Government of Western Australia
Department of Water and Environmental Regulation

Decision Report

Application for Works Approval

Division 3, Part V *Environmental Protection Act 1986*

Works Approval Number	W6291/2019/1
Applicant	Harvey Industries Group Pty Ltd
ACN	117 597 985
File Number	DER2019/000469
Premises	Harvey Beef Abattoir Lot 3 on Diagram 70328; Lots 105, 106 and 113 on Plan 202106; Lots 115, 116, 117, 118, 119, 142, 143, 145, 147, 149, 172. 173. 174. 175, 177, 200, 201, 202, 203, 204, 205, 228, 229, 230, 231 and 232 on Plan 2492; Lots 235 and 236 on Plan 29898; and Lots 400 and 401 on Plan 302521. Seventh Street HARVEY WA 6220
Date of Report	10 February 2020
Status of Report	Final

Table of Contents

1. Definitions of terms and acronyms

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

Table 1: Definitions

Term	Definition
ACN	Australian Company Number
Applicant	Harvey Industries Group Pty Ltd
CAL	covered anaerobic lagoon
Category/ Categories/ Cat.	Categories of Prescribed Premises as set out in Schedule 1 of the EP Regulations
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
EP Act	Environmental Protection Act 1986 (WA)
EP Regulations	Environmental Protection Regulations 1987 (WA)
Existing Licence	The Licence issued under Part V, Division 3 of the EP Act and in force prior to the commencement of, and during this Review
HDPE	High-density polyetheylene
m^3	cubic metres
mbgl	metres below ground level
Noise Regulations	Environmental Protection (Noise) Regulations 1997 (WA)
Occupier	has the same meaning given to that term under the EP Act.
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
UDR	*Environmental Protection (Unauthorised Discharges) Regulations 2004* (WA)

2. Purpose and scope of assessment

Harvey Industries Group Pty Ltd (the Applicant) currently operate an abattoir and rendering facility on Seventh Street, Harvey under Existing Licence L6395/1993/16.

An application was received from the Applicant on 30 August 2019 to construct a covered anaerobic lagoon (CAL) to enhance wastewater treatment and recover biogas, a by-product of the treatment process. The CAL will be located on Lot 145 on Plan 2492, within the existing premises, approximately 180 m northwest of the existing processing facility.

When constructed, the CAL will replace the existing anaerobic pond. The CAL will include a high-density polyethylene (HDPE) cover to capture biogas (primarily methane). The recovered biogas will be used in the onsite steam boiler or directed to an onsite flare. The CAL will also have a HDPE liner and will be sized to take into account an expansion to 250,000 animals per year. This expansion is being assessed under a separate licence amendment.

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

- the design of the proposed works; and
- a risk-based assessment of the emissions and discharges associated with the construction, commissioning and operation of the proposed CAL.

The Applicant has requested commissioning and time limited operations of the CAL under this Works Approval.

2.1 Application details

Table 2 lists the documents submitted during the assessment process.

Table 2: Documents and information submitted during the assessment process

Document/information description	Date received
Application form (Works Approval) and supporting information, Harvey Industries Group Pty Ltd, 30 August 2019 (DWERDT195800)	30 August 2019
Supporting information, Proposed Covered Anaerobic Lagoon and Production Expansion, August 2019 (DWERDT190881)	19 August 2019
Additional information, received via e-mail on 26 August 2019 (DWERDT214322)	26 August 2019
Additional information, Harvey Beef CAL commissioning plan, 26 August 2019	9 September 2019
Harvey Beef Response to DWER Additional Queries v0, KASA Consulting, 5 February 2020	5 February 2020
Additional information on protection of liner from effects of desludging, received by e-mail on 6 February 2020	6 February 2020

3. Background

The Applicant currently operates an abattoir and rendering facility located approximately 2 km west of Harvey on the Swan Coastal Plain, approximately 120 km south of Perth.

Currently, wastewater generated from the abattoir and rendering plant is directed through primary (solids removal) and secondary (anaerobic and RENOIR (Removal of Nitrogen for Irrigation) ponds. Treated wastewater is then stored in evaporation ponds until it is used to irrigate pastures and crops on the Premises as part of the Applicant's cropping program.

The Applicant has applied to construct a CAL that will replace the existing anaerobic pond, with

the anaerobic pond being decommissioned once the CAL is operational. The CAL will treat combined flows from the existing saveall (primary solids removal from wastewater from the abattoir and rendering plant) and yard pond (which holds wastewater from the existing livestock holding yards).

The CAL will include a HDPE cover to capture biogas (primarily methane) which will be used in the onsite steam boiler (comprising of two stacks) or directed to a flare.

Table 3 lists the prescribed premises categories authorised under Existing Licence L6395/1993/16.

Table 3: Prescribed Premises Categories in the Existing Licence

Classification of Premises	Description	Approved Premises production or design capacity or throughput
Category 15	Abattoir: premises on which animals are slaughtered	Not more than 220,000 tonnes (hot standard carcass weight) of beef cattle slaughtered per annual period
Category 16	Rendering operations: premises on which substances from animal material are processed or extracted	Not more than 120,000 tonnes of animal material rendered per annual period
Category 55	Livestock saleyard or holding pen: premises on which live animals are held pending their sale, shipment or slaughter	Not more than 170,000 animals per year.

4. Overview of Premises

4.1 Existing operational aspects

Beef cattle are transported by truck to the property via an entrance on Eighth Street, Harvey, and unloaded in the stockyards and held in lairage pens or holding paddocks before slaughter.

Mortality is either processed within the rendering plant or denatured prior to transport to a licenced landfill facility. Faecal material recovered from the lairage yards is taken offsite.

Animals are slaughtered and processed in the abattoir building. The slaughter and boning floors operate 5 days a week all year round; however, this can reduce or increase depending on seasonal variation. The slaughter floor runs one shift per day and the boning room runs two shifts per day. Each shift can operate 8.5 to 12 hours.

Blood is collected in a dedicated sump prior to transfer to the rendering area. Paunch (undigested stomach contents) and hides are taken off site for disposal or further processing.

All renderable materials including offal and blood from the abattoir, and renderable material sourced from offsite, are processed in the rendering plant at the premises. The processing rate of renderable material is highly dependent on the drying rate of the products introduced to the cooker with dry products being processed faster than wetter products. The combined (wet and dry) rendering operations can process up to approximately 18 tonnes per hour (15 t/hr of dry products and 3 t/hr of wet (blood) products). Process water is sourced from the Harvey Pipeline Scheme. Rendering plant operations include the drying of blood; cooking, screening, pressing and milling raw material to produce meat bone meal; screening, polishing and settling material to produce tallow and cooking and decanting material from the kill floor to produce other products.

Extracted air (odour) emissions from the rendering facility is directed at low flows into the base of one of two biofilters where the air is diffused through wood chip filter media. Moisture content within the biofilters is maintained using scheme water to sustain microbial activity. Treated air is released over the surface of the biofilters.

Wastewater generated from the slaughter floor, boning room and rendering plant, along with some contribution from cleaning of chilling and freezing areas within the abattoir, is directed through primary (solids removal) and secondary (anaerobic and RENOIR (Removal of Nitrogen for Irrigation) ponds for treatment of the wastewater. Treated wastewater is then stored in evaporation ponds until it is used to irrigate pastures and crops on the Premises as part of the Applicant's cropping program. Sludge wastes are currently removed offsite.

4.2 Proposed construction (from application)

The Applicant is proposing to construct the CAL during summer (December 2019 to March 2020) with construction activities taking place between 7am and 6pm weekdays (occasional Saturday work may be required).

The Applicant has indicated that construction activities will include:

- implementation of soil erosion and sediment controls before construction commences, in order to minimise erosion of the site and direct clean runoff away from the site;
- excavation of clayey subsoil to the specified depth and stockpiling the material for reuse in construction the CAL bund walls. This may include dewatering activities;
- bund walls – constructed in compacted layers (from mixing of excavated soil, adjusting moisture content as required);
- preparing the top of the bund wall for perimeter access and an anchor trench for securing the base geomembrane liner and cover;
- placing topsoil on the external exposed embankment and sowing grass for erosion control;
- construction of perimeter access road;
- installation of perimeter fencing and signage around top of CAL preventing unauthorised access;
- installation of associated water, pumps and biogas pipelines;
- installation of tanks for storing stormwater;
- installation of synthetic HDPE geomembrane liner of permeability to meet $<1 \times 10^{-9}$ m/s;
- installation of a static pond sludge removal system,
- filling of the lagoon with clean water;
- cover installation for capture of biogas for combustion in a flare or existing boiler; and
- installation of an emergency vent and standalone biogas flare.

CAL

The CAL will have a design volume of 24 ML with a water level depth of 5 m. It will be 70 m wide by 110 m in length (inside top of wall dimensions). The CAL have a height of 6 m with the base of the pond approximately 3.4 m below the natural ground level. The walls and base of the CAL will be lined with a 1.5 mm HDPE liner.

A nominal freeboard of approximately 1 m (a minimum of 500 mm) will be used to protect the biogas collection system from any foam or crust and provide an area for gas collection.

The crest of the wall will be 7.6 m wide to allow for perimeter access at the top of the pond. The external batter will have a gradient slope of 3:1.

A 2 mm HDPE cover will be fixed by a perimeter anchor trench.

Flare and emergency vent

A flare skid will be installed at natural ground level on the south side of the CAL and have a stack height of between 6 to 8 metres.

A diaphragm pressure relief assembly (emergency vent) will be installed on the crest of the CAL

bund wall and will act as an automatic mechanical vent to relieve the pressure under the CAL cover.

Stormwater
The area where the CAL is proposed to be located has a natural fall in ground level towards Eighth Street (to the west). Grassed swales will be constructed on the north and south side of the CAL to minimise any potential impact on the CAL embankments by diverting uncontaminated stormwater away from the CAL, toward the Eighth Street roadside swale.

Vehicles and machinery
There is expected to be additional vehicles and machinery on site on a daily basis during the 6 month construction period. Heavy construction vehicles will be onsite while being used for bulk earthworks over a 12 to 16 week period.

A water cart will be onsite to be used for dust control as required and for moisture conditioning of soil fill.

Acid sulfate soils
For the management of potential acid sulfate soils, the Applicant has stated that the earthworks will be conducted during summer when the water table is lowest. However, the application of lime to stockpiles may be considered as a contingency measure in accordance with the Acid Sulphate Soils Management Plan and subject to the outcome of an acid sulphate soil self-assessment. The need for, and the application rate of lime will be dependent on the identification of acid generating soil material, the volume of this material, duration of stockpiling and risk relative to establish environmental pathways.

Dewatering
The Applicant has proposed that minor dewatering of the construction site over a limited period may be required. The Applicant expects volumes of inflow into the excavation to be less than 1 L/s over a duration of approximately 4 months. If dewatering is required, the Applicant will install and use a subsoil drainage system to collect and redirect the groundwater away from the excavation. Any dewatering is proposed to be directed into the existing wastewater treatment pond system.

The Applicant expects that the volumes of dewater that may be required are not large enough to trigger a requirement to obtain a 26D or 5C licence from DWER.

Construction Quality Assurance Plan
The Applicant has provided a Construction Quality Assurance Plan (CQAP) which includes:

- scope of works covered by the CQAP;
- roles and responsibilities;
- inspection, testing and verification protocols;
- construction quality assurance parameters; and
- non-conformance management and reporting.

The CQAP details how the liner will be installed correctly with verification and quality assurance checks completed prior to commissioning.

4.3 Commissioning

The Applicant has provided a CAL commissioning plan, developed by Johns Environmental Group Pty Ltd. Commissioning will be completed in 6 stages which include:

- Stage 1: Training of staff in operation and monitoring of CAL (approximately 1 – 2 days);
- Stage 2: Commissioning and debugging of electrical and mechanical equipment (approximately 1 week) – this includes testing of the wastewater pumps and control systems;

- Stage 3: CAL commissioning (approximately 13 – 15 weeks) – where wastewater will be fed to the CAL to build the bacterial mass required to handle the incoming organic load. As the CAL will be full of cool, clean water, it may take up to 5 weeks to raise the CAL temperature to optimal levels for bacterial activity and up to 13 weeks to achieve stable initial CAL performance. These processes can occur concurrently;
- Stage 4: Seeding of the CAL (approximately 1 – 5 days) – As part of Stage 3, the CAL will be seeded with 20 - 30 tonnes of sludge from the existing anaerobic pond (using a vacuum truck) to accelerate the development of bacterial activity and biogas production;
- Stage 5: Biogas Flare Commissioning (approximately 1 week) – personnel from the biogas flare vendor will attend the site to commission the biogas flare and associated equipment (emergency vent etc.) once a sufficient amount of biogas has accumulated. This will most likely be 4 – 8 weeks after initial wastewater being fed to the CAL. Training of Harvey Beef staff in the operation of this equipment will also occur; and
- Stage 6: Commissioning Biogas feed to boiler (approximately 4 – 6 weeks) – once the CAL is producing biogas at the quantity and quality required for feeding to the boiler onsite (expected to be at least 1 – 2 months post flare commissioning) the biogas piping, compression and boiler feed system will be commissioned.

  As this stage is dependent on when the boiler can be taken off-line for modifications, the Applicant has advised that this commissioning stage may occur a considerable time after the biogas flare commissioning. Training of Harvey Beef personnel in the management and operation of the biogas boiler system will also occur.

During commissioning wastewater will be pumped to both the existing anaerobic pond and the new CAL until commissioning is completed and the CAL is performing as expected. Over time, wastewater infeed to the existing anaerobic pond will diminish to a point where the anaerobic pond can be decommissioned.

4.4 Proposed operational aspects (from application)

The CAL will treat wastewater generated from the abattoir and rendering process for a throughput of up to 250,000 animals per year over 6 days a week during peak season. The design assumes that there is at least one non-process day per week.

The Applicant predicts that average flow rates will be approximately 2,600 L/head/day at 833 head/day, 6 days a week. (The Applicant has stated that this design allows for 1,000 head/day, 6 days a week during peak periods, subject to market demand.)

The Applicant is anticipating that COD loadings will be approximately 0.38 kg/m^3/day with BOD loading approximately half that.

The CAL will have a hydraulic retention time of 14.4 days during peak season.

Biogas will be allowed to accumulate under the HDPE cover to pressures of 20-70 Pa. Biogas will be removed by a blower connected to a perimeter wall gas extraction system. This allows a degree of biogas inventory to be held under the cover at low pressure.

Flare

When there is a build-up of biogas pressure under the CAL cover and the gas is not being used in the existing boiler, the biogas will be directed to the flare for combustion. Biogas will enter the flare via knock-out pot and will then be drawn into a fan feeding the combustion stack and ignited by an interrupted LPG gas pilot.

The flare will be designed to operate at low to medium pressure, typically 0 to 100 Pa, and continuous burning in a wide range of biogas flow. This avoids the need for biogas storage and keeps the pressure under the CAL cover relatively constant.

The flare skid will be installed at natural ground level on the south side of the CAL and have a

stack height of between 6 to 8 metres. The flame will be fully enclosed within the tubular stack and there will be no visible flame from flaring operation.

Stormwater on CAL cover

The CAL cover typically floats on the surface of the wastewater which is one metre below the crest of the walls and will collect rainfall. Stormwater pump(s) will be used to remove accumulated stormwater. The stormwater will be pumped into two small holding tanks, located on the CAL wall with overflow piped and discharged into an existing swale on the eastern side of the CAL.

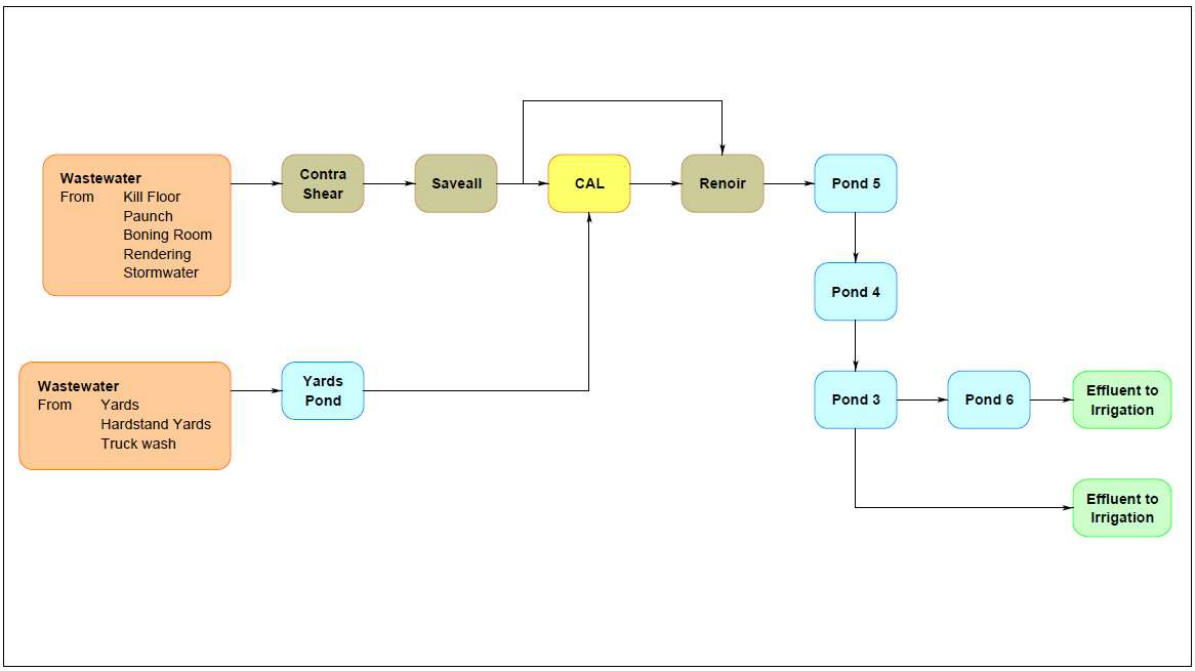

Figure 1: Wastewater process flow diagram (with CAL operational and anaerobic pond decommissioned)

Wind control

To secure the HDPE cover over the CAL under windy conditions, the cover will be weighted using a series of HDPE pipes that will remain filled with water at all times in order to minimise cover movement. The pipes will be filled on installation by the cover installer contractor, and thereafter, refilling of the weighted pipes will be assessed and manually instigated by operational staff. The weighted pipes will also direct stormwater to collection places on the cover for pump out. The holding tanks will be connected to the weighted pipes and valves will allow control of the water ballast across the cover.

CAL pond desudging

The introduction of a protective layer (gravel or otherwise) is not proposed, as it cannot be guaranteed that such a layer in itself would not compromise the integrity of the installed liner during or after construction.

An alternative a sludge removal system will be installed in the new CAL to allow sludge withdrawal as required while the CAL is operational. There will be no requirement for the cover to be removed, nor for water levels to be reduced, nor for mechanical removal systems that could potentially damage the primary liner. The withdrawal system is completely static.

In brief, a series of 5 HDPE sludge removal pipes will be placed horizontally across the base of the CAL. The pipes are raised about 300 mm off the base of the CAL and rest on concrete-

filled, sealed HDPE pedestals each of which sit on an HDPE wear pad to ensure there is no contact with the primary liner. The pipes have a series of holes through which sludge can be removed from the CAL. Sludge is then withdrawn out of the CAL using an external pump or vacuum pump system. Each sludge removal pipe is installed to run up the eastern internal wall of the CAL and out of the CAL via a sealed penetration through the liners complete with thrust block for liner protection. The Construction Quality Assurance Plan includes hold points for verifying that it has been installed to specifications.

Predicted treated wastewater quality

The Applicant has provided anticipated treated wastewater quality, which is shown in Table 4. This takes into account an increase of up to 250,000 animals/year received premises (assessed through a separate licence amendment). The Applicant has stated that further improvements to treated wastewater quality may also be achieved through upgrades and optimization of the RENOIR pond performance.

Table 4: Predicted (from Application) and current treated wastewater quality

Parameter	Predicted					Current Pond 3 and Pond 6 treated wastewater quality (2016-2018)	
	CAL Design Feed	RENOIR[1] (existing pond)		Pond 3 and Pond 6 (final effluent irrigated)			
	Median	Median	Max	Median	Max	Average	Max
BOD[2] (mg/L)	2,750	30 – 50	100	20 – 30	70	13.3	75
TN (mg/L)	200	75	100	50	70	83.5	190
TP (mg/L)	35	20	40	20	40	24.2	75

[1] Assumes pro rata flow of 2.5 ML/day, 6 days/week with 10% raw feed to RENOIR
[2] BOD results are for non-filtered sample

From Table 4, the Applicant is predicting lower average TN and TP concentrations but a slightly higher BOD concentration in the treated water when compared to current treated wastewater quality.

4.5 Infrastructure

The proposed infrastructure, as it relates to the CAL, is detailed in Table 5 and with reference to the site plan. The information in this table has been provided by the Applicant.

Table 5: Proposed infrastructure

Prescribed Activity Category 15, 16 and 55 – construction of the CAL	
The Applicant will construct and operate a covered anaerobic lagoon (CAL) for the treatment of wastewater from the abattoir and rendering facilities. It will have a capacity of 24 ML with a water depth of 5 m (allowing for a nominal freeboard of 1 m and a minimum of 500 mm). A HDPE cover will allow the capture of biogas for use in the steam boiler onsite or directed to a flare.	
1.	Covered 24 ML CAL 1.5 mm HDPE lined (with geofabric underlay) CAL (70 m by 110 m by 6 m high) with the base of the pond approximately 3.4 mbgl. The CAL will include a 2 mm HDPE cover for the capture of biogas. External batter of 3:1 gradient slope. The CAL will be fitted with a static sludge withdrawal system.
2.	Stormwater, wastewater and biogas pipelines and associated pumps
3.	Flare – installed on a skid at natural ground level, with a stack height of 6 to 8 m
4.	Emergency vent – installed on the crest of the CAL bund wall (automatic mechanical vent to relieve pressure under the CAL cover)

5.	Up to two 1,500 L polyethylene tanks for the storage of stormwater pumped from the CAL cover by a sump pump located adjacent to the centre weighting pipes
6.	Grassed swales for the diversion of uncontaminated stormwater
7.	Modifications of the boiler to include the replacement of the existing gas burner and gas train to accept duel fuels (natural gas and biogas), without adversely altering the overall functionality nor increase emissions under standard operations.

4.6 Exclusions to this Assessment

An existing abattoir and rendering facilities, livestock holding pens and associated wastewater treatment infrastructure are currently operated by the Applicant under Licence L6395/1993/16. However, this Decision Report only assesses the emissions and discharges from construction, commissioning and operation of the proposed new CAL and associated infrastructure. Even though this CAL will, once operational, replace the existing anaerobic lagoon, this Decision Report does not assess emissions and discharges from the decommissioning of the existing anaerobic lagoon. Details on the decommissioning of the anaerobic lagoon should be provided by the Applicant when applying for a licence amendment, to include the CAL on the licence, following construction. This Decision Report also does not assess an increase in throughput for category 55 from 170,000 to 250,000, this has been assessed through a separate licence amendment application.

5. Legislative context

Table 6 below summarises approvals relevant to the assessment.

Table 6: Relevant approvals and tenure

Legislation	Number	Approval
Rights in Water and Irrigation Act 1914	N/A	The Applicant has stated that volumes of dewatering required are predicted not to trigger a requirement to obtain a 26D or 5C licence from DWER due to: • an expected flow rate of 1 L/s for a duration of 4 months; and • maximum expected volume of water likely to be dewatered is 11,000 kL (over 4 months). A licence may be required if dewatering exceeds 25,000 kL and water is taken at a pump rate greater than 10 L/s over a period of less than 30 consecutive days.
Local Government Authority – Shire of Harvey – Development approval	P143/19	Development Approval was granted by the Shire of Harvey on 28 November 2019 for the proposed Covered Anaerobic Lagoon.

5.1 Contaminated sites

The adjacent lot (Lot 3 on Diagram 70328, which includes the abattoir and rendering processing buildings) was reported to DWER in 2007 because soil and groundwater contamination (sheen observed on groundwater) was identified during the removal of underground diesel storage tanks. The lot is currently classified as '*possibly contaminated – investigation required'*.

Soil remedial works were undertaken by the Applicant in the vicinity of the tanks during 2007; however, groundwater investigations have not been carried out, the quality of groundwater on

Lot 3 is unknown and groundwater flow direction has not been characterised. Therefore, there is a potential for impacted groundwater to have migrated from Lot 3 onto Lot 145 (where the CAL is to be constructed) and for site workers to come into contact with potentially impacted groundwater during excavation and dewatering activities (ConSites 2019a).

5.2 Part V of the EP Act

5.2.1 Applicable regulations, standards and guidelines

The overarching legislative framework of this assessment is the EP Act and EP Regulations. The guidance statements which inform this assessment are listed in Appendix 1.

5.2.2 Works approval and licence history

Table 7 summarises the works approval and licence history for the premises since September 2015.

Table 7: Works approval and licence history

Instrument	Issued	Nature and extent of works approval, licence or amendment
L6395/1993/16	10/09/2015	Licence renewal
L6395/1993/16	29/04/2016	Notice of Amendment of Licence Expiry Dates – extended Licence expiry date to 14 September 2030
L6395/1993/16	10/11/2016	Amendment Notice 1 Licence amendment to amend conditions relating to the management of treated wastewater within the irrigation area, nutrient loading rates, management of wastewater storage ponds, notification requirements, administrative changes, and update plan of Premises.
L6395/1993/16	5 April 2019	Licence Amendment Licence amendment to include an additional irrigation area, administrative changes, update to new format licence and consolidate changes made in Notice of Amendment of Licence Expiry Dates and Amendment Notice 1.
W6291/2019/1	10 February 2020	Works Approval For construction and time-limited operation of a covered anaerobic lagoon.

6. Location and siting

6.1 Siting context

The Premises is located on the Swan Coastal Plain approximately 2 km west of Harvey and 120 km south of Perth. The land is zoned as intensive farming under the Shire of Harvey's Town Planning Scheme No. 1 (District Scheme) and includes restricted use area 6 (abattoir) and restricted use area 4 (abattoir and holding paddocks with 30 m of dense native vegetation between the buildings and Uduc Rd and around the wastewater lagoons). The surrounding land is zoned as intensive farming and includes land uses such as stock grazing, farm stay accommodation, fruit trees, viticulture and intensive horticulture.

6.2 Residential and sensitive Premises

Table 8 below lists the closest sensitive land uses to the Prescribed Premises which may be receptors relevant to the proposed amendment.

Table 8: Receptors and distance from activity boundary

Sensitive Land Uses	Distance from Prescribed Premises
Residential premises (rural)	Two residential premises located within 600 m of the proposed CAL (480 m NE and 590 m E). An additional 19 residential premises located 600 – 1,000 m from the proposed CAL; with the majority located SE, E and N of the CAL. The remaining are located NE, NW and W.
Residential area	Residential area located approximately 1.5 km east of the proposed CAL.
Accommodation	Farm stay accommodation is located approximately 1.75 km W of the proposed CAL.

6.3 Specified ecosystems, groundwater and water sources

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 9. Table 9 also identifies the distances to other relevant ecosystem values which do not fit the definition of a specified ecosystem and groundwater and water sources.

Table 9: Environmental values

Specified ecosystems and other environmental receptors	Distance from the Premises
Geomorphic wetlands Swan Coastal Plain (management)	Premises located within: Swan Coastal Plain – Semeniuk, Palusplain (seasonally waterlogged), flat, multiple use.
Environmental Protection (Peel Inlet – Harvey Estuary) Policy 1992 (EPP)	Proposed CAL is located 830 m S of an area protected under the EPP.
Surface water	The Premises is located within the Harvey Irrigation District proclaimed under the *Rights in Water and Irrigation Act 1914*. The Harvey Dam is located 5.46 km east and the Harvey Main Drain located 2.4 km NE of the proposed CAL. The Harvey Diversion Drain is located approximately 2 km S of the proposed CAL. A minor river is located 1.5 km WNW of the proposed CAL. Existing agricultural drainage networks are located immediately east of the Lot the CAL is proposed to be constructed within. Other drain lines are located immediately west of the Lot (across Eighth Street). These drain lines flow to the Harvey Diversion Drain discharging into the ocean near Myalup, approximately 19 km downstream. Resource enhancement (sumpland and dampland) wetlands are located approximately 5.5 km west of the proposed CAL.
Groundwater	The South West Coastal Groundwater Area, proclaimed under the *Rights in Water and Irrigation Act 1914*, is located 5.8 km west of the proposed irrigation area. The premises is based within the South West Coastal Groundwater Allocation Plan and is located within the unproclaimed Karri Groundwater Area.

	The Applicant has a production bore onsite; however, it is rarely used due to unsuitable water quality for processing purposes. The Applicant has advised that there are approximately 51 groundwater bores within a 3 km radius, most of which are for production purposes associated with livestock and domestic requirements. The nearest licence to take groundwater, for the Harvey Golf Club, is located approximately 6.5 km west of the proposed CAL. In June 2019 the Applicant commenced monitoring of three groundwater monitoring bores located approximately 630 m E, 1.52 km WNW and 1.1 km WSW of the proposed CAL. The most recent results from the monitoring of these bores indicates that the winter groundwater level is between 0.87 and 1.7 mbgl. Geotechnical investigations by the Applicant at the proposed CAL site in June 2019 showed that depth to groundwater was between 1.7 and 4.8 mbgl. Field tests, conducted by the Applicant, of sampled groundwater bores indicate pH values of 6.3 to 6.8 and total dissolved solids between 2,100 to 2,138 mg/L. The Perth Groundwater Map shows that the groundwater salinity at the premises is 1,500 – 3,000 mg/L, which is considered brackish to saline.

6.4 Soil type

Table 10 details soil types and characteristics relevant to the assessment.

Table 10: Soil and sub-soil characteristics

Groundwater and water sources	Distance from Premises
Soil type classification	The Applicant has provided, with their application, a NIMP that includes information on soil type of the Premises. Soils at the Premises are described as very gently undulating alluvial terraces and fans. Moderate to moderately well drained uniform brown loams or well-structured gradational brown earths. And flat to very gently undulating with deep, imperfect to poorly drained acidic gradational yellow or grey-brown earths and mottled yellow duplex soils, with loam to clay loam surface horizons (NIMP, 2019). The Applicant had an acid sulfate soil and groundwater investigation completed in 2019 by Douglas and Partners which showed that the top soil at the proposed CAL location is dark brown, fine to medium grained sandy topsoil with clay encountered to depths of 0.2 to 0.3 m in all three test locations. Orange-brown mottled grey, grey mottled yellow-brown, medium plasticity clay/sandy clay was encountered below the topsoil to depths of at least 5 m in the three test locations.
Acid sulfate soil risk	Moderate to low acid sulfate soil disturbance risk (<3 m from surface). High to moderate acid sulfate soil disturbance risk (>3 m from surface). Soil samples were taken as part of the acid sulfate soil and groundwater investigation for the proposed CAL. The Applicant has reported that the results showed: • that pH_F was between 4.3 and 7.8; • the results of pH_{FOX} were reported between 2.9 and 6.1. One of the 24 pH_{FOX} results being less than 3. The Applicant had a peer review of the acid sulfate soil results completed which concluded that the acid sulfate soil risk at the site is low. This was based on recorded pH_{FOX} being indicative of some neutralising capacity in the sediments. Additionally the Applicant believes that groundwater pH and sulfate:chloride ratios further justify the low acid sulfate soils risk at the proposed CAL location.

6.5 Meteorology

The region experiences cool, wet winters and warm to hot, dry summers. The nearest Bureau

of Meteorology site is Wokalup (site number 009642), located approximately 5.8 km SSE of the premises.

6.5.1 Wind direction and strength

Figure 2 shows the wind direction and strength for 9am at Wokalup.

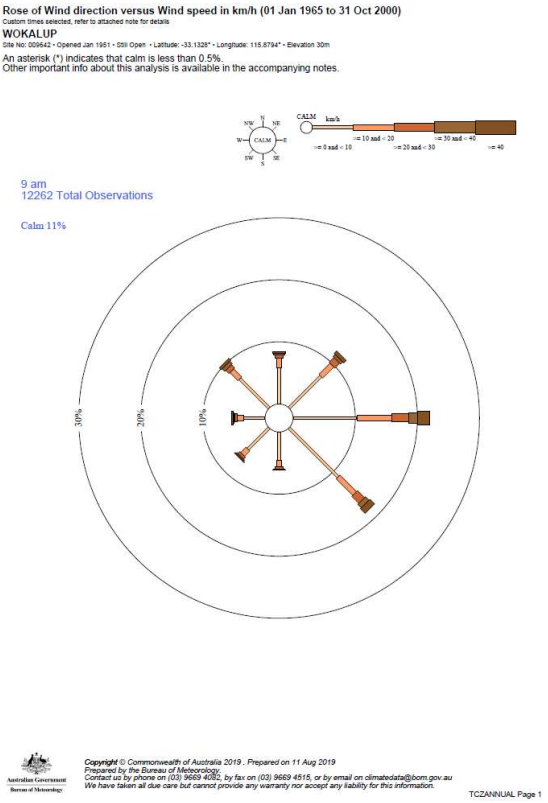

Figure 2: Wind direction and strength for 9am at Wokalup (site no. 009642)

It is important to note that the wind rose (shown in Figure 2) show historical wind speed and wind direction data (1 January 1965 to 31 October 2000) for Wokalup weather station and should not be used to predict future data.

6.5.2 Rainfall and temperature

Figure 3 shows the average monthly maximum temperature and the average monthly rainfall for Wokalup and is based on data from 1951 to 2019.

The average minimum temperatures range between 7.9˚C and 16.1˚C while the average maximum temperatures range between 16.7˚C and 31˚C. The total annual average rainfall is 966.5 mm.

Rainfall exceeds pan evaporation for 5 months of the year (May to September).

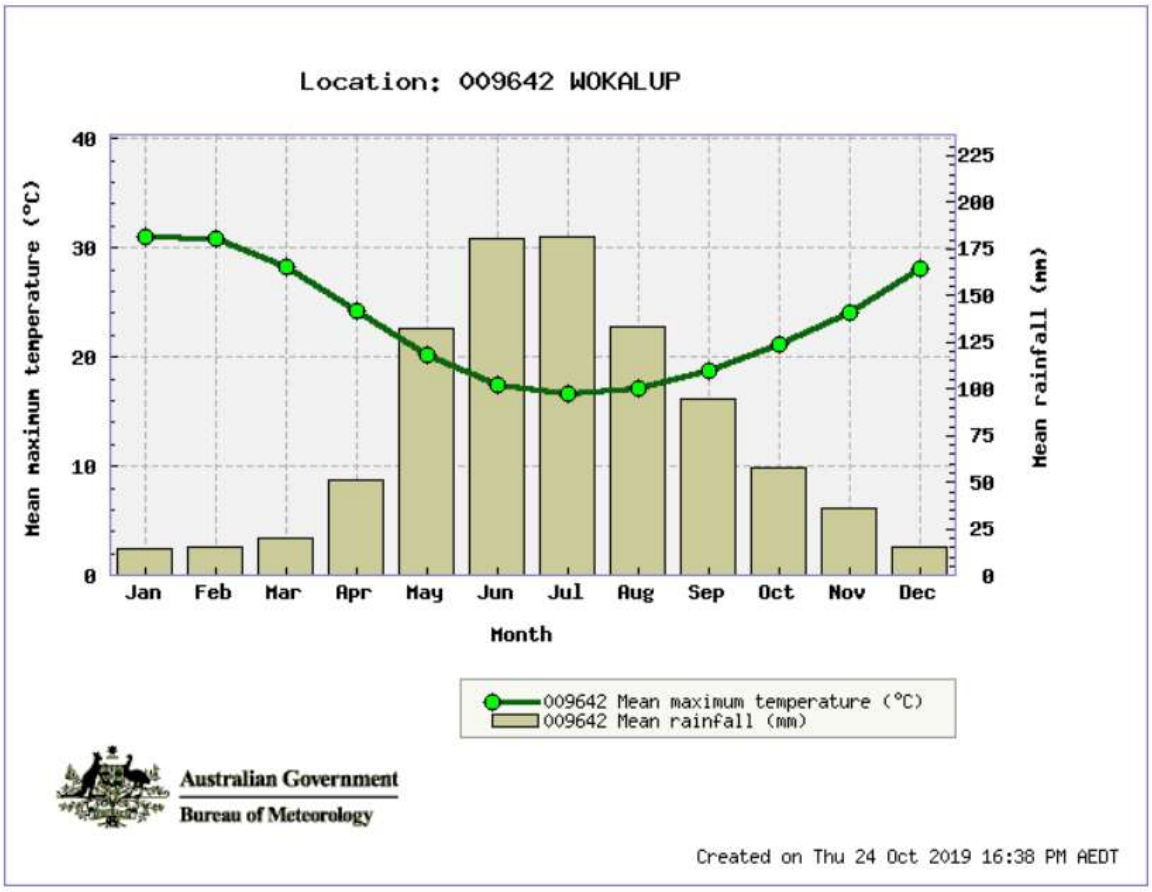

Figure 3: Average monthly maximum temperature and average monthly rainfall

7. Risk assessment

7.1 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 11 and Table 12.

The identification of the sources, pathways and receptors to determine Risk Events are set out in Table 11 and Table 12.

Table 11. Identification of emissions, pathway and receptors during construction

Risk Events							
Sources/Activities		**Potential emissions**	**Potential receptors**	**Potential pathway**	**Potential adverse impacts**	**Continue to detailed risk assessment**	**Reasoning**
Construction of CAL including excavation and installation of liner and associated infrastructure	Disturbance of acid sulfate soils	Acidic water containing metals	Depth to groundwater is approximately 1 to 4 mbgl.	Direct discharge and infiltration to groundwater	Soil and groundwater contamination affecting ecosystem health.	Yes	See section 7.4
	Vehicle movements on unsealed roads and construction and installation of infrastructure	Fugitive dust	Closest rural residential premises located approximately 480 m NE and 590 m E of the proposed CAL location.	Air / wind dispersion	Potential health and amenity impacts	No	The Delegated Officer considers that the separation distance from the proposed location of the CAL to the closest rural dwelling is sufficiently large for there to be no adverse impact from noise or dust emissions from the construction of the CAL. Additionally, construction is expected to be of short duration (less than 6 months). The EP Noise Regulations apply to noise emissions.
		Noise			Potential amenity impacts		

Table 12: Identification of emissions, pathway and receptors during commissioning and operation

Risk Events					Continue to detailed risk assessment	Reasoning
Sources/Activities	**Potential emissions**	**Potential receptors**	**Potential pathway**	**Potential adverse impacts**		
Movement of sludge during seeding of the CAL (commissioning)	Odour	Closest rural residential premises located approximately 480 m NE and 590 m E of the proposed CAL location	Air / wind dispersion	Potential amenity impacts	No	The Delegated Officer considers that the separation distance between the source and potential receptors is sufficient and noting that the activity is likely to be of short duration (1 – 5 days).
	Spills of sludge containing excessive contaminants during transfer of sludge	Surface water: existing agricultural drainage networks located east and west of proposed CAL. Soil and groundwater beneath the premises – approximately 1 to 4 mbgl.	Direct discharge to land or surface water. Contamination of soil and infiltration to groundwater	Surface water, soil and groundwater pollution from excessive contaminants.	No	The Delegated Officer considers that as the vacuum truck will not leave the premises during the transfer of the sludge, the separation distance between the source and potential receptors if any spills were to occur is sufficient. The Delegated Officer also notes that the activity is likely to be of short duration (1-5 days) and will be undertaken by a suitably experienced and qualified company. Additionally, general provisions of the EP Act make it an offence to cause or allow pollution.
Commissioning and operation of the CAL	Seepage of wastewater through the CAL liner. Containment failure of wastewater transfer pipes (majority anticipated to be located underground).	Depth to groundwater is approximately 1 to 4 mbgl.	Infiltration to groundwater	Groundwater contamination affecting ecosystem health.	Yes	See section 7.5.
	Overflow of CAL.	Surface water: existing agricultural drainage network located immediately east and west of the Lot where the CAL is proposed to be constructed.	Direct discharge to land. Discharge to existing drainage network from overland flows.	Surface water contamination affecting ecosystem health.	Yes	See section 7.5.
	Rainfall collected on the CAL cover, pumped and stored in two tanks prior to overflow discharged into an existing swale drain. Potential for the rainfall to be contaminated if the integrity of the CAL cover is compromised.	Surface water: existing agricultural drainage network located immediately east of the Lot where the CAL is proposed to be constructed. Depth to groundwater is approximately 1 to 4 mbgl.	Direct discharge to land and infiltration to groundwater.	Surface water and groundwater contamination affecting ecosystem health.	No	The Delegated Officer considers that the purpose of the CAL cover is to capture biogas and therefore the Applicant will maintain the integrity of the CAL cover such that contamination from biogas or wastewater within the CAL of any rainfall falling on the cover will be minimised. Additionally, general provisions of the EP Act make it an offence to cause or allow pollution.
	Odour from CAL and biogas management system	Closest rural residential premises located approximately 480 m NE and 590 m E of the proposed CAL location.	Air / wind dispersion	Potential amenity impacts	No	The Delegated Officer considers that the separation distance between the source and potential receptors is sufficient noting that fugitive odour from the CAL and biogas management system is expected to not be significant compared to abattoir and rendering operations onsite and the treatment of wastewater in the existing open wastewater treatment infrastructure (save all / DAF and pond system). There have been no complaints received by DWER in relation to odour in at least the last 3 years.
	Noise (from operation of pumps, flare and other associated infrastructure)	Closest rural residential premises located approximately 480 m NE and 590 m E of the proposed CAL location.	Air / wind dispersion	Potential amenity impacts	No	The Delegated Officer considers that the separation distance from the proposed location of the CAL to the closest rural dwelling is sufficiently large for there to be no adverse impact from noise emissions from the operation of the CAL. Additionally, noise from the operation of the CAL is expected to be insignificant compared to abattoir and rendering operations onsite. The EP Noise Regulations apply to noise emissions.
	Emissions from the flare including hydrogen sulphide and CO	Closest rural residential premises located approximately 480 m NE and 590 m E of the proposed CAL location.	Air / wind dispersion	Potential amenity and health impacts	No	The flare will be commissioned for approximately 1 week (4 – 8 weeks after initial wastewater being fed to the CAL). Once commissioned, the flare will be the primary release of biogas until the biogas feed to the boiler has been commissioned. The Applicant has advised that it will take approximately 1 to 2 months post flare commissioning for the CAL to produce the quantity and quality required to feed the boiler to start commissioning. Additionally, as commissioning of the biogas feed to the boiler is dependent on when the boiler can be taken offline for modifications, commissioning of the biogas feed to the boiler may be a considerable time after the commissioning of the flare. Therefore, the flare may be the primary biogas release mechanism for up to six months until the biogas feed to the boiler can be commissioned and start operation. Once the CAL and associated infrastructure has been commissioned, during operation of the CAL, the flare may be used as a contingency when the steam boiler requires maintenance and the biogas is at capacity within the CAL. Boiler maintenance is scheduled to occur quarterly, however, the need to use the flare during these periods may not always be necessary. The flare may also be used during annual shutdown, during extended holiday periods, or as a contingency measure prior to a severe storm event or imminent bushfire. This is expected to be infrequent and over a limited period of time.

Risk Events					Continue to detailed risk assessment	Reasoning
Sources/Activities	**Potential emissions**	**Potential receptors**	**Potential pathway**	**Potential adverse impacts**		
						The Delegated Officer considers that the separation distance between the source and receptor is sufficient noting the relatively short duration of the activity. Additionally, general provisions of the EP Act make it an offence to cause or allow pollution.
	Odour from the release of methane from the emergency vent	Closest rural residential premises located approximately 480 m NE and 590 m E of the proposed CAL location.	Air / wind dispersion	Potential amenity impacts	No	The Delegated Officer considers that the separation distance between the source and potential receptors is sufficient noting that methane released through the diaphragm pressure relief assembly (emergency vent) will only occur in exceptional circumstances.

7.2 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 13 below.

Table 13: 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 14 below.

Table 14: 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.

7.3 Acceptability and treatment of Risk Event

DWER will determine the acceptability and treatment of Risk Events in accordance with the Risk treatment Table 15 below:

Table 15: 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.

7.4 Risk Assessment – Disturbance of acid sulfate soils during construction

7.4.1 Description of Risk Event

During construction of the CAL, excavation (and dewatering) may be required below the groundwater table, potentially disturbing acid sulfate soils and exposing them to air which may cause acidic water containing metals to leach into surrounding soil and groundwater affecting ecosystem health.

7.4.2 Identification and general characterisation of emission

There is a moderate to low acid sulfate soil disturbance risk <3 m from the surface and a high to moderate acid sulfate soil disturbance risk > 3 m from the surface. The Applicant is proposing to construct the base of the CAL pond at approximately 3.4 m below natural ground level. Construction is expected to be of short duration, less than 6 months.

Soil samples were taken as part of an acid sulfate soil and ground water investigation for the proposed CAL, with the Applicant concluding that the acid sulfate soil risk at the site is low (see section 6.4).

7.4.3 Description of potential adverse impact from the emission

Disturbing acid sulfate soils and exposing to oxygen has the potential to cause significant environmental impacts such as fish kills and loss of biodiversity in wetlands and waterways, contamination of groundwater resources by acid, arsenic, heavy metals and other contaminants. If not managed appropriately, acid sulfate soils may cause environmental harm.

Depth to groundwater at the proposed CAL location has been measured by the Applicant to be between 1.7 and 4.8 mbgl. Existing agricultural drainage networks, that may show expressions of groundwater, are located immediately east and west of the proposed CAL location. These drainage networks flow to the Harvey Diversion Drain which discharges into the ocean near Myalup approximately 19 km downstream.

7.4.4 Criteria for assessment

General provisions of the EP Act make it an offence to cause or allow pollution. Additionally, it is an offence to discharge acid with a pH less than 4 into the environment under regulation 3 of the UDR.

7.4.5 Applicant controls

This assessment has reviewed the controls set out in Table 16 below.

Table 16: Applicant's proposed controls for the management of acid sulfate soils during construction

Control	Description
Infrastructure	Excavated soil will be stockpiled to the north of the construction area and within the Existing Licence L6395/1993/16 premises boundary. Temporary sediment traps will be constructed to capture any sediment runoff from the stockpiles. Groundwater levels in the vicinity of excavation will be constantly monitored. The need for, and extent of dewatering for excavation will be assessed prior to mobilisation of the excavation works contractor and during excavation works (particularly near full depth). Subject to this assessment, if dewatering is required, subsoil drainage system will be installed and utilised to collect and redirect groundwater away from the excavation.
Procedures / Management	Construction will occur during summer when the water table is the lowest. Where there is potential for acid generation, the application of lime to stockpiles may be considered by the Applicant as an appropriate contingency measure. Subject to the outcome of the acid sulphate soils self-assessment, the application of lime will be conducted in accordance with the Acid Sulphate Soils Management Plan. The need for, and application rate of lime will be dependent on the identification of acid generating soil material, duration of stockpiling and risk relative to establish environmental pathways. Anticipated volumes of inflow into the excavation is likely to be less than 1 L/s. Any dewatered water will be placed in the existing wastewater treatment pond system.
Monitoring	Pre-construction check of the review measures for stockpiles will be completed by the Project Manager and Earthworks Contractor prior to commencing site works.

7.4.6 Key findings

The Delegated Officer has reviewed the information regarding the disturbance of acid sulfate soils during construction and has found:

1. As the proposed development involves earthworks beyond 3 m below the natural ground surface and possibly a temporary period of dewatering, DWER considers that there is a risk of groundwater acidification associated with the proposed works (ConSites 2019a).

7.4.7 Consequence

Based upon the base of the pond being constructed at approximately 3.4 mbgl, a moderate to high risk of acid sulfate soils greater than 3 m below the surface and soil monitoring results, the Delegated Officer considers that there will be low level impacts at a local scale. Therefore the Delegated Officer considers the consequence to be **moderate**.

7.4.8 Likelihood of Risk Event

Based upon the Applicant's proposed controls and proximity to receptors the Delegated Officer has determined that the likelihood of low level impacts on a local scale will probably not occur in most circumstances. Therefore, the Delegated Officer considers the likelihood to be **unlikely**.

7.4.9 Overall rating of Risk Event

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 13) and determined that the overall rating for the risk of acid sulfate soils being disturbed and impacting on soil and groundwater affecting ecosystem health is **medium**, and therefore suitable for regulatory controls.

7.5 Risk Assessment – Overflow or containment failure of wastewater transfer infrastructure and lined pond

7.5.1 Description of Risk Event

Failure of CAL liner, wastewater transfer pipes leaks; overtopping of CAL, causing land, soil and groundwater contamination, reducing groundwater quality and ecosystem health.

7.5.2 Identification and general characterisation of emission

Wastewater is generated from the slaughter floor, boning room and rendering plant with a small amount of wastewater from the cleaning and chilling and freezing areas within the abattoir. This wastewater is directed through solids removal (save all / DAF) and then, once the CAL is constructed, will be directed to the CAL prior to being directed to the existing RENOIR pond.

Contaminated stormwater from the existing livestock holding yards is directed to the existing yard pond. Once the CAL is operational, wastewater from the yard pond will also be directed to the CAL. New pipework for the wastewater will be installed between the yard pond and solids removal (save all / DAF) to the CAL, and from the CAL to the RENOIR pond. It is anticipated that the majority of these pipes will be located below ground. A determination of which portions of pipework will be located above and below ground will be made following confirmation of logistical aspects prior to installation.

Wastewaters from the abattoir and rendering processing plants are characterised by high biochemical (or biological) oxygen demand, chemical oxygen demand, total suspended solids, oil and grease, nitrogen, phosphorus salt (typically NaCl), micro-organisms and chemicals (AMPC 2017). Stormwater from the livestock holding yards will contain manure and urine. Expected CAL inflow wastewater quality is shown in Table 4 in section 4.4, which estimates high BOD and total nitrogen levels.

There is potential for impacts to land, soil and groundwater if the CAL pond overtops, or the CAL liner or wastewater transfer pipes fail.

7.5.3 Description of potential adverse impact from the emission

Wastewater containing excessive contaminants (including nitrogen, phosphorus, BOD, COD and TSS) from overtopping of the CAL pond or failure of the wastewater transfer pipes or CAL liner could lead to contamination of land, soil and groundwater.

An existing agriculture drain is located adjacent to the location of the pipes for the transfer of wastewater from the yard pond, save all / DAF to the CAL and from the CAL to the RENOIR.

The base of the CAL will be located approximately 3.4 mbgl with the CAL liner being up to approximately 1.7 m within the groundwater table.

7.5.4 Criteria for assessment

General provisions of the EP Act make it an offence to cause or allow pollution.

Water Quality Protection Note (WQPN) 26 *Liners for containing pollutants, using synthetic membranes* (DoW, 2009) includes recommendations for liners, such as:

- liners should be installed on a stable soil sub-base with the underside of the lowest liner at least two metres above the highest anticipated wet season watertable, unless:
  - an effective underdrainage measures are installed to prevent upward water pressure on the liner; and
  - allowance is made for any mounding of the groundwater table resulting from any predicted seepage from the containment compound;
- all lined storage compounds should have sufficient freeboard (at least 50 cm) maintained;
- all synthetic fluid containment liners should have a coefficient of permeability of less than 2 x 10^{-10} m/s when tested using the American Society for Testing and Materials (ASTM) method D4716;
- liners should be constructed on gradients of less than one in three, unless appropriate engineering methods are used to prevent liner slippage;
- HDPE liners should have a minimum thickness of 0.75 mm, with a tolerance of 5%;
- all seams and joints made on site should be continuous. Panels of the liner should be overlapped by a minimum of 100 mm, prior to heat-welding or mechanical jointing; and
- the effectiveness of any lined containment should be determined by monitoring contained fluid balances, standing water table levels and groundwater quality adjacent to the site.

Practice Note 21 – Farm Dairy Effluent Ponds by the Institution of Professional Engineers New Zealand, August 2017 (FDE NZ 2017) states that "*it is considered inappropriate to construct ponds below the groundwater profile. If this must occur, then specific design from a geotechnical professional must be sought*". Advice from DWER's Contaminated Sites Branch (ConSites 2019b) suggests that if the pond cannot be constructed such that the base of the pond is above the maximum groundwater table, then the pond should be double-lined with a drainage layer between the two liners. Monitoring of water quality in this drainage layer would give an early warning of leakage with leaks then being able to be identified using electrical testing techniques and repaired.

7.5.5 Applicant controls

This assessment has reviewed the controls set out in Table 17 below.

Table 17: Applicant's proposed controls for overflow or containment failure of pipes and CAL containing wastewater

Control	Description
During construction	
Procedures / Management	Construction Quality Assurance Plan includes the installation of the CAL geomembrane liner and associated pipework, including: • geotextile fabric underlay: - ensure geofrabric underlay quality assurance documentation is received from the geomembrane supplier prior to lining works commencing; - inspection by the geomembrane supplier of the finished clay surface to be lined prior to installation works commencing; - inspection of installed underlay by contractor as each sheet is laid; • HDPE liner and cover: - ensure HDPE liner and cover quality assurance documentation is

Control	Description
During construction	
	received from the geomembrane supplier prior to lining and cover works commencing; - inspection and identification by geomembrane supplier of HDPE material surface for defects or damage; - inspection by geomembrane supplier of panel overlap and welded seams; - all defects and damage identified will be repaired and recorded by the geomembrane supplier; - HDPE panels will be installed by the geomembrane supplier during specified weather conditions; - the liner and cover will be secured by the geomembrane supplier in anchor trenches as per the construction drawings; • wastewater pipework: - inspection of wastewater pipework type and size by plumber and hydraulic engineers; - set-out of pipe route checked by licensed surveyor prior to piping installation; - inspection of piping alignment, spacing, welding and jointing by a plumber during installation; - inspection of installed pipework system by hydraulic engineers and project manager following installation. Hold point (work must not proceed without authorisation by appropriate suitably qualified personnel) for: • geotextile fabric underlay: - inspection of subsoil surface; - inspection of installed underlay; and • HDPE liner and cover: - inspection of panel overlap and weld seams; • the wastewater pipework: - survey of pipe route; - inspection of piping prior to back-fill of trenches; and - inspection of installed pipework system. The installation of a static sludge removal system consisting of: - a series of 5 HDPE sludge removal pipes placed horizontally across the base of the CAL. - the pipes are raised about 300 mm off the base of the CAL and rest on concrete-filled, sealed HDPE pedestals each of which sit on an HDPE wear pad to ensure no contact with the primary liner. - the pipes have a series of holes through which sludge can be removed from the CAL using an external pump or vacuum pump system. - each sludge removal pipe is installed to run up the eastern internal wall of the CAL and out of the CAL via a sealed penetration through the liners complete with thrust block for liner protection.
During operation	
Infrastructure	Enclosed pipe system for the transfer of wastewater to the CAL and from the CAL to the RENOIR. Level sensors and alarms used in the CAL. Standby pumps for wastewater to and from the WWTP.

Control	Description
During construction	
	Covered anaerobic lagoon lined with 1.5 mm HDPE on the base and walls and 2 mm HDPE (cover) fixed by a perimeter anchor trench. HDPE liners will achieve a hydraulic conductivity less than 1 x 10^{-9} m/s.
Procedures / Management	Nominal freeboard of 1 m (minimum of 500 mm) in the CAL to protect the biogas collection system from foam, crust and excessive working level and provide gas inventory. It will also minimise the risk of overtopping under normal operation. Operational procedures and operator training.
Monitoring	Regular checks of CAL water levels and pump operation by WWTP operator. Regular checks of CAL walls by WWTP operator. Regular checks of integrity of pipework and CAL with any issues rectified.

7.5.6 Key findings

The Delegated Officer has reviewed the information regarding overflow or containment failure of transfer infrastructure and lined pond and has found:

1. The Applicant is proposing to construct the CAL such that the base is 3.4 mbgl. Groundwater investigations by the Applicant at the proposed CAL location showed that depth to groundwater was between 1.7 and 4.8 mbgl. Therefore, the CAL liner could be up to 1.7 m within the groundwater table during winter (when the groundwater is closest to the surface).
2. The Applicant has acknowledged that the separation distance to the highest groundwater level is a deviation from WQPN 26 and has stated that the use of a single HDPE geomembrane liner with permeability of less than 1 x 10^{-9} m/s on the pond base and walls will minimise the risk to groundwater.
3. The Applicant has proposed to install and utilise a subsoil drainage system to collect and redirect groundwater away from the excavation of the CAL only if dewatering during construction is required. It is unclear whether this subsoil drainage system will actually be constructed and utilised and if so, if it is intended to continue to redirect groundwater during operation of the CAL.
4. WQPN 26 recommends that if there is less than two metre separation between the underside of the lowest liner and highest groundwater table, effective underdrainage measures are installed to prevent upward pressure on the liner.
5. It is acknowledged that the CAL is proposed to have a nominal freeboard of 1 m and a minimum freeboard of 500 mm. This meets WQPN 26 recommendation of at least 500 mm freeboard.
6. No groundwater monitoring bores are proposed to be installed near the CAL to monitor groundwater quality to help detect any leakage through the liner. The Delegated Officer will consider the requirements for bore installation and monitoring as part of any additional regulatory controls required to manage the risk event.

7.5.7 Consequence

If overflow or containment failure of wastewater transfer infrastructure and CAL occurs, then the Delegated Officer has determined that the impact of wastewater containing excessive contaminants on soil, land, surface water and groundwater will be high level on site impacts. Therefore, the Delegated Officer considers the consequence to be **major**.

7.5.8 Likelihood of Risk Event

Depth to highest groundwater level at the location of the proposed CAL is between 0.87 and 4.8 mbgl (based on Applicant geotechnical investigations). The base of the CAL is proposed to be 3.4 mbgl. It is unclear whether subsoil drainage will be installed, and if so, continue to be used during operation of the CAL. Additionally, no groundwater monitoring or leak detection system is proposed by the Applicant. Therefore, the Delegated Officer has determined that the likelihood of impacts from the failure of containment of wastewater in transfer pipes and/or lined CAL on land, soil and groundwater could occur at some time. Therefore, the Delegated Officer considers the likelihood to be **possible**.

7.5.9 Overall rating of overflow or containment failure of wastewater transfer infrastructure and lined pond

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 13) and determined that the overall rating for the risk of containment failure of wastewater transfer infrastructure and lined pond is **high**, and therefore suitable for regulatory controls.

7.6 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 18 below. Controls are described further in section 8.

Table 18: Risk assessment summary

	Description of Risk Event			Applicant controls	Risk rating	Acceptability with controls (conditions on instrument)
	Emission	**Source**	**Pathway/ Receptor**			
1.	Acidic water containing metals	Disturbance of acid sulfate soils during construction	Direct discharge and infiltration to groundwater. Soil and groundwater contamination affection ecosystem health. Depth to groundwater is approximately 1 to 4 mbgl.	Infrastructure (stockpile management, sediment traps, subsoil drainage), management (construction timing, use of lime) and monitoring (pre-construction checks) measures	Moderate consequence Unlikely likelihood **Medium risk**	Acceptable subject to applicant controls conditioned and may be subject to additional regulatory controls.
2.	Overflow or containment failure of wastewater transfer infrastructure and lined pond	Seepage through CAL liner. Containment failure of wastewater transfer pipes (majority anticipated to be located underground). Overflow of CAL.	Infiltration to groundwater. Direct discharge to land. Discharge to existing drainage network from overland flows. Depth to groundwater is approximately 1 to 4 mbgl. Surface water and existing agricultural drainage network located immediately east	Management measures during construction (construction quality assurance plan). Infrastructure (enclosed pipe system, level sensors, HDPE base and cover for CAL), management (freeboard and operator procedures / training) and	Major consequence Possible Likelihood **High risk**	Risk event may be tolerated subject to Applicant controls and multiple regulatory controls.

	Description of Risk Event			Applicant controls	Risk rating	Acceptability with controls (conditions on instrument)
	Emission	Source	Pathway/ Receptor			
			and west of the Lot where CAL is proposed to be constructed.	monitoring (regular checks of infrastructure) measures		

8. Regulatory controls

8.1 Works Approval controls

8.1.1 Acid sulfate soils management infrastructure

Infrastructure proposed by the Applicant for the management of acid sulfate soils during construction will be conditioned in the works approval. The requirements are derived from Applicant controls as described in section 7.4.

Additionally, the Applicant will be required to conduct an acid sulfate soils self-assessment form and, if required as a result of the self-assessment, an acid sulfate soils report and an acid sulfate soils management plan shall be submitted to DWER before any construction commences.

Grounds: During construction of the CAL, excavation (and dewatering) may be required below the groundwater table, potentially disturbing acid sulfate soils and exposing them to air which may cause acidic water containing metals to leach into surrounding soil and groundwater affecting ecosystem health.

DWER recommends that model acid sulfate soils condition EN8 and advice Ena1 is applied, as published in 'Model Subdivision Conditions Schedule' (Department of Planning, Lands and Heritage, WAPC, May 2019) (ConSites 2019a). This requires the Applicant to conduct an acid sulfate soils self-assessment.

8.1.2 Overflow or containment failure of wastewater transfer pipes and lined pond infrastructure

Infrastructure proposed by the Applicant for the management of overflow or containment of wastewater will be conditioned in the works approval. The requirements are derived from Applicant controls as described in section 7.5.

Additionally, the Applicant will be required to:

- suitably prepare the in situ soil such that optimum compaction is achieved;
- install a double-lined system;
- construct a protective layer at the base of the pond to protect the liners from future desludging activities;
- maintain and operate the CAL to ensure that the hydrostatic pressure does not compromise the HDPE liners; and
- install additional groundwater monitoring bores adjacent to the CAL.

Grounds: Operations of the CAL includes the storage of wastewater containing excessive contaminants where there is a risk to land, surface water and groundwater if not managed appropriately. The current design proposed does not meet the guideline separation distance of 2 m and so there is an increased risk of impacts to groundwater, groundwater users and

groundwater dependant ecosystems.

The Applicant has proposed to line the base and walls of the CAL with a 1.5 mm HDPE liner; however, no additional measures to reduce impacts to groundwater have been proposed. As the CAL may be up to 1.7 m within the groundwater table during winter and, if the integrity of the HDPE liner were to be compromised, the wastewater would be in direct contact with the groundwater, the Delegated Officer considers a double HDPE liner with a drainage layer between the two liners will provide an appropriate barrier to ensure an acceptable risk to impacts on groundwater, groundwater users and groundwater dependant ecosystems. Considering a submission from the Applicant (see Appendix 2) the Delegated Officer considers that the requirement for a drainage layer between the liners is not required as the groundwater monitoring bores located within close proximity to the CAL should be sufficient to detect any leakage from the liners.

The requirement to suitably prepare the in situ soil such that optimum compaction is achieved is required to provide an additional barrier to the groundwater, particularly during winter when it is closer to the surface. If below the water table construction of the pond is required, dewatering of the pond footprint may be required.

The requirement to place a protective layer over the base of the pond is considered essential to protect the integrity of the liners from punctures that may occur during future desludging activities. Alternatively the works approval holder may propose an alternative management system of in-situ desludging that would not risk damaging the liner integrity.

The requirement to maintain and operate the CAL to reduce upward groundwater pressure on the liner is required to ensure that the risk of damage to the liner caused by a pressure differential across a partially submerged liner is minimised. This may be achieved by the construction of a subsurface cut-off wall or a ring-drain around the pond footprint and the construction of an underdrainage system (which would require a discharge management plan). Geotechnical advice may be required to be obtained to determine the most appropriate approach.

In the absence of an underdrainage leak detection, the requirement to install additional shallow groundwater monitoring bores around the CAL is necessary to provide an early detection of breach of containment to allow actions to be taken and ensure that impacts are limited. It will also provide reliable information about groundwater depth around the CAL. Conditions require that bores are appropriately installed and sited. See section 8.1.3 for monitoring of groundwater.

8.1.3 Monitoring of groundwater

The Applicant will be required to carry out groundwater monitoring of the new bores around the CAL, commencing within 30 days of their installation, for numerous parameters.

Grounds: The Delegated Officer considers that the storage of wastewater in the CAL may impact on groundwater quality if the integrity of the HDPE liner is compromised. The base of the CAL is proposed to be constructed at 3.4 mbgl, therefore, the pond may be up to 1.7 m within the groundwater table during winter. Monthly monitoring will be required to establish a clear understanding of seasonal groundwater depth fluctuations. Quarterly monitoring will be required for other parameters. Monitoring results will be used to assess whether there is potential that wastewater from the CAL is impacting on the surrounding groundwater and whether additional controls need to be implemented. DWER may review appropriateness and adequacy of the controls based on the review of the monitoring data, including requirements for monitoring frequency and parameters tested. Appropriate quality control of the sampling and analysis undertaken is an important aspect and conditions for sampling to be carried out in accordance with Australian Standards and tested by NATA accredited laboratory have been included.

8.2 Works Approval – commissioning controls

The Applicant will be required to submit an environmental compliance report and a critical

containment infrastructure report prior to commissioning.

Conditions have been added to the Works Approval detailing requirements and duration of commissioning. These were derived from the application.

Grounds: The Applicant is permitted to commission for a period of 180 calendar days. This commissioning period will allow the Applicant to ensure the infrastructure is operating as expected.

8.3 Works Approval – time limited operations

Following submission of the stage 1 and stage 2 environmental commissioning report, the issued Works Approval will allow the Applicant to operate the covered anaerobic lagoon (CAL) and associated infrastructure for a time limited operations phase of 180 days. This period of operations under the Works Approval will allow the Applicant to submit a licence amendment application for DWER to assess, noting DWER's target timeframe of 60 working days to assess an amendment application.

Conditions to be included in the Works Approval to allow the Applicant to operate the CAL and associated infrastructure during time limited operations phase are derived from Applicant controls and additional regulatory controls.

Grounds: Operations of the CAL includes the storage of wastewater containing excessive contaminants where there is a risk to land, surface water and groundwater if not managed appropriately. The Delegated Officer considers a double HDPE liner with a drainage layer between the two liners will provide an appropriate barrier to ensure an acceptable risk to impacts on groundwater, groundwater users and groundwater dependant ecosystems. The Applicant will be required to conduct a weekly check of the liner integrity through monitoring of the drainage layer between the HDPE liners.

The requirement to maintain and operate the CAL to reduce upward groundwater pressure on the liner is required to ensure that the risk of damage to the liner caused by a pressure differential across a partially submerged liner is minimised. This may be achieved by the construction of a subsurface cut-off wall or a ring-drain around the pond footprint and the construction of an underdrainage system (which would require a discharge management plan). Geotechnical advice may be required to be obtained to determine the most appropriate approach. Alternatively, if no underdrainage system is constructed, a suitable level of water would be required to be maintained within the CAL.

8.3.1 Monitoring of groundwater

The Applicant will be required to carry out groundwater monitoring of the new bores, commencing within 30 days of their installation, for numerous parameters.

Grounds: The Delegated Officer considers that the storage of wastewater in the CAL may impact on groundwater quality if the integrity of the HDPE liner is compromised. The base of the CAL is proposed to be constructed at 3.4 mbgl, therefore, the pond may be up to 1.7 m within the groundwater table during winter. Monthly monitoring will be required to establish a clear understanding of seasonal groundwater quality and depth fluctuations. Monitoring results will be used to assess whether there is potential that wastewater from the CAL is impacting on the surrounding groundwater and whether additional controls need to be implemented. DWER may review appropriateness and adequacy of the controls based on the review of the monitoring data, including requirements for monitoring frequency and parameters tested. Appropriately quality control of the sampling and analysis undertaken is an important aspect and conditions for sampling to be carried out in accordance with Australian Standards and tested by NATA accredited laboratory have been included.

8.4 Licence controls

Licence controls will be similar to the time limited operation controls specified in the Works Approval, including weekly check of the drainage layer between the CAL HDPE liners, monitoring of groundwater monitoring bores as per section 8.3.1, and maintaining and operating the CAL to ensure that any upward hydrostatic pressure does not compromise the HDPE liners.

Grounds: Are discussed above in section 8.3.

8.4.1 Monitoring reports

Existing licence conditions include the submission of an annual environmental report which will include monitoring information from the new groundwater monitoring bores to be constructed in the vicinity of the CAL.

Grounds: The Delegated Officer considers the submission of an annual environmental report to be required to monitor any trends or impacts the operation of the CAL may have on the environment.

9. Determination of Works Approval conditions

The conditions issued in the Works Approval have been determined in accordance with DWER's *Guidance Statement: Setting Conditions*.

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.

10. Determination of Licence conditions

This Works Approval authorises works associated with the Application.

Following the Applicant completing the works and submitting specified certifications, they will commission the infrastructure and operate the infrastructure under time limited operations.

During the time limited operations stage the Applicant will need to submit an application for a licence amendment to continue operation of the CAL and associated infrastructure. The Applicant should ensure that the application is lodged and all necessary information is provided to allow timely processing, assessment and determination of the new licence application.

Licence conditions will be determined in accordance with *Guidance Statement: Setting Conditions* following compliance with this Works Approval and assessment of a licence amendment application.

11. Applicant's comments

The Applicant was provided with the draft Decision Report and draft Works Approval on 10 January 2020. The Applicant provided comments which are summarised, along with DWERs response, in Appendix 2. The Applicant was provided with a revised draft Decision Report and revised draft Works Approval on 29 January 2020. The Applicant provided comments on 5 February 2020 which are summarised, along with DWERs response, in Appendix 2.

12. 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 Works Approval 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 ref	Availability
1.	Licence L6395/1993/16– Harvey Beef	L6395/1993/16	accessed at www.der.wa.gov.au
2.	Contaminated Sites planning advice input, 2019	ConSites 2019a	DWER records (DWERDT216482)
3.	*Wastewater Management in the Australian Red Meat Processing Industry*, Version 2, Australian Meat Processor Corporation, 2017	AMPC 2017	accessed at http://www.ampc.com.au
4.	Contaminated Sites advice on design of pond, 2019	ConSites 2019b	DWER records (A1851617)
5.	*Practice Note 21 – Farm Dairy Effluent Ponds*, Institution of Professional Engineers New Zealand, version 3, August 2017	FDE NZ 2017	available from www.dairynz.com.nz
6.	Perth Groundwater Map		Accessed at https://maps.water.wa.gov.au
7.	Water Information Reporting		Accessed at http://wir.water.wa.gov.au
8.	Bureau of Meteorology – Climate data online		Accessed at www.bom.gov.au
9.	Water Quality Protection Note 26 – *Liners for containing pollutants, using synthetic membranes*, Department of Water, 2009	WQPN 26	
10.	Water Quality Protection Note 30 – *Groundwater Monitoring Bores*, Department of Water, February 2006	WQPN 30	Accessed at www.water.wa.gov.au
11.	DWER, July 2015. *Guidance Statement: Regulatory principles.* Department of Environment Regulation, Perth.		accessed at www.dwer.wa.gov.au
12.	DWER, June 2019, *Guideline: Industry Regulation Guide to Licensing*. Department of Water and Environmental Regulation, Perth.		
13.	DWER, October 2015. *Guidance Statement: Setting conditions.* Department of Environment Regulation, Perth.		
14.	DWER, February 2017. *Guidance Statement: Risk Assessments.* Department of Water and Environmental Regulation, Perth.		
15.	DWER, November 2016. *Guidance Statement: Environmental Siting*. Department of Water and Environmental Regulation, Perth.		
16.	DWER, June 2019. *Guideline: Decision Making*. Department of Environment Regulation, Perth.		

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

Licence Holder comments on draft Decision Report and draft Works Approval received on 23 January 2020

Summary of Applicant comment	DWER response
Currently natural gas consumption varies on average between 100 kg/h to less than 500 kg/h during operational hours. The anticipated biogas delivered to the boiler is expected to be around 250 kg/h and partly replace the natural gas currently being used. Both biogas and natural gas will have a sulphur content of less than 0.25%. Therefore, this proposal itself is not considered to trigger Category 67 or Category 87 in its own right. Category 87 may be applicable subject to the aggregated consumption of natural gas and biogas in the Harvey Beef boiler following the proposed expansion at Harvey Beef (subject to a separate licence amendment application being assessed by DWER). Harvey Beef proposes to further review its anticipated natural gas consumption and operational data as relevant to Category 87 as part of the licence amendment application to include the CAL following the completion of construction.	The Delegated Officer has considered the Applicant's comments in response to a request to confirm the design capacity of the steam boiler (fuel throughputs) with reference to whether or not the boiler meets the definition of: a) Category 67 Fuel burning: premises on which gaseous, liquid or solid fuel is burnt in a boiler for the supply of steam or in power generation equipment (in aggregate 500 kg or more per hour (fuel with sulfur content of >0.25% or in aggregate 2,000 kg or more per hour (fuel with sulfur content of <0.25%); or b) Category 87 Fuel burning: premises on which gaseous, liquid or solid fuel with a sulfur content of less than 0.25% is burnt in a boiler for the supply of steam or in power generation equipment (more than 500 but less than 2,000 kg per hour in aggregate). Considering that: a) gas consumption will remain less than 500 kg/h; and b) sulphur content will be less than 0.25%; the Delegated Officer considers than neither Category 67 or 87 are triggered by the proposed works approval. However, it is noted that a separate application for licence amendment following the completion of CAL works under this works approval, may propose an increase in aggregated consumption of natural gas and biogas in the boiler associated with an expansion of Harvey Beef, which may trigger Category 87. Following the Applicant's review of gas consumption as part of the licence amendment application to include the CAL, DWER will determine if the inclusion of Category 87 is required in the amended licence.
The Applicant responded to further information required or the clarification of information (highlighted in yellow in the draft works approval and draft decision report), which included information on:	This information has been updated in the works approval and decision report.

Summary of Applicant comment	DWER response
- discharge points associated with the boiler; - soil erosion and sedimentation controls; - storage of stormwater on CAL cover prior to release to drain; - stormwater holding tanks (size and construction materials); - hydrogen sulphide scrubbers; - acid sulphate soil management and use of lime for treatment; - wind control on CAL cover (use and management of weighting pipes); - location of grassed swales for the diversion of uncontaminated stormwater; - modifications to the boiler; - commissioning of the flare; - commissioning of the biogas feed to the boiler; - post-commissioning and operational use of the flare; - expected emissions from the flare; - installation and use of subsoil drainage system where dewatering is required; - location of new wastewater pipework; - acknowledgment of the requirement to prepare in situ soils such that optimum compaction is achieved, - acknowledgement of the requirement to maintain and operate the CAL to ensure hydrostatic pressure does not compromise HDPE liners; and - acknowledgement of the requirement to install additional groundwater monitoring bores adjacent to the CAL.	
The requirement for installation of a double liner system on the CAL, as stipulated in condition 2, is strongly challenged on the following basis: - groundwater monitoring to date has not identified any contamination directly associated with existing ponds at Harvey Beef, which anecdotal evidence suggests comprise of a clay liner in accordance with Works Approvals granted by DWER; - the requirement for a double liner is therefore not commensurate	The Delegated Officer has considered the Applicant's comments in response to condition 2 requiring the CAL be installed with two layers of 1.5 mm HDPE liners on the base and walls. The Delegated Officer considers that the base of wastewater ponds should be constructed above the water table where possible to limit the risks of damage to the liner caused by a pressure differential across a partially submerged layer. However, given the shallow nature of the water table beneath the Harvey Beef site (as shallow as 0.6 m below ground level) and

Summary of Applicant comment	DWER response
with environmental risks at the premises, particularly given the proposed controls, and despite the potential for shallow water tables in certain portions of the site; - the installation of a double liner will double costs with this aspect of the CAL design; - the Applicant's research indicates that the requirement for application of double liners is very rare. This presents a competitive disadvantage to Harvey Beef; - the CAL does not process solids, so there would be minimal stress on the liner (as opposed to landfills or tailings dams); - as an additional mitigation measure, the Applicant proposed to use a 2 mm HDPE liner rather than 1.5 mm; - in addition, the Applicant proposes the liner will have a protection (cushion) layer of geotextile underlay to protect the geomembrane from subsoil puncture; and - implementation of the CQAP further ensures that the construction and installation of the liner is conducted in a manner that ensures all quality assurance and performance targets are complied with prior to operation of the CAL.	the proposed height of the CAL (6 m), construction below the water table is likely to be necessary. Therefore, given that the Applicant proposes to construct the CAL below the water table, the Delegated Officer determines that it should be a double-lined system with a drainage layer between the two layers. Monitoring of water quality within the drainage layer will enable an early detection of any leakage. The leaks can be identified using electrical techniques outlined in ASTM D7007-16 "Standard Practice for Electrical Methods for Locating Leaks in Geomembranes Covered with Water or Earthen Materials" and repaired. The recent (2017) New Zealand Institute of Engineers guidance document on the construction of ponds, such as the CAL proposed at the Harvey Beef site, is considered to be the most up-to-date guidance on pond construction in Australasia, and makes the following statement in Section 4.4.1 on page 21: *"It is considered inappropriate to construct ponds below the groundwater profile. If this must occur, then specific design from a geotechnical professional must be sought".* Therefore, the Delegated Officer is open to other suggestions as put forward by a geotechnical professional on behalf of the Applicant in order to adequately address the risks associated with CAL construction below the water table.
The Applicant has requested that DWER reviews the requirement for the maintenance of a 1 m freeboard, suggesting that the limit be made consistent with other freeboard requirements imposed on Harvey Beef and other licensed premises of at least 300 mm. The 1 m freeboard referred to in the Applicant's application supporting documentation is not a minimum, but a nominal level. Under normal operation, it is expected that a freeboard of at least 800 mm (e.g. maximum of 200 mm over the outlet weir) will be achieved.	The Delegated Officer has considered the Applicant's comments in response to conditions requiring a minimum of 1 m freeboard be maintained in the CAL. The CAL Design Report (John's Environmental Group, 2019) submitted with the works approval application supporting documentation states that a high CAL freeboard should be maintained as a contingency measure to protect against significant hazards such as discharge pump failure. The NIMP that was also provided with the application supporting documentation states "*the (CAL) design allows for a freeboard of 1.0 m which protects the biogas collection system from foam, crust and excessive working level and provides gas inventory. The extensive freeboard also minimises the risk of overtopping under normal operation*…" The Delegated Officer recognises that CALs have different risks associated with them than other ponds that are not covered, and that the design freeboard is intended to mitigate these risks. The Delegated Officer has therefore determined that a 1 m freeboard is appropriate to maintain the

Summary of Applicant comment	DWER response
	integrity of the biogas collection system, prevent overtopping, and allow for maximum gas collection.

Licence Holder comments on revised draft Decision Report and revised draft Works Approval received on 5 February 2020 with additional comments received on 6 February 2020

Summary of Applicant comment	DWER response
The Applicant has again requested that DWER reviews the requirement for the maintenance of a 1 m freeboard, suggesting that a minimum freeboard of 500 mm is sufficient. The 1 m freeboard referred to in the application was intended to present a nominal value, not an absolute minimum limit. The Applicant believes that a 500 mm minimum freeboard will be sufficient for reasons outlined in their response including the following: - the volume differential between the nominal 1 m freeboard and 500 mm minimum freeboard will give approximately 1.5 production days' volume (3 ML) at the highest throughput envisaged allowing enough time to respond prior to the 500 mm freeboard being exceeded; - the flow into and out of the CAL is able to be immediately terminated in the event of unforeseen emergencies; - there is provision for a depth gauge and electronic level detection device with alarms; - the CAL cover eliminates wind action on the lagoon and there is no mechanical agitation therefore wave action is predicted to be non-existent; and - a minimum 500 mm freeboard meets the recommendation in WQPN 26.	The Delegated Officer has considered the Applicant's additional comments in relation to the conditions requiring a minimum of 1 m freeboard to be maintained in the CAL. The Delegated Officer recognises that CALs have different risks associated with them than other ponds that are not covered, and that the design freeboard is intended to mitigate these risks. DWER understands that the CAL will be operated with a nominal freeboard of 1 m and a minimum freeboard of 500 mm. The Delegated has considered the Applicant's reasoning for amending the condition to require a minimum freeboard of 1 m and has determined that a 500 mm freeboard will be sufficient for maintaining the integrity of the biogas collection system and prevent overtopping of the CAL. The Works Approval and this Decision Report have been updated accordingly.
The Applicant has proposed an alternative to the requirement for the CAL to be installed with two 1.5 mm HDPE liners on the base and walls with a drainage layer to be constructed between the two HDPE liners. The Applicant is proposing to construct the CAL with a primary containment liner of 2 mm HDPE overlying a secondary containment liner of 1.5 mm and	The Delegated Officer has considered the Applicant's proposed alternative and considers that the 2 mm primary and 1.5 mm secondary HDPE liners with no drainage layer between the liners is acceptable. However, the Delegated Officer considers that there should be an additional protective layer at the base of the pond to protect the liner from the effects of desludging. Additionally, the Applicant will be required to construct, maintain and operate

Summary of Applicant comment	DWER response
removing the requirement for the drainage layer between the liners. The Applicant's justification is outlined in their response which includes: - the CAL is designed to operate at a near constant water depth of 5 m at all times; - construction of leak detection between the two liners would be extremely challenging due to the CAL cover and the depth of the lagoon; - detection of leakage that may occur can be identified through the adoption of a monitoring bore network located as close as possible to the CAL base; and - any contingency or remedial actions that may need to be employed in the event of a confirmed leak is unlikely to vary regardless if the leak was identified through a drainage system or CAL monitoring bore network. Indicative monitoring bore locations were also provided by the Applicant.	the CAL to ensure that any upward hydrostatic pressure does not compromise the HDPE liners. This may be achieved by ensuring that a suitable level of water is maintained in the CAL. The Works Approval and this Decision Report have been updated accordingly.
The Applicant provided comments in relation to the protection of the liner(s) from the effects of desludging. Comments included: - concern that a protective layer (gravel or otherwise) over the liners may compromise the integrity of the liners during or after construction; - the Applicant has provided some information on a sludge removal system. This system includes a series of pipes that allows for the removal of sludge via an external or vacuum pump system. Therefore, sludge is able to be removed without the CAL cover being removed, with no mechanical removal systems that could damage the liner and water levels do not need to be reduced.	The Delegated Officer has considered the Applicant's additional comments and has updated the works approval conditions to include the proposed static sludge removal system to be installed within the CAL.