Application for Works Approval

Part V Division 3 of the *Environmental Protection Act 1986*

Works Approval Number	W6398/2020/1
Applicant	Mallokup Malt Pty Ltd
ACN	634 495 739
File Number	DER2020/000190
Premises	Lot 51 Ludlow Road North STIRLING ESTATE WA 6271 Legal description - Lot 51 on Deposited Plan 61595
Date of Report	2 October 2020
Decision	Works approval granted

Fiona Roser
A/Manager, Process Industries

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an officer delegated under section 20 of the *Environmental Protection Act 1986* (WA)

Table of Contents

1. Decision summary

This Decision Report documents the assessment of potential risks to the environment and public health from emissions and discharges during the construction and operation of the Premises. The Delegated Officer will grant the Works Approval.

2. Scope of assessment

2.1 Regulatory framework

Mallokup Malt Pty Ltd (the Applicant) lodged an application for a works approval under Part V of the *Environmental Protection Act 1986* (EP Act) to establish a craft malting facility located at Lot 51 Ludlow North Road, Stirling Estate (the Premises).

In completing the assessment documented in this Decision Report, the department has considered and given due regard to its Regulatory Framework and relevant policy documents which are available at https://www.der.wa.gov.au.

2.2 Application summary

On 21 April 2020 the Applicant submitted an application for a works approval to the department under section 54 of the *Environmental Protection Act 1986* (EP Act).

The application is to undertake construction works relating to the processing of malt at the Premises. The Premises is approximately 4 km north-west of the Capel town site.

The Premises relates to Category 18: Food processing and has been assessed at a throughput of up to 500 tonnes/annum of malt produced, under Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations). The infrastructure and equipment relating to the premises category and any associated activities, which the department has considered in line with *Guidance Statement: Risk Assessments* (DER 2017), are outlined in Works Approval W6398/2020/1.

3. Overview of Premises

3.1 Infrastructure

The malt facility Premises infrastructure, as it relates to Category 18 activities, is detailed in Table 1 and with reference to the Figure 1 below and Figure 2. The information in Table 1 has been provided by the Applicant.

Table 1 lists infrastructure associated with each prescribed premises category.

Table 1: Category 18 infrastructure

	Infrastructure	Site Plan Reference
	Prescribed Activity Category 18	
The design capacity of the malt production is 500 tonnes per year generating wastewater through a wastewater treatment plant (WWTP). This treated wastewater is irrigated onto 0.9 ha of pasture.		
Proposed		
1	Malt production Enclosed malt, packaging and storage shed (18x18m) housing the following: • Concrete graded floor that gravity drains all liquid spills to the grated concrete floor drain that drains into the 30kL sump. • Stainless steel steep tank (10.82m^3, 1660mm diameter x 5000mmH) • 2x Stainless steel germination – kilning vessels (GKV) (12 x 4 x 5m) 240m^3 • Vacuum transfer machine • Bagging machine Outside of shed roof line: • 3x 20 tonne grain silos contained on a concrete apron. • 120kL Rainwater tank (malt production use)	Malt production layout see Figure 1.
3	WWTP with a 250kL storage capacity consisting of the following: • 30kL solids sump • Float switches • 60kL aeration tank with removal cover • 250kL wastewater reservoir (storage tank) • Aeration and transfer pumps	WWTP Layout see Figures 1
4	0.9 Ha wastewater irrigation area consisting of the following: • Pipeline • Flow meter • 5x Irrigation valves • 5x sprinkler lines • Sprinklers with 863L/hr capacity • Soil moisture probe • Computer monitoring programme • Weather Station • Monitoring Bore 1	Irrigation Layout see Figure 2

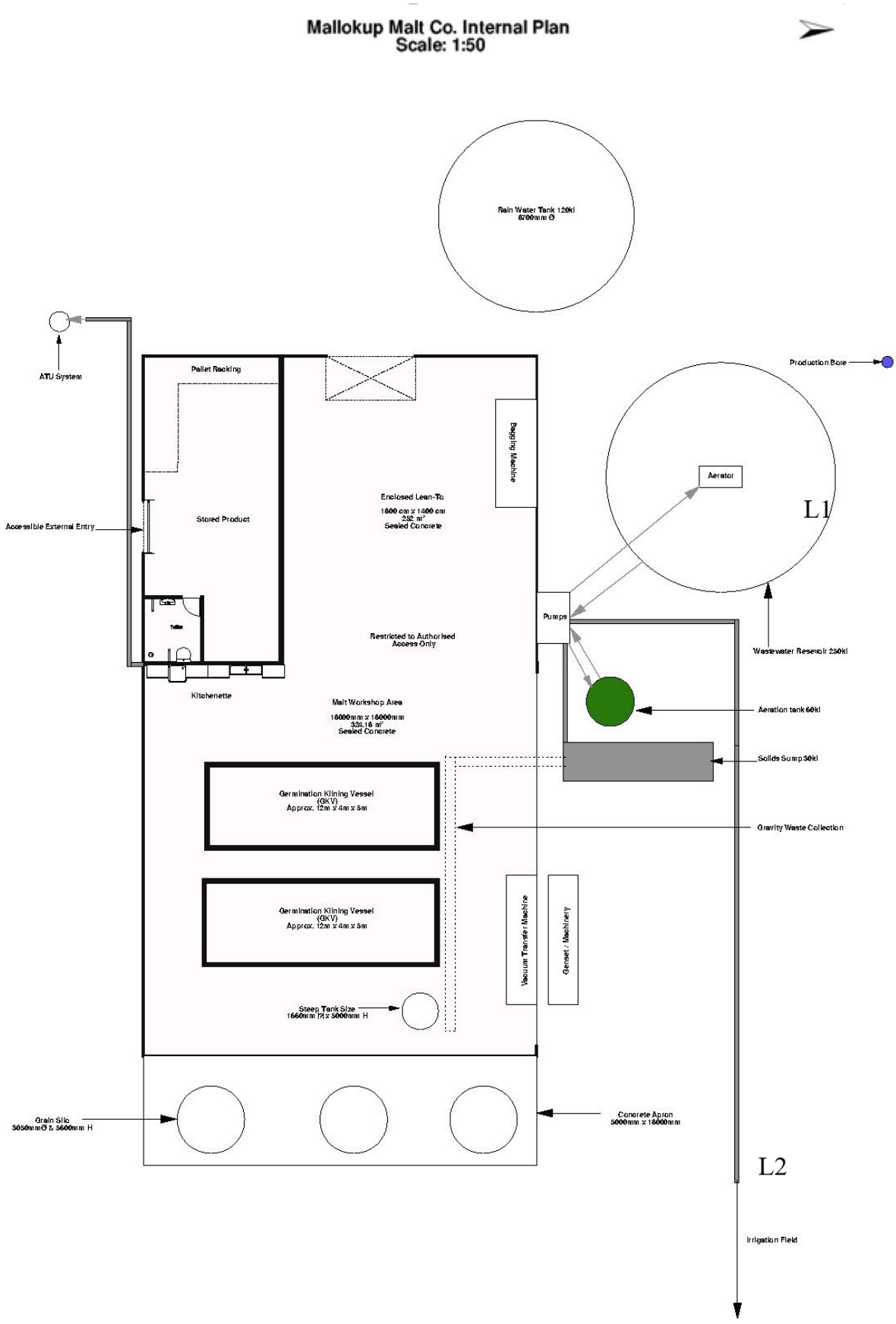

Figure 1: Mallokup Malt Production layout

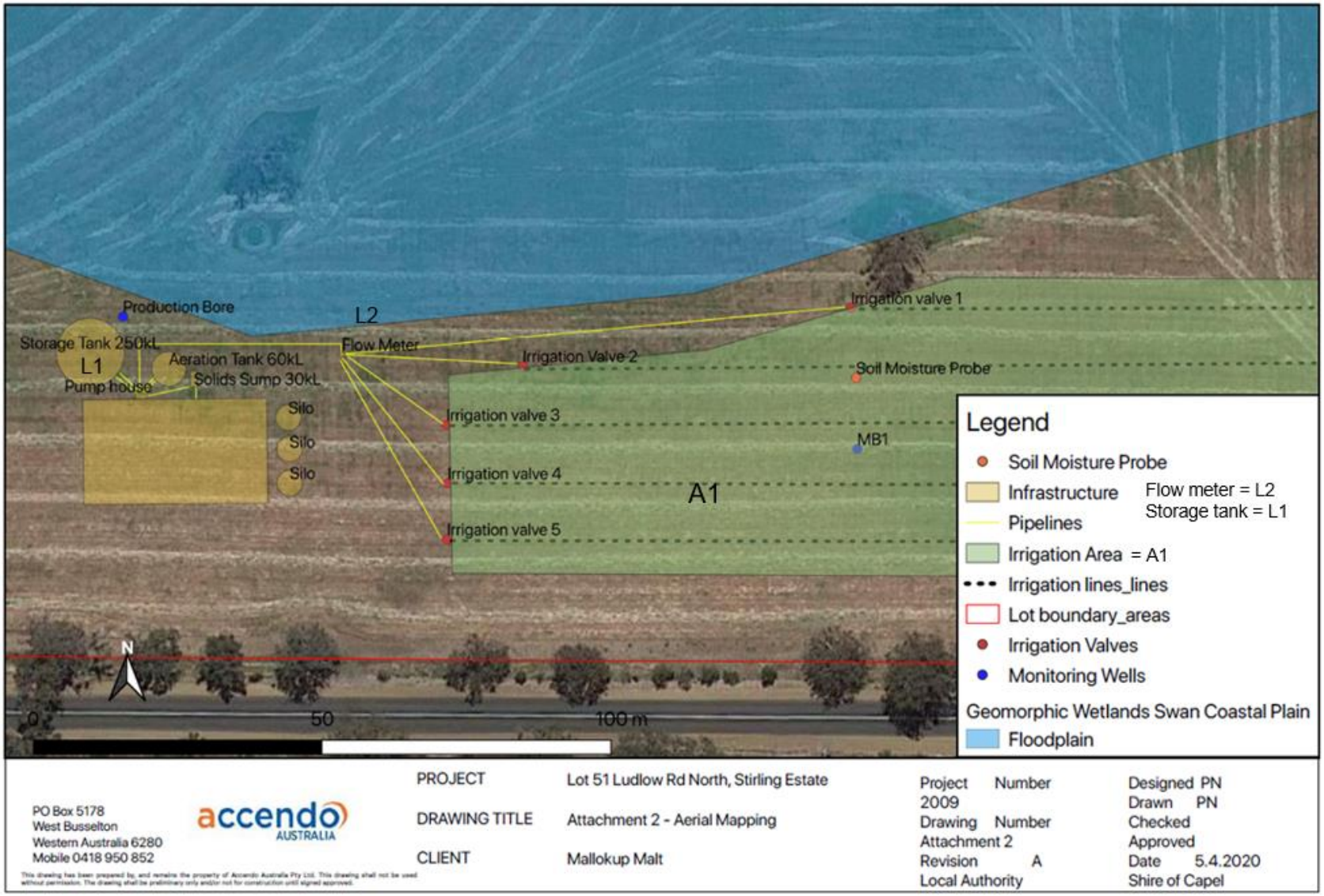

Figure 2: Map of the prescribed premises, outlining monitoring and sampling locations.

3.2 Construction aspects

The Applicant has nominated a construction period of 12 months to build the malt processing plant.

All earthwork requirements will be carried out by the lot owner Nordale Pastoral Pty Ltd including the shed, hardstand, sewerage, power, water supply, driveway, stormwater management and site preparation works. The Applicant will install all operational infrastructure including the WWTP, irrigation system and malt processing, packaging and storage infrastructure.

3.3 Operational aspects

All malt processing is contained within a shed, to prevent the ingress of stormwater. The proposed processing facility will produce up to 500 tonnes per year of malt using barley and cereal grain. Wastewater from the malting facility processed through a wastewater treatment system consisting of a settling, aeration and storage tanks before being irrigated to land. The malting facility will operate with staff between 7:00am and 6:00pm, 7 days a week. The operation will be closed to the public and accessible to staff and external deliveries and load outs of product.

3.3.1 Malt Processing

The manufacturing process involves three stages; steeping, germination and kilning. Ten tonnes of grain (barley / cereal grain) will be transferred once per week from the grain stored in three 20 tonne silos to the steep tank for processing. There are two different steep cycle processes; a three steep and one steep cycle. A three steep cycle involves the steeping tank being filled with 14kL of water above the grain bed and intermittently supplied with oxygen. The grain is soaked for 6-8 hours, where the water is changed three times over the 36-48 hour steeping process. A further 10kL of water is used in the second steeping cycle and 8kL in the third cycle. The total volume of wastewater produced over the three steep cycles including cleaning is 26kL.

A one steep cycle involves the tank being filled with 14kL water above the grain bed and intermittently supplied with oxygen. The grain is soaked for 18 hours transferred to the germination tank via vacuum and sprayed with 7kL of water. In a one steep cycle, 16kL of wastewater is produced, which includes malt processing and cleaning. During the steeping cycles, the grain will change from 12% to 45% moisture content. It is estimated that one steeping cycle will occur each week.

The steeped grain is transferred from the steeping tank to the germination vessel via a vacuum. The grains are rested for three days in the germination vessel (stainless steel container), where the humidity is controlled to assist with germination. Within the germination vessel malt turners (augers) are programmed to turn the grain every four hours to prevent malt matting onto the bottom of the vessel. The malt turners have spray jets attached and spray water to ensure moisture levels are maintained for maximised growth.

The wastewater from the steeping and germination process is drained to the WWTP. All grains and husks are retained in the tanks.

The process of kilning occurs in the same vessel as the germination vessel. The kilning process involves dry air being blown through the vessel and the grain bed at 70 to 110^0 C until the desired malt colour is created.

The clean malt is then processed through a bagging machine via vacuum transfer into 25 kg polypropylene bags. Occasionally, one tonne bulka polypropylene bags will be used. The vacuum process separates the malt culms (rootlets) from the clean malt through the filtration on the vacuum. All malt culms, debris and residual malt is swept up and deposited into a pallet waste bin. The malt culms are a source of protein and will be on sold to cattle and sheep farmers within the locality.

A small quantity of the malt will be roasted per week (approximately 100kg). The 25 kg bags of malt will be roasted in a roasting machine for a few hours to produce the desired product. Roasted malts will be bagged into 0.5 to 5 kg paper pouch bags through the bagging machine and manually heat sealed.

Cleaning of the steep and germination/kilning tanks will be through hot water pressure scrubbing, vacuum and sweeping of dry debris. All solid debris will be deposited into the pallet waste bin. All wastewater will be drained to the 30kL sump.

3.3.2 Wastewater Treatment Plant

The Applicant provided details on the amount of wastewater that would be produced each week (DWER 2020, DWERDT321861). Between October to May, 26kL/week (3,714L/day) of wastewater is expected to be produced. Between June to September, 16kL/week (2,290L/day) of wastewater is expected to be produced. The maximum design capacity of the WWTP is based on a weekly design throughput and limited by the sump at 30kL/week.

The wastewater will be drained through a 3mm perforated mesh via gravity into a 30kL sump. The mesh and settling in the sump will remove gross solids.

Wastewater generated from the cleaning process, enters the grated drains at several locations within the hardstand shed and gravity feed to the solids sump. The grated drain contains a basket screen that captures course solids and debris up to 3mm. The basket screens are emptied weekly and any loose grain is swept up and placed in the pallet waste bin.

With the use of a float switch wastewater is transferred from the solids sump to the 60kL aeration tank where it undergoes aeration, caustic dosing and aerobic treatment to balance pH and remove BOD and nutrients. The tank is covered with an impermeable cover during winter to restrict rainfall from entering. The treated wastewater is pumped to a 250KL storage tank fitted with an aerator to ensure adequate oxygenation occurs, especially over the stored winter months.

Sludge will be monitored monthly in all tanks and extracted and disposed offsite by a licensed liquid waste contractor as required.

3.3.3 Irrigation

Treated wastewater is to be irrigated to a 0.9ha irrigation area, seeded with perennial ryegrass and harvested for hay at least twice a year in October, January and/or April. Additional water will be irrigated to ensure that hay can be produced outside of the season. Irrigation is via automated sprinkler system connected to a rain sensor and soil moisture monitor that will shut off irrigation during periods where the hydraulic load of the soil is at capacity.

An above ground low pressure sprinkler system (Windfighter R2000WF 1616) will be used for irrigation. The sprinklers are placed 10m apart along the sprinkler lines and have a low application rate of 4mm/hour (Applicant supplied).

A lowara 40 125/30 electric pump will transfer treated wastewater from the 250kLstorage tank to five separate valves on the sprinkler lines. This will be controlled by a computer program (Mait120 EnviroPro) that will be linked to a rain sensor and soil moisture probe located within the irrigation area, and will have a parameter setting to stop irrigation at 5 (KPa) at a depth of 30cm. A weather station located on shed roof within the Premises will record daily rainfall and be kept and entered into a water balance spreadsheet. Irrigation schedules will be entered manually on the day of watering after monitoring the weather, evaporation and soil moisture. A water meter will be installed on the main pipeline from the storage tank to measure the volume of wastewater irrigated.

The Applicant proposes to irrigate treated wastewater during summer, with winter irrigation being dependent on rainfall and soil moisture measured onsite with an automatic shutdown at 5kPa. Irrigation will occur on a rotational basis, with irrigated areas dry for 24 hours between

applications.

3.4 Exclusions to the Premises

This Decision Report does not consider the toilet facilities and wastewater treatment system that supports the ablutions associated with the malt operation. The Applicant outlined in communication with DWER (DWERDT285336) that sewerage would be treated separately to the malt processing wastewater. The Applicant has not provided details of the treatment and disposal of sewerage other than it will be treated by a secondary treatment system and irrigated to land. Disposal of sewage waste to the proposed irrigation area has not been assessed and therefore is not authorised under this works approval.

It is noted that the Applicant will require approval for the Construction or Installation of an Apparatus by the Executive Director, Public health (Department of Health) for both the sewage (toilet facilities) disposal system and the malt processing WWTP and irrigation of wastewater system.

4. Monitoring and hydraulic loading data

4.1 Treated wastewater quality

The Applicant has provided wastewater quality data from a similar malt processing production facility, Voyager Malt (Table 2) to determine applicable loading rates and support the assessment of environmental risk. The data includes two samples taken from the first and second steep process. The higher concentration levels in Sample 1 is due to a higher percentage of water retained in the grain from the first steep cycle and less wastewater. It is predicted that a third steep cycle would have a higher percentage of wastewater (due to recycling of the water through the steep process) and a lower concentration of nutrients. The second steep cycle (Sample 2) is used to provide average concentrations and loadings.

No post treatment samples have been provided by the Applicant. This information will not be available until after commissioning of the WWTP has commenced. The Applicant has used the water quality data from Sample 2 to calculate applicable loading rates (see section 4.3).

Data shows that water quality from untreated wastewater exceeds the ANZECC (2000) /WQPN 22 (DoW 2008) criteria for irrigation (Table 2) demonstrating the need for treatment prior to irrigation.

Table 2: Water quality data from the malt processing (pre-treatment).

	pH	EC dS/m)	TDS (mg/L)	TSS (mg/L)	TDS (mg/L)	BOD (mg/L)	COD (mg/L)	TP (mg/L)	TN (mg/L)
ANZECC 2000-Primary Industries[1]	5.5-9.0	1.3-2.9 Moderate tolerant crops	<3	<40		<15	<40	0.8 – 12[2]	25-125[2]
WQPN 22 Risk Category C[3]						30		3.1	19
Sample 1[4] November 2019	5.4	2.21			2270	1850		44.7	93
Sample 2[5] November 2019	5.4	1.16			1070	1500		13.5	59

[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 (ANZECC 2000).

[2]ANZECC 2000, requires site specific assessment to determine actual value.

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

[4]Sample 1 is from Voyager Malt. It is a pre-treated wastewater sample taken from steep rinse first cycle.

[5]Sample 2 is from Voyager Malt. It is a pre-treated sample taken from the steep rinse second cycle.

4.2 Hydraulic loading and irrigation area

The Applicant included two water balance calculations to assess the volume of wastewater proposed to be irrigated against the hydraulic output of the irrigation area and the volume of storage required. The Applicant used the following tools and assumptions in undertaking the water balance to inform the Nutrient Irrigation Management Plan (NIMP) (Accendo Australia, May 2020):

- Estimated effluent production of 2,290l/day during periods where rainfall exceeds evaporation (22 weeks) and 3,714L/day for the remaining 30 weeks. Note: DWER interprets this to be 22 weeks of processing using a one steep cycle and 30 weeks processing using a three steep cycle;
- The design irrigation rate equivalent to that specified in Table 9 from EPA Code of Practice for onsite wastewater management;
- Land application area of 0.9ha;
- Mean monthly rainfall obtained from Bureau of Meteorology (BoM) Capel North Station;
- Monthly pan evaporation data from the Department of Primary Industries and Regional Development (DPIRD) Capel station 2;
- Storage requirements calculated to ensure that irrigation does not occur on days exceeding 1mm of rainfall (therefore reduced irrigation during winter); and
- Victorian Land capability Assessment Framework – Irrigation area sizing using nominated area water balance for zero storage spreadsheet.

The water storage requirements were calculated by adding storage requirements for each month, which were based on the average amount of rain days within each month where irrigation could not occur. The calculations provided in the NIMP determined that 181kL of storage would be required between April and October based on 84 days of rainfall occurring during this period. It was determined that no storage would be required with a minimum irrigation area of 0.4576ha.

The water balance calculations provided by the Applicant have not considered the following:

- the close proximity to the hydrologic zone of the Stirling Wetlands;
- the hydraulic conductivity of the soils at a rate of 1.1m/day (from Applicant);
- the likely high groundwater table peaking at 0.5 to 1.0mbgl in late winter/early spring (see section 5.1.3);
- additional wastewater generated from cleaning and wash down during malt production;
- water balance requirements for multiple harvests; and
- wastewater volumes/quality based on maximum production rates.

These factors can influence the proposed irrigation schedules, and be reflected within the water balance and storage volumes required throughout the year. The Applicant did not demonstrate that winter irrigation would not lead to leaching of nutrients past the root zone of the irrigated crops associated with low nutrient uptake rates by plants that occurs in winter periods in the

south west. The Applicant only focused on soil moisture levels and not the changing nutrient requirements during the seasons or the short-term residual time of nitrogen being available for root assimilation within the soil. Furthermore, the Applicant did not provide details of how multiple harvests will be grown and sustained.

4.3 Nutrient loading of irrigation area

Nutrient loading rates were calculated using the same wastewater data from the Voyager Malt facility (see section 4.1). As such, nutrient load calculations are likely to be more conservative and may not be reflective of the actual concentration of wastewater discharged from the WWTP. The Applicant based the calculations on a flow rate of 3,101L/day, irrigated onto 0.9ha of land and irrigating during both summer and winter. WQPN 22 Risk Category D (DoW 2008) was used by the Applicant to demonstrate loading acceptability against criteria. Noting that the irrigation area is adjacent to a wetland system that is impacted by eutrophication, the Delegated Officer considers that Risk Category C more appropriately applies. Table 3 outlines the Applicant's loading calculations.

Table 3: Loading calculations (from Applicant)

	TN kg/ha/yr	TP kg/ha/yr	BOD kg/ha/day
WQPN 22 – Risk category D	480	120	30
WQPN 22 – Risk category C	300	50	30
Loading rates based on irrigating 52 weeks/yr	74	17	5.2
[1]Loading rates including harvesting.	0	0	5.2

[1]Loading rates including harvesting are based on a twice yearly harvest, harvesting on 4 tonnes/ha/cut, removing 2.5kg phosphorus and 17kg nitrogen per tonne of grain removed.

4.4 Water balance and nutrient loading verification

In order to verify the information provided by the Application, DWER carried out calculations using the Applicant's submitted water balance information (DWER, 2020, DWERDT321861) to determine:

- a water balance;
- the land area requirement for irrigation to land; and
- the required area for nitrogen, phosphorus and biological oxygen demand (5-day) uptake for the malt processing and cleaning wastewater.

These calculations were based on the Applicant's proposed production capacity using the three steep cycle over 35 weeks (October to May at 26kL/week) and one steep cycle over 17 weeks (June to September at 16kL/week) irrigated over 0.9 hectares (totalling 1,182kL/year).

DWER used the same data provided by the Applicant for rainfall, evaporation and water quality concentrations.

The water balance (Table 4) demonstrates that between May to August rainfall exceeds evaporation and that from June to September rainfall exceeds evaporation and/or groundwater is likely to be above 1.5mbgl. Irrigation for nutrient rich wastewater should not occur when rainfall exceeds evaporation or when groundwater is above 1.5mbgl (DoW 2008).

The Applicant proposes to store wastewater generated within these months (June - September).

Assuming no irrigation occurs during these months, the water balance determined that the maximum storage requirement is 272kL using a one steep cycle over 17 weeks during winter. Currently, the Applicant proposes to install a 250kL storage tank.

The Applicant requires additional storage of 22kL for the 1 steep cycle of production during winter. The Applicant has committed to using the 60kL aerator tank as additional storage to capture the shortfall. Alternatively, the Applicant will be required to reduce production of malt in winter to limit the wastewater production to meet the hydraulic demand of the irrigation area, or tank wastewater from site.

Table 4: Water balance (calculated by DWER)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean Rainfall (mm)	13.6	7.5	20.8	37.4	90.9	114.7	134.7	109.2	74.6	30.2	25.9	12.1
Mean monthly evaporation (mm)	266.8	218	180.75	115.45	81	49.4	52.85	76.15	104.05	146.2	207.65	280.95
Rainfall exceeds evaporation	No	No	No	No	[3]Yes / No	Yes	Yes	Yes	No	No	No	No
[1]Ground-water higher than 1.5mbgl	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes / No	No	No
[2]Storage kL)	0	0	0	0	0	80	64	64	64	0	0	0
[2]Cumulative storage (kL)	0	0	0	0	0	80	144	208	272	0	0	0

[1] See section 5.1.3 for groundwater

[2] Storage calculated on a one steep cycle for production

[3] It is noted that over the last 10 years of May rainfall data, the month of May often does not reach the average rainfall and therefore has evaporation levels higher than rainfall.

Note: Orange sections highlights the critical periods of storage.

The proposed irrigation area is mostly flat with a 1% slope that drains towards the Stirling Wetlands.

A significant constraint for siting a wastewater irrigation scheme is ensuring that the area of land selected is sufficiently sized to enable wastewater and it's dissolved constitutes to be taken up by the vegetation or retained within the soil profile without seepage into groundwater. A wastewater hydraulic loading calculation was undertaken using the following formula (US EPA, 2006)

$$A = (3.65 \times Q) / (L \times T_{app})$$

Where:
A = land area (hectares)
Q= flow rate of wastewater (m^3/day)
L= wastewater hydraulic loading to soil (cm/week)
T_{app} = period of wastewater application each year (weeks)

DWER calculated the hydraulic loading for the proposed irrigation of wastewater assuming 35 weeks of irrigation (period of the year when evaporation exceeds rainfall), total flow rate of 1,236kL/year and a wastewater loading to soil of 4cm/week. An area of 0.13ha was calculated to be required. The Applicant has proposed 0.9ha for irrigation.

The area of land required for vegetation to accommodate the applied nutrients without seepage to groundwater (assuming irrigation takes place when there is no rainfall) can be determine by calculating nutrient loading rates for the Premises. A preliminary assessment of nutrient loading rates at the Premises can be determined as follows (NSW EPA, 1998).

$$A = \frac{C \times Q}{L_x}$$

Where

A	=	land area (m^2)
C	=	concentration of nutrient or BOD (mg/L)
Q	=	treated wastewater flow rate (L/d)
L_x	=	critical loading rate of nutrient or BOD ($mg/m^2/d$)

DWER calculated nitrogen, phosphorus and BOD^5 uptake for the proposed irrigation of wastewater using the Voyager Malt water quality data over a 35 week irrigation period and using a critical loading rate of $36mg/m^2/day$ for nitrogen, $4mg/m^2/day$ for phosphorus and $3000\ mg/m^2/day$ for BOD^5. The minimum irrigation area required for 35 weeks of irrigation for: nitrogen uptake was the 0.55ha; phosphorus uptake required 1.14ha and BOD^5 uptake required 0.17ha. The Applicant has proposed an irrigation area of 0.9ha, which is below the size requirements for phosphorus uptake.

It is noted that the water quality samples are from pre-treated water samples. DWER has calculated that phosphorus levels would need to have an average concentration level of 10.5mg/L after wastewater treatment to meet the land area requirement of 0.9ha.

5. Risk assessment

The department assesses the risks of emissions from Prescribed Premises and identifies the potential source, pathway and impact to receptors in accordance with the *Guidance Statement: Risk Assessments* (DER 2017).

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.

5.1 Source-pathways and receptors

5.1.1 Emissions and controls

The key emissions and associated actual or likely pathway during construction and operation have been considered in this Decision Report are detailed in Table 5 below. Table 5 also details the proposed control measures the applicant has proposed to assist in controlling these emissions, where necessary.

Table 5: Applicant proposed controls (from Application)

Emission	Sources	Potential pathways	Proposed controls
Construction			
Noise	Building and construction of the malt facility, WWTP and irrigation system.	Air/windborne pathway	All construction works occur in day-time hours (7:00am to 6:00pm.) and will be of short duration (12 months)

Emission	Sources	Potential pathways	Proposed controls
Operation			
Odour	Processing of malt. Wastewater treatment system Irrigation of treated wastewater	Air/windborne pathway	All malt processing occurs with a confined shed. Sump and storage tanks are covered. Aeration tank is open and has a removable cover that can be placed over the tank to reduce odours. Storage tank is aerated. Rotation of irrigation areas. Even application of irrigated wastewater.
Noise	Pump transferring treated wastewater to the irrigation site. Aeration pumps Truck deliveries of cereal grains and load out of malt products.	Air/windborne pathway	All operations occur in day-time hours (7:00am to 6:00pm, 7 days a week)
Solid waste	Sludge from sump, aeration, and storage tanks.	Spills of wastewater to soil and groundwater	Levels will be monitored monthly in each tank and sludge removed by an authorised waste contractor. Sump and aerator tanks located on concrete floor and bunded wall.
Discharge to land	Irrigation of nutrient enriched wastewater	Seepage through soil to high groundwater (above 1.5mbgl) and overland surface flows to Stirling Wetlands system located 15m from the irrigation site.	Soil moisture probes at 30cm below ground to measure moisture levels at the root zone of the irrigated area. Groundwater levels to be monitored from 3 bores to ensure groundwater separation of 1.5m. Irrigation will cease if groundwater rises above 1.5mbgl. 250kL winter storage tank for treated wastewater. *Note: Based on DWER calculations, this is 109 days storage (15.6 weeks) based on 16kL/week wastewater.* Integrated computer-controlled irrigation system to cease irrigation when soil moisture is at 5 kPA at a depth of 30cm. Flow meter to record volumes of irrigation water discharged. Rotation of irrigation areas. Even application of irrigated wastewater. No irrigation during rainfall of flooded areas. Irrigation area planted with perennial pasture

Emission	Sources	Potential pathways	Proposed controls
			(hay) and healthy vegetation cover maintained. Irrigation area harvested a minimum of twice a year.
	Spills and leaks from wastewater treatment plant	spills and leaks from wastewater treatment plant	All tanks have a backup float valve to shut off supply to pumps that are linked to pump shut off float switches. The 30kLsump tank has a high-level alarm that flashes within the malt shed. Sump and aerator tanks located within a 92m^3 concrete bunded area. Contingency plan to have liquid waste disposed off-site by an authorised waste contractor. This will occur when there is less than 30kL capacity contained within the 250kL storage tank

5.1.2 Receptors

In accordance with the *Guidance Statement: Risk Assessment* (DER 2017), the Delegated Officer has excluded employees, visitors and contractors of the Applicant's from its assessment. Protection of these parties often involves different exposure risks and prevention strategies and is provided for under other state legislation.

Table 6 below provides a summary of potential human and environmental receptors that may be impacted because of activities upon or emission and discharges from the prescribed premises *(Guidance Statement: Environmental Siting* (DER 2016)).

Table 6: Sensitive human and environmental receptors and distance from prescribed activity

Human receptors	Distance from prescribed activity
Four rural residential premises located within 500m of the malt processing facility	• 220m south of malt processing facility • 400m north of the malt processing facility • 455m south east of the malt processing facility • 500m south east of the malt processing facility
Mallokup Holiday Chalets	410m east of the malt processing facility
Environmental receptors	**Distance from prescribed activity**
Geomorphic Wetlands – Stirling Wetlands	Multiple use floodplain 15m north of the irrigation source Multiple use sumpland 99m north west of the irrigation source Multiple use estuary peripheral wetland 220m west of the irrigation source Conservation estuary peripheral wetland 720m west of the irrigation source

Parks and Wildlife Managed Lands and Waters	Tuart Forest National Park 230 m south of the irrigation source.
Threatened Ecological Communities and Priority Ecological Communities	Premises contained within the 500m buffer for the Tuart woodlands and forests of the Swan Coastal Plain (critically endangered) Premises located within the 500m buffer for the subtropical and temperate coastal saltmarsh (vulnerable)
Major watercourses/waterbodies	Capel River 280m north of the irrigation source. Capel River is a Protection Catchment Waterway and is a groundwater fed waterway in the Geographe Catchment (DoW 2010).
Groundwater	The Groundwater is managed under the *Rights to Water and Irrigation Act 1914* within the proclaimed Busselton Capel Groundwater Area. The Perth-Swan Superficial is a managed resource that is utilised by licensed users. See section 5.1.3 for further details. Groundwater is seasonally likely to be higher than 1.5mbgl during winter early spring.
Soil type	The Department of Primary Industry and Regional Development (DPIRD) Natural Resource Information (WA) database classifies the Premises as Vase Wonnerup Wet Flats Phase (211VaWOw) that consist of poorly drained flats around the edge of Vasse Estuary, with dark calcareous sands and mixed estuarine deposits. This is typically distinguished as deep loamy duplexes and earths underlined by deep pale sands. Soil testing at 2 locations (HA1 and HA4 – see Figure 3) confirmed that the site consisted of brown sandy clay. Further testing of the soil at HA4 determined a permeability rate of 1.1m/day and a PRI 189. These tests were not conducted at HA1 site.
ASS	The northern part of the Premises has a high to moderate risk of ASS occurring within 3m of the natural soil surface. The lower southern portion of the Premises, where the malt processing facility and irrigation paddock is located, has a moderate to low risk of ASS occurring within 3m of the natural soil surface.

5.1.3 Groundwater resources

The Applicant has two monitoring bores MW1 and MW2 (see Figure 3 for location) on the Premises located on an elevation of appropriately 2mAHD and have provided single monthly water level readings for January to May 2020. These readings indicated groundwater ranged between 2.4 to 2.1mbgl. DWER groundwater bore BN1S (site reference 61030001), is located 480m from the proposed irrigation area (Figure 3). Groundwater monitoring data from BN1S is available from 1983 to 2020.

It is noted that the Capel River separates BN1S and the proposed irrigation area (Figure 3). Both sites however share the same soil and geology and are equal distance from the Capel River and Stirling Wetlands. Thus, it is assumed that the same groundwater gravitation forces would be applied to both sites, making the groundwater levels recorded at BN1S reflective of the irrigation area.

Groundwater level data recorded at BN1S (Figure 4) demonstrates that the superficial

groundwater level can fluctuate seasonally by 2m. Data also indicates that the groundwater peaks at 1.5mAHD or 1.1mbgl.

Figure 3: Proximity of the Stirling Wetland hydrological areas to the Premises (orange outline) and locations of the soil test pits and monitoring bores

Note: The premise is outlined in orange. The blue areas are multiple use wetlands, the green areas are conservation wetlands. The red circle indicates the location of DWER groundwater bore BN1S. The yellow circles are soil sample sites HA1 and HA4. The green circles are monitoring bores MW1 and MW2 and the purple rectangle is the proposed irrigation site.

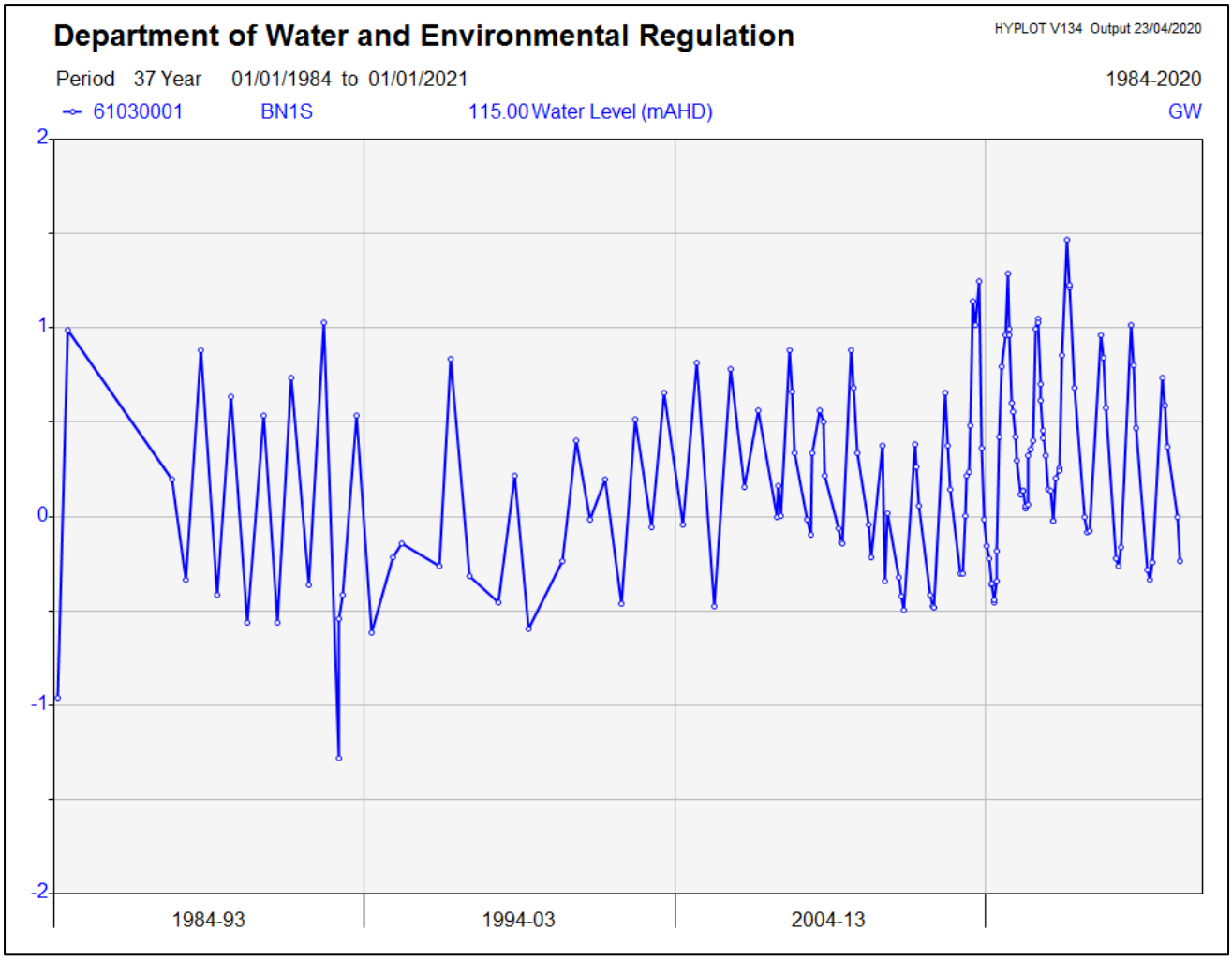

Figure 4: DWER Shallow bore BN1S groundwater levels from 1884 to 2020.

Table 7 shows the groundwater levels at bore BN1S and the two monitoring bores (MW1 and MW2) located on the premises. The data suggests that March had the lowest water levels and August has the highest water levels. Data also suggests that groundwater at MW1 and MW2 is closer to the surface than bore BN1S and that there is potential that the irrigation site may have a groundwater table above 1.5mbgl from June to October.

The proposed irrigation site lies at an elevation ranging between 2.0 to 1.5mAHD, lower than BN1S which lies at 2.573mAHD. Without groundwater level measurements from the winter period over a number of years to provide groundwater level confirmation. Based on data from BN1S and as a conservative measure, the Delegated Officer assumes that the groundwater may peak between 0.5 to 1 mbgl in winter/spring at the irrigation site depending on seasonal rainfall.

It is noted that the permeability rate of the soil of the proposed irrigation area was measured to be 1.1m/day (from Application). Nutrients that move below the root zone are likely to leach and be dispersed into the interconnected Stirling Wetlands that lie adjacent to the proposed irrigation site (Figure 3). Furthermore, the Vasse Wonnerup Water Quality Improvement Plan (WQIP) (DoW 2010) indicates that the Capel River is a groundwater fed waterway in the Geographe Catchment where the dilution of nutrients by groundwater has contributed strongly to nutrient concentration levels in the river.

Table 7: Groundwater levels from bore BN1S (1984 – 2020) and MW1 and MW2 (2020) (mbgl).

Month	January	February	March	April	May	June	July	August	September	October	November	December
BN1S Count (number of measurements)	3	4	23	24	21	7	3	5	24	19	16	4
BN1S Minimum value	2.337	2.497	2.497	2.477	2.377	1.647	1.837	1.167	1.347	1.387	1.947	2.207
BN1S Maximum value	2.787	2.857	3.167	3.107	3.127	2.395	2.227	1.897	2.257	2.977	2.487	2.847
BN1S Average	2.537	2.678	2.903	2.852	2.735	2.175	2.07	1.572	1.823	2.038	2.274	2.502
MW1 Bore	2.4	2.47	2.4	2.35	2.21							
MW2 Bore	2.11	2.25	2.22	2.21	2.06							

Note: Dark highlighted area indicates 'trough' and orange highlighted area indicates the 'peak' groundwater levels.

5.2 Risk ratings

Risk ratings have been assessed in accordance with the *Guidance Statement: Risk Assessments* (DER 2017) for each identified emission source and takes into account potential source-pathway and receptor linkages as identified in Section 5.1. Where linkages are in-complete they have not been considered further in the risk assessment.

Where the applicant has proposed mitigation measures/controls (as detailed in Section 5.1), these have been considered when determining the final risk rating. Where the Delegated Officer considers the applicant's proposed controls to be critical to maintaining an acceptable level of risk, these will be incorporated into the works approval as regulatory controls.

Additional regulatory controls may be imposed where the applicant's controls are not deemed sufficient. Where this is the case the need for additional controls will be documented and justified in Table 8.

Works Approval W6398 that accompanies this Decision Report authorises construction and time-limited operations. The conditions in the issued Works Approval, as outlined in Table 8 have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

A licence is required following the time-limited operational phase authorised under the works approval to authorise emissions associated with the ongoing operation of the Premises i.e. irrigation to land and malt processing activities. A risk assessment for the operational phase has been included in this Decision Report, however licence conditions will not be finalised until the department assesses the licence application.

Table 8: Risk assessment of potential emissions and discharges from the Premises during operation

Risk Event					Risk rating[1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions[2] of works approval	Justification for additional regulatory controls and/ or control recommendations
Source/Activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
Construction								
Installation of malt processing equipment, WWTP and irrigation system	Noise	Air/windborne pathway causing impacts amenity	Four rural residences located within 500m of the malt processing facility (range from 220 – 500m)	All operations occur in day-time hours (7:00am to 6:00pm.)	C = Slight L = Possible **Low Risk**	Y	None required	The Delegated Officer considers that construction works are minor, of short duration and that the separation distance between the source and potential impacts is sufficient to prevent negative impacts.
Operation								
Malt manufacturing including deliveries and load outs.	Noise	Air/windborne pathway causing impacts amenity	Four rural residences located within 500m of the malt processing facility (range from 220 – 500m)	All manufacturing operations occur in day-time hours (7:00am to 6:00pm, 7 days a week.) All malt processing occurs with a confined shed.	C = Slight L = Possible **Low Risk**	Y	None required	Noise Regulations are sufficient for regulating noise impacts during operation.
	Odour	Air/windborne pathway causing impacts amenity		All malt processing occurs with a confined shed.	C = Slight L = Possible **Low Risk**	Y	Condition 1	All malting operations to occur within an enclosed shed. The Delegated Officer considers applicant controls sufficient to manage odour.
WWTP operations	Odour	Air/windborne pathway causing impacts amenity	Four rural residences located within 500m of the malt processing facility (range from 220 – 500m)	Sump and wastewater storage tanks are covered.	C = Slight L = Possible **Low Risk**	Y	Condition 1 & 7	The Delegated Officer considers controls sufficient to manage odour.
	Noise	Air/windborne pathway causing impacts		No controls.	C = Slight L = Possible **Low Risk**	Y	None required	The Delegated Officer considers controls sufficient and that the Noise Regulations are sufficient for regulating noise impacts

Risk Event					Risk rating[1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions[2] of works approval	Justification for additional regulatory controls and/ or control recommendations
Source/Activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
		amenity						during operation.
	Overtopping of containment, spills and leaks of wastewater from containment tanks and pipeworks	Spills and seepage of treated and untreated wastewater to soil and groundwater	Wetlands contained within and adjacent to the Premises. Capel River 280m from malt facility. Groundwater likely to be with 0.5-1mbgl of site. Premises contained within the buffer of 2 threatened ecological communities and priority ecological communities	All tanks have a backup float valve to shut off supply to pumps. A high-level alert (flashing alarm in malt shed) is in the solids sump to alert that sump is high. Aeration and sump tanks are enclosed within a concrete bund with a volume capacity of 92m^2.	C = Minor L = Possible **Medium Risk**	N	**Condition 1** & 8	The Delegated Officer considers Applicant controls insufficient to manage spills and leaks from WWTP. Requirement for a high level alarm to be placed within sump, aeration and storage tanks to detect overtopping and spills to reduce risk to the environment.
Irrigation of nutrient enriched wastewater	Direct discharge of treated wastewater to land	Seepage to soil and groundwater and overland surface flows to Stirling Wetlands system located 15m from the irrigation site.	Wetlands contained within and adjacent to the Premises. Capel River 280m from malt facility. Groundwater likely to be with 0.5-1 mbgl of site. Premises contained	Soil moisture probes placed 30cm below ground level set to alert moisture levels from 5-10kPA. Groundwater levels to be monitored from 2 bores to ensure groundwater separation of 1.5m 250kL winter storage tank for treated wastewater (based on DWER calculations, 97 days storage based on 18kL/week wastewater or 62 days storage based on 28kL/week	C = Moderate L = Likely **High Risk**	N	Conditions 1, 8 , **9, 10, 11**, **12, 13,14, 15, , 18, 19, 20 21**	The Delegated Officer considers Applicant controls insufficient to manage nutrient seepage to groundwater and overland to sensitive receptors located 15m from irrigation area. High groundwater and leaching of nutrients through the soil profile have not been satisfactory addressed and/or managed by the Applicant. High groundwater and preventing the mobilisation of nutrients leaching in winter requires additional controls to address

Risk Event					Risk rating[1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions[2] of works approval	Justification for additional regulatory controls and/ or control recommendations
Source/Activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
			within the buffer of 2 threatened ecological communities and priority ecological communities.	wastewater.) Integrated computer controlled irrigation system to cease irrigation when soil moisture probes detect 5-10kPA at 30cm below ground level. Rotation of irrigation areas. Even application of irrigated wastewater. No irrigation during periods of rainfall or onto flooded areas Healthy vegetation cover maintained over the irrigation areas Irrigation area harvested a minimum of twice a year.				the risk.

Note 1: Consequence ratings, likelihood ratings and risk descriptions are detailed in the Guidance Statement: Risk Assessments (DER 2017).

Note 2: Proposed applicant controls are depicted by standard text. **Bold and underline text** depicts additional regulatory controls imposed by department.

5.3 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 9 below.

Table 9: 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 10 below.

Table 10: 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.

5.4 Acceptability and treatment of Risk Event

DWER will determine the acceptability and treatment of Risk Events in accordance with the Risk treatment table 11 below:

Table 11: 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.

5.5 Detailed risk assessment for overtopping of containment, spills and leaks of wastewater from containment tanks and pipeworks

5.5.1 Description of overtopping of containment, spills and leaks of wastewater from containment tanks and pipeworks

Seepage / leaching of treated wastewater through the soil into the saturated zone of the seasonal aquifer below the site due to overtopping of containment, spills and leaks of wastewater. Once in the groundwater, contaminants migrate down the hydraulic gradient towards the Stirling Wetlands.

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, and downstream, of the premises.

5.5.1 Identification and general characterisation of emission

The malt wastewater is characterised by elevated organic content: BOD; TN and TP. The Premises will produce up to 1,236kL/year (3,386L/day average) of wastewater. Wastewater will be contained within wastewater tanks during treatment and prior to irrigation. The nutrient quality of the wastewater emissions is unknown as only a representative sample from a similar malt processing plant has been provided.

5.5.2 Description of potential adverse impact from the emission

The irrigation area is within the buffer of the critically endangered Tuart woodlands and forest of the Swan Coastal Plain, and the vulnerable listed subtropical and temperate coastal saltmarsh. The WWTP is 25 m from the hydrologically connected Stirling Wetland system that comprises of multiple use and conservation wetlands. The Capel River is located 300m north of

the WWTP where surface water flows through the wetland system into drainage networks into the Capel River.

Overtopping of the WWTP containment infrastructure and/or spills or leaks of wastewater, may result in nutrients leaching through the soil profile leading to contamination of groundwater, or surface water flows over the soil that can wash nutrients into the receiving Stirling Wetlands causing eutrophication. An increase in algal blooms can result in nuisance macro algae covering estuary peripheral vegetation and increased breeding of nuisance insects. The Capel River, Stirling Wetlands and groundwater resources proclaimed under the RIWI Act are interlinked and increased nutrient contamination could result in the degradation of the estuary peripheral conservation wetland and the subtropical and temperate coastal saltmarsh which is a vulnerable listed threated ecological community.

5.5.3 Criteria for assessment

The ANZECC (2000) wastewater quality guidelines for primary industries are considered appropriate assessment criteria to determine the acceptability of the quality of wastewater. Table 12 outlines the criteria for assessment.

Table 12: 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.

5.5.4 Applicant controls

This assessment has reviewed the controls set out in Table 13 below.

Table 13: Applicant's proposed controls for WWTP overtopping, spills and leaks

Site infrastructure	Description	Operation details	Site plan reference
Controls for Emissions to Land Effluent Irrigation			
WWTP	Treatment of nutrient rich wastewater	All tanks have a backup float valve to shut off supply to pumps. A high-level alert (flashing alarm in malt shed) is in the solids sump to alert that sump is high. Aeration and sump tanks are located on a concrete floor enclosed within a concrete bund with a volume capacity of 92m^2.	Figure 2WWTP and Irrigation map

5.5.5 Key findings

The Delegated Officer has reviewed the information regarding overtopping of containment and/or spills and leaks of wastewater from containment tanks and/or pipeworks and has found that the WWTP treatment ability is unknown and therefore the expected quality of treated wastewater is unknown.

5.5.6 Consequence

If surface and groundwater contamination occurs due to overtopping of containment and/or spills and leaks of wastewater from containment tanks and/or pipeworks, 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 of the surface water (Capel River & nearby wetlands). Therefore, the Delegated Officer considers the consequences of the Risk Event to be **Minor**.

5.5.7 Likelihood of Risk Event

Taking into account the Applicant's controls, the proximity to sensitive water resource receptors, the soil type, location of the WWTP, the likely shallow seasonal groundwater level and the nutrient levels in the pre-treated wastewater, the Delegated Officer has determined that overtopping of containment and/or spills and leaks of wastewater from containment tanks and/or pipeworks causing surface or groundwater contamination may occur in some circumstances. Therefore, the Delegated Officer considers the likelihood of the risk event to be **Possible.**

5.5.8 Overall rating of Emission to overtopping of containment and/or spills and leaks of wastewater from containment tanks and/or pipeworks

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 9) and determined that the overall rating is **Medium**.

5.6 Detailed risk assessment for irrigation of nutrient enriched wastewater to land

5.6.1 Description of irrigation of nutrient enriched wastewater

Seepage / leaching of nutrients through the soil into the saturated zone of the seasonal aquifer below the site due to excessive irrigation. Once in the groundwater, contaminants may migrate down the hydraulic gradient towards the Stirling Wetlands.

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, and downstream, of the premises.

5.6.2 Identification and general characterisation of emission

Treated malt wastewater is characterised by elevated organic content: BOD, TN and TP. The Premises will produce up to 1,236kL/year (3,386L/day average) of wastewater. Wastewater will be treated through a WWTP and disposed of via irrigation to 0.9ha irrigation area. The Applicant has proposed that irrigation will occur year round but not on rainy days.

The nutrient quality of the wastewater emissions is unknown as the Applicant did not provide representative samples of the post-treatment wastewater, only pre-treatment samples from a similar facility. Pre-treated wastewater quality data was used by the Applicant in determining nutrient loading to land and represents worst case.

5.6.3 Description of potential adverse impact from the emission

The irrigation area is within the buffer of the critically endangered Tuart woodlands and forest of the Swan Coastal Plain, and the vulnerable listed subtropical and temperate coastal saltmarsh. The irrigation site is 15 m from the hydrologically connected Stirling Wetland system that comprises of multiple use and conservation wetlands. Surface water flows through the wetland system into drainage networks that feed into the Capel River located 280m north of the irrigation site.

The proposed irrigation area is expected to have a shallow groundwater table that is above 1.5mbgl for part of the year (refer to section 5.1.3). The proposed irrigation schedule did not account for storage of wastewater due to a high groundwater table, from June to September. Rather, the Applicant established a schedule based on year round irrigation other than on rainy days or when the irrigation area was flooded or saturated. Thus, the Applicant has not considered the mobilisation of nutrients from the soil profile when groundwater rises.

Furthermore, the Capel River is a Protection Catchment Waterway and is a groundwater fed waterway in the Geographe Catchment. Dilution of nutrients by groundwater has contributed strongly to nutrient concentration levels in the river (DoW 2010). It is likely that the application of nutrients in exceedance of vegetation growth needs will lead to the loss of nutrients to the surrounding environment.

Eutrophication can result from nutrients leaching through the soil profile contaminating groundwater or via surface water that flows over the soil washing nutrients into the receiving Stirling Wetlands. An increase in algal blooms can result in nuisance macro algae covering the estuary peripheral vegetation and increased breeding of nuisance insects.

The Capel River, Stirling Wetlands and groundwater resources proclaimed under the RIWI Act are interlinked. Increased nutrient contamination could result in the degradation of the estuary peripheral conservation wetland and the subtropical and temperate coastal saltmarsh which is a vulnerable listed threated ecological community.

5.6.4 Criteria for assessment

The ANZECC (2000) wastewater quality 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 14 outlines the criteria for assessment.

Table 14: 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.

Capel River is a Protection Catchment Waterway in the Geographe Catchment within the Vase-Wonnernup WQIP (DoW 2010). The WQIP has criteria set for zero increase in nutrient loads for nitrogen and phosphorus. The key nutrient management outcomes for this criteria are based on balancing ground and surface water nutrient management applications for point source and diffuse pollution sources.

5.6.5 Applicant controls

This assessment has reviewed the controls set out in Table 15 below.

Table 15: Applicant's proposed controls for emissions to land

Site infrastructure	Description	Operation details	Site plan reference
Controls for Emissions to Land Effluent Irrigation			
Irrigation of treated wastewater	Irrigation is via sprinklers on an irrigation line	Soil moisture probes to manage irrigation at the root zone. Groundwater levels to be monitored from 3 bores (MW1, MW2) to ensure groundwater separation of 1.5m 250kl winter storage tank for treated wastewater. The Aeration Tank will also provide supplementary storage if required. Surplus wastewater not able to be stored onsite will be removed offsite by a licensed contractor. Integrated computer controlled irrigation system to cease irrigation when site parameters are unsuitable. Flow meter to record amounts of irrigation water discharged. Rotation of irrigation areas. Even application of irrigated wastewater. No irrigation during rainfall of flooded areas Healthy vegetation cover maintained. Irrigation area harvested a minimum of twice a year.	Figure 2 WWTP and Irrigation map

5.6.6 Key findings

The Delegated Officer has reviewed the information regarding wastewater irrigation and has found:

1. **The irrigation area is located on an area which is likely to have a high water table (<1.5mbgl) during the winter to early spring months (see section 5.1.3) ,where the high groundwater table can mobilise nutrients stored within the soil to the Stirling Wetland system.**
2. **The Applicant has not provided details of irrigation management during periods of high groundwater.**
3. **The Applicant proposes to irrigate wastewater during months when rainfall exceeds evaporation (June to September).**
4. **The Applicant has not provided a post-treatment representative sample, only pre-treatment samples. Thus, the risk assessment is based on pre-treated water quality representing the worst case scenario.**
5. **The Applicant has not demonstrated how irrigation of the wastewater will be carried out in a manner that ensures the nutrients applied match the year round seasonal growth needs (including nutrient and water) to the irrigated crop (refer to sections 4.3 and 4.4).**
6. **The Applicant has provided a 15 metre buffer between the edge of the**

irrigation area and the receiving sensitive receptor (Stirling Wetland).

7. **The Applicant has insufficient wastewater storage to manage and store wastewater when irrigation is not occurring from June to September inclusive (refer to sections 4.4). The Delegated Officer has determined that the Applicant requires an additional 22kL based on one steep cycle production during winter however notes that the applicant has committed to using the Aeration Tank for additional storage or removing excess wastewater offsite as required.**

5.6.7 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 of the surface water (Capel River & nearby wetlands). Specific criteria, ANZECC (2000) and Vasse Wonnerup WQIP (DoW 2010) are at risk of not being met. Therefore, the Delegated Officer considers the consequences of the Risk Event to be **Moderate**.

5.6.8 Likelihood of Risk Event

Taking into account the Applicants controls, 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 surface or groundwater nutrient contamination due to irrigation of wastewater will probably occur in most circumstances. Therefore, the Delegated Officer considers the likelihood of the risk event to be **Likely.**

5.6.9 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 9) and determined that the overall rating for the risk of surface and groundwater nutrient contamination due to irrigation is **High**.

6. Regulatory controls

6.1 Works Approval controls

The Delegated Officer intends to grant the Works Approval, although specifically exclude the irrigation of malt wastewater to land via irrigation in winter (June to September inclusive) as proposed by the Applicant. The derived DWER controls listed below have been assessed (see Table 8) to manage the risk to the environment, public amenity and health.

6.1.1 Infrastructure and equipment (construction) – processing facilities

The design and construction requirements have been set via Condition 1

Grounds: The infrastructure and equipment table in Condition 1 has been determined through risk assessment to be necessary to control emissions, where the stated infrastructure or equipment requires construction or installation. The condition ensures that the Applicant constructs the specified infrastructure specified requirements that have been described by the Applicant works approval conditions.

Applicant is required to submit a compliance document verifying that construction has occurred in accordance with works approval requirements (Condition 2).

6.1.2 Infrastructure and equipment (construction) – groundwater

monitoring bores

Two new groundwater monitoring bores to be drilled to monitor nutrient movements through the superficial groundwater. Bores are to be placed up and down gradient of the irrigation area.

The new bores to be sited and installed in accordance with *ASTM D5092/D5092M-16: Standard practice for design and installation of groundwater monitoring bores* and meet the following requirements:

- MB3 and MB4 (superficial groundwater) have screened intervals from 0.5 to 3.0 mbgl;
- MB3 and MB4 superficial bores are located up and down gradient of the irrigation area as indicated on Figure 1, Schedule 1 of the issued works approval;
- all bores surveyed to Australian Height Datum; and
- bores MB3 and MB4 will require thorough bentonite clay compaction above the screening to the surface to ensure surface flow does not contaminate the bores.

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. The detection of nutrient movements through the groundwater can assist in determining if nutrients are leaching beyond the root zones and subsequently impacting groundwater uses and nearby surface waters including the Stirling Wetlands and Capel River. Furthermore, the two bores located at either gradient end of the irrigation area will assist in determining groundwater levels throughout the year and to quantify nutrient data and the effectiveness of emission controls outlined in the risk assessment. Conditions 2, 4 and 5 ensure that monitoring bores are appropriately installed and sited.

The Applicant is required to submit a compliance document verifying that construction has occurred in accordance with works approval requirements (Condition 4).

6.1.3 Wastewater treatment plant (operation)

The following wastewater treatment plant operational requirements have been applied to the works approval:

Table 16: Irrigation operational requirements

Overtopping, spills and leaks of WWTP management	**Justification**
(a) All tanks have a backup float valve to shut off supply to pumps. (b) Aeration tank to be fully bunded. (c) **The float switches located within the sump, aeration tank and storage tank are connected to a high level alarm to prevent overflowing.**	High level alarm system connected to the float switches within the sump, aeration and storage tanks are required to manage the risk of overtopping.

Note: Conditions are derived in part from the Application and CEO requirements(bold).

Grounds: The Delegated Officer considers that the operational requirements for the WWTP to manage the risk of overtopping, spills and leaks from tanks and pipeworks are necessary to minimise the risk of discharges to land. (See Section 4.2, 4.3 and 4.4 for further information.)

6.1.4 Wastewater irrigation (operation)

The following wastewater irrigation operational requirements have been included on the works

approval and are derived in part from application commitments and CEO requirements (in bold) to be managed onsite:

Table 17: Irrigation operational requirements

Discharge via irrigation requirements	Justification
(a) wastewater must be treated in the wastewater treatment system, which includes pH buffering, aerobic treatment and settling, prior to discharge to land; (b) only treated wastewater from the storage tank in the WWTP is irrigated; (c) irrigation occurs on a rotational basis ensuring that areas are dry for 24 hours between applications. **(d) no irrigation occurs between 1 June to 30 September (inclusive).** (e) no irrigation generated run-off, spray drift or discharge occurs beyond the boundary of the irrigation area; (f) irrigation is not undertaken when rainfall is imminent, during or immediately after a rainfall event; (g) wastewater is evenly distributed over the irrigation area and that no ponding or pooling occurs; (h) irrigation does not occur on land that has a soil moisture greater than 10 kPA, 30cm below ground level; **(i) there are daily visual inspections of the irrigation area including sprinklers, pipeline; valves and pump.** (j) vegetation in the irrigation area A1 is harvested twice every 12 months; **(k) no livestock is permitted to graze the irrigation area;** (l) no soil erosion occurs, and (m) healthy vegetation cover is maintained over the irrigated area.	(d)The irrigation area lies 15 meters from a wetland system where the risk of nutrients mobilising within the soil is increased when groundwater tables rise above 1.5mbgl and rainfall exceeds evaporation. (i)Daily inspection will minimise leaks and assist in maintaining equipment in good working condition. (k)Grazing of livestock has not been considered within the nutrient balance of the irrigation field

Grounds: The Delegated Officer has determined that the risk associated with wastewater irrigation is Moderate and considers that the operational requirements for wastewater irrigation are necessary to minimise the risk of discharges to land (see Section 4.2, 4.3 and 4.4 for further information). Operational requirements have been included to ensure the application of nutrient enriched wastewater does not exceed vegetation growth needs that could lead to the loss of nutrients to the surrounding environment.

In addition, section 5.1.3 outlines DWER's groundwater estimated levels for the irrigation area, indicating that groundwater is likely to peak between 0.5 to 1mbgl and be above the threshold of 1.5mbgl from June to September. Rising groundwater tables can leach nutrients stored within the soil. Furthermore, the US EPA (2006) and NSW EPA (1998) both recommend that irrigation of wastewater does not occur when rainfall exceeds evaporation in high rainfall areas or when groundwater tables are high.

In the South West region of Western Australia vegetation water needs are met by rainfall. This occurs from May to August based on rainfall and evaporation data from the Capel North Station

for BoM and DPIRD respectively. It is noted in the last 10 years of data that rainfall for the month of May often does not reach the average rainfall and has evaporation levels higher than rainfall. Noting this, the Delegated Officer considers it suitable to irrigate in May.

6.1.5 Emission limits

The works approval includes the following nutrient loading limits for irrigating:

- TN - 300kg/ha/annual period;
- TP - 50kg/ha/annual period; and
- BOD^5 - 30kg/ha/day.

Note: Conditions are derived in part from the Application and CEO requirements. Refer to section 4.3.

Grounds: Environmental risk associated with nutrient application via irrigation was assessed as Moderate (refer to Section 5.6). The Delegated Officer considers that the emission limits for discharge are necessary to minimise the risk of discharges to lands.

6.1.6 Monitoring (irrigation)

The works approval requires the Applicant to monitor the quality of treated wastewater used for irrigation on a monthly basis. Data is to be presented in a tabular and graphical format, for the following parameters.

Table 18: Emissions and discharge monitoring during time limited operation

Discharge point	Parameter	Frequency	Unit	Method	
				Sampling	Analysis
L2 as shown in Figures 5 in Schedule 1 (outflow of storage tank in the WWTP)	Volumetric flow rate	Continuous when discharging	m^3/day	n/a	n/a
L2 as shown in Figures 5 in Schedule 1	Volume of treated wastewater discharged	Monthly	m^3		
L1 as shown in Figures 5 in Schedule 1 (the storage tank in the WWTP)	pH[1]	Monthly	-	Spot sample	AS/NZS5667.1-1998 and AS/NZS5667.10-1998
	Electrical conductivity[1]		µS/cm		
	Total nitrogen		mg/L		
	Total phosphorus				
	Total dissolved solids				

	Total suspended solids				
	BOD_5				

[1] In field NATA accredited analysis permitted.

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

Grounds: The Delegated Officer considers that the monitoring is required to verify water quality parameters to confirm that the assessment of risk is accurate and to determine the effectiveness of the WWTP.

6.1.1 Monitoring (groundwater)

The works approval holder is required to monitor the standing water level of all three groundwater monitoring bores (including the two new bores required to be constructed under this works approval) and monitoring of ambient groundwater quality from two new bores, commencing within 30 days of their installation.

Table 19: Monitoring of ambient concentrations during time limited operation

Monitoring well location	Parameter	Unit	Frequency	Method	
				Sampling	Analysis
MB1, MB3 and MB4	Standing water level	m(AHD) and mbgl	Monthly	n/a	n/a
MB3 and MB4	pH[1]	pH units	Each quarterly period in the months of March, June, September and December	Spot sample	Spot and grab samples, in accordance with AS/NZS 5667.11.
	Electrical conductivity[1]	µS / cm			
	Total nitrogen	mg/L		Grab samples	
	Ammonia nitrogen				
	Nitrate nitrogen				
	Total phosphorus				
	Reactive phosphorus				

[1] In field NATA accredited analysis permitted.

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

Grounds: The Delegated Officer considers that monitoring data supports the verification of the risk assessment and allows an assessment of the effectiveness of emission controls.

6.1.2 Monitoring reporting requirements

The Applicant is required to report monitoring data including the volume of malt produced, wastewater production and irrigation is required. In addition, reporting of monitoring data collated for groundwater and irrigation wastewater tor the verification of infrastructure, operational control, and 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 malt inputs and outputs will validate the premises production volumes and controls.

7. Determination of Works Approval conditions

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

Table 19 provides a summary of the conditions to be applied to this works approval.

Table 20: Summary of conditions to be applied

Condition Ref	Grounds
Infrastructure and Equipment (construction) 1 and 2	These conditions are valid, risk-based and contain appropriate controls.
Infrastructure Compliance (construction) 3,4 and 5	Infrastructure compliance is a valid, risk-based condition to ensure appropriate linkage between the licence and the EP Act.
Operational requirements and emission limits 6, 7, 8, 9 and 10	These conditions are valid, risk-based and consistent with the EP Act.
Monitoring and Reporting 11, 12, 13, 14, 15 and 16	These conditions are valid, risk-based and consistent with the EP Act.
Compliance, Information and Reporting 17, 18, 19, 20 and 21	These conditions are valid and are necessary administration and reporting requirements to ensure compliance.

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 *works approval* under the EP Act.

8. Consultation

Table 21 provides a summary of the consultation undertaken by the department.

Table 21: Consultation

Consultation method	Comments received	Department response
Application advertised on the department's website (19/05/2020)	No responses were received.	N/A
Local Government Authority advised of proposal 19/05/2020	The Shire of Capel replied on 2/7/2020 confirming that a Development Application has been received. The Applicant provided the department a copy of the Planning Development approval on 13 January 2021.	The Delegated Officer notes this planning approval.

Other Stakeholders DoH, advised of proposal on 19/05/2020	The Department of Health has been contacted by DWER for comments on the application on 19/5/2020 and 15/6/2020. DWER has not received a reply to date.	The Delegated Officer notes that an approval for the Construction or Installation of an Apparatus by the Executive Director, Public health (DoH) is required for both the sewage (toilet facilities) disposal system and the malt processing WWTP and irrigation of wastewater system.
Applicant was provided with draft documents on 21/07/2020)	Refer to Schedule 1	Refer to Schedule 1

9. Conclusion

Based on the assessment in this Decision Report, the Delegated Officer has determined that a works approval will be granted, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

The Works Approval will allow for 180 days of time limited operation on completion of the works subject to Condition 6 and 7. During this time the Works Approval Holder will be required to apply for a Licence.

References

1. ANZECC 2000, *National Water Quality Management Strategy Paper No. 4 – Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 3 Primary Industries*
2. Department of Environment Regulation (DER) 2016, *Guidance Statement: Environmental Siting*, Perth, Western Australia.
3. DER 2019, *Guidance Statement: Decision Making*, Perth, Western Australia.
4. DER 2017, *Guidance Statement: Risk Assessments*, Perth, Western Australia.
5. DER 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
6. DoW 2008, *Water Quality Protection Note 22: Irrigation with nutrient-rich wastewater*, Perth, Western Australia.
7. DoW 2010, *A water quality improvement plan for the Vase Wonnerup Wetlands and Geographe Bay*, Perth, Western Australia
8. DWER 2020, , *Mallokup Malt Pty Ltd response to 21 day package (Decision Report and draft Works Approval W6398/2020/1)* (Document Reference: DWERDT321861)
9. NSW EPA 1998, *Environmental & Health Protection Guidelines: On site Sewerage Management for Single Households*. NSW EPA Technical Guidelines.
10. US EPA 2006, *Process design manual, land treatment of municipal wastewater effluents. Report EPA/625/R-06/016*.
11. WML 2020, *A site and soil evaluation report for onsite sewerage management, Lot 51 Mallokup Road, Stirling Estate, Capel, Commercial Malt Business.*

Schedule 1: Summary of applicant's comments on risk assessment and draft conditions

Condition	Summary of Applicant's comment 14/08/2020	DWER response
Decision report		
Section 3.1, Table 1	The WWTP has been designed as a weekly system. The maximum weekly wastewater and cleaning volume is 26kL but has a maximum weekly capacity of 30kL (size of the sump). Wastewater is designed to be stored and treated in the sump for 5 days.	DWER notes and has updated this information into the report.
Section 3.3.2	The malt wastewater and steep cycle frequencies for all malt processing and cleaning are: • 26kL/week or 3,714L/day (October to May, 35 weeks) • 16kL/week or 2,290L/day (June-September, 17 weeks)	DWER notes and has updated this information into the report.
Section 3.3.3	The sprinklers will irrigate at a rate of 4mm/hour.	DWER notes and has updated this information into the report.
Section 3.3.3	The weather station will be located on the top of the shed.	DWER notes and has updated this information into the report.
4.3 and 4.4	Loading rates and water balance. The Applicant provided a new water balance that demonstrated: • The differences in wastewater produced over the one and three steep cycles. • That wastewater would be stored from June to September inclusive over a 17-week period. • Demonstrating that 238kL is stored in the storage tank and 32kL in the aeration tank over the 17-week storage period.	The water balance provided relies on wastewater being stored in the 250kL storage tank and the treatment aeration tank to meet the required 272kL of storage for the 17 weeks holding period. The water balance assumes immediate irrigation in October to reduce storage volumes. In situations where October has high rainfall or soil moisture, the Applicant does not have adequate storage. In this instance the Applicant will require either stopping production or, in order to continue operations, utilise a contingency measure such as having wastewater pumped out of the storage tank by an authorised controlled waste entity. Refer to section 7 for further information on the determination of works approval conditions. The Applicant should note that yearly contingency measures for October may be required and / or will need to provide an alternative solution should irrigation not be viable due to rainfall occurring during October.
Section 5.1.1 Table 5 Solid waste	Wastewater treatment tanks are located within a contained area on concrete floor enclosed within a concrete bunded wall.	DWER notes and has updated the information into the report.

Condition	Summary of Applicant's comment 14/08/2020	DWER response
Section 5.1.1 Table 5 Discharge to land	Irrigation will cease if groundwater rises above 1.5mbgl, in case of rain event, if the soil moisture probe content at 30cm reaches 10kpa between 1 June to 30 September. The Applicant indicated that additional water irrigation maybe required (sourced from local groundwater) outside of harvest times and a water licence is currently lodged with DWER. Harvest times have been indicated to be scheduled in April, September, December/January	The risks associated with irrigation have been assessed in section and works approval conditions imposed preventing irrigation between 1 June to 30 September (refer to sections 4.4, 5.6 and 7). All irrigation should cease any time of the year when rainfall is imminent, during and 24 hours after a rain event and / or if the soil moisture probe reaches 10kpa. Crop harvesting is vital for nutrient management. The Applicant has not provided a water balance demonstrating sufficient water availability to irrigate a crop for harvest outside the normal seasonal time for hay and that additional water application will be required. The Applicant has provided a copy of a water licence on 13 January 2020 for additional watering during summer to allow crop growth/harvest.
Section 5.1.1 Table 5 Spills and leaks	The sump and aerator tanks are located within a concrete bunded area with a volume capacity of 92m^3. Overflowing is prevented when the float valve shuts of the flow when the tank is full which is indicated by pump shut off float switch that are in each tank. A high-level alert (flashing alarm in malt shed) is in the solids sump to alert that sump is high. Contingency plan is in place to have liquid waste disposed off-site by an authorised waste contractor. This will occur when there is less than 30kL capacity contained within the 250kL storage tank. A water balance was provided to demonstrate this.	DWER notes and has updated this information into the report. DWER notes and has updated this information into the report. The Applicant does not have the full storage requirement of 272kL to contain the 17weeks non irrigation period. The Applicant has committed to using the aerator tank as supplementary storage. The Applicant does not have any emergency storage to compensate for periods when October may be wet or have a high soil moisture that prevents irrigation. The Applicant's current storage design may require the yearly use of the contingency plan (i.e. removal offsite).
Section 5.1.2 Table 6	Tuart Forest National Park 230m south of the irrigation source and not the stated 150m.	DWER notes and has updated this information into the report.