64	56	57	64	77	92	144	145								
Storage	S	(P+W)-(ET+B)	mm/month	-150	-136	-109	-51	35	70	79	50	6	-57	-114	-132								
(i.e. excess water)																							
Cumulative storage			mm/month	0	0	0	0	0	104	149	129	56	0	0	0								
Maximum storage	V		mm	149																			
Storage volume required		(V x l)/1000	m3	**5,040**																			
			kL	5,040																			

Demonstrates that Precipitation exceeds the Evaporation and Percolation for salt requirements. Rainfall exceeds growth requirements for plants. Irrigation is not required to sustain plant growth.