Government of Western Australia
Department of Water and Environmental Regulation

Decision Report

Review of Existing Licence

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

Licence Number	L6010/1989/13
Licence Holder	Prime Meat Processors Pty Ltd
ACN	618 734 875
File Number	DER2018/000285
Premises	Avon Valley Abattoir 503 Northam-Pithara Road, IRISHTOWN WA 6401 Lot 1343 on Plan 246966 (as depicted in Schedule 1 of the licence)
Date of Report	9 February 2022
Decision	Licence granted

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1. Decision summary

This report presents the delegated officer's assessment of risks to the environment and public health arising from a review of emissions and discharges generated by the primary activities conducted at Avon Valley Abattoir (premises). As a result of this assessment, revised licence L6010/1989/13 has been granted.

2. Scope of assessment

2.1 Regulatory framework

In completing the assessment documented in this report, the department has considered and given due regard to its regulatory framework and relevant policy documents which are available at https://dwer.wa.gov.au/regulatory-documents.

2.2 Licence review summary

The Chief Executive Officer (CEO) determined to review licence L6010/1989/13 (existing licence) held by Prime Meat Processors Pty Ltd (licence holder) under Division 3, Part V of the *Environmental Protection Act 1986* (EP Act). The review follows the serving of a Prevention Notice on the licence holder on 21 May 2019, further amended on 19 July 2019, to prevent and control unreasonable odour emissions and unauthorised discharges identified at the premises following a series of odour complaints and subsequent department investigations in early 2019.

This review is to ensure accuracy and adequacy of existing licence conditions with respect to emissions and discharges from on-site activities.

2.3 Licence amendment application

In December 2020 the licence holder applied for a licence amendment to:

- expand the premises boundary for the purpose of increasing the authorised irrigation area; and
- construct and operate a new foetal blood and tripe room and upgrade an existing carcase chiller room to facilitate the recommencement of de-boning activities.

The delegated officer has determined these proposed changes to site operations will be assessed and authorised as part of this licence review.

2.4 Exclusions

This review excludes an assessment of emissions and discharges from fellmongering, as the risk of potential impacts from this activity were recently assessed as part of a licence amendment in relation to the construction and refurbishment of fellmongering infrastructure at the premises. The amendment was issued on 14 July 2020 and specified new and revised regulatory controls to manage the risk of impact to public health and the environment from fellmongering odours and wastewater.

This review also excludes an assessment of emissions and discharges from rendering operations, given this activity is no longer authorised at the premises in accordance with the Prevention Notice. Further, emissions or discharges arising from the use of infrastructure or equipment not directly associated with the premises' prescribed activities, such as vehicles, offices, lavatories and septic systems, are also excluded from this assessment.

3. Background

The premises occupies 45 hectares of rural land about 3 km north of Northam at Lot 1343, Northam-Pithara Road, Irishtown. The first licence to operate an abattoir at the premises was granted in 1989. Operations initially comprised the slaughtering and processing of cattle, with sheep introduced for slaughter in September 2014.

The licence holder acquired the property and existing licence on 28 August 2017 from P.R. Hepple and Sons Pty Ltd. The abattoir was not operational at the time of acquisition, though the licence authorised an abattoir (Category 15), rendering plant (Category 16) and livestock holding pens (Category 55) under Part V of the EP Act. Site operations were recommissioned on 25 September 2017, with production gradually increasing to 780 tonnes per month (hot standard carcase weight) by March 2019.

Following a series of odour complaints between December 2018 and May 2019, the department conducted a site inspection in February 2019 and identified several non-compliances against licence conditions. The department subsequently served the licence holder with a Prevention Notice in May 2019 that required implementation of additional controls to manage and abate odour emissions attributable to operations at the premises (further detailed in section 5.2.2). Key actions included a general site clean-up, the immediate shutdown of the rendering plant (a primary source of odour emissions) and the submission of a Waste Discharge Management Plan.

The existing licence was then amended on 14 July 2020 to permit construction and refurbishment of fellmongering infrastructure at the premises. The amendment authorised *Category 83: Fellmongering* as a prescribed activity at the premises and imposed new conditions to manage associated emissions and discharges. *Category 16: Rendering operations* and *Category 55: Livestock saleyard or holding pen* was also removed from the licence, given rendering was no longer authorised under the Prevention Notice and the temporary holding of livestock prior to slaughter is within the scope of *Category 15: Abattoir*.

Presently, the licence holder is authorised to operate an abattoir with fellmongering at the premises under Schedule 1 of the Environmental Protection Regulations 1987 (EP Regulations) at the approved throughputs shown in Table 1.

Table 1 Prescribed premises categories in the existing licence

Classification of premises	Description	Approved premises throughput or production capacity
Category 15	Abattoir: premises on which animals are slaughtered	16,500 tonnes of sheep and cattle per year (live weight)
Category 83	Fellmongering: premises on which animal skins or hides are dried, cured or stored	100,000 skins or hides per year

4. Premises overview

4.1 Operational aspects

The premises is divided into several operational areas including the lairage (comprised of covered livestock holding pens with concrete floors and unsealed, uncovered holding pens and livestock overflow yards), abattoir (including the slaughterhouse, basement and chiller rooms), fellmongering shed and pond-based wastewater treatment system (WWTS). Treated wastewater is disposed via irrigation over paddocks to the north of the main abattoir facility. To the south of the abattoir facility is a 10.92 ha solid waste (paunch) disposal area. There are no groundwater abstraction bores on the premises and scheme water is the only source of potable water used at the premises.

4.1.1 Lairage

The abattoir processes cattle and sheep transported from nearby farms. Cattle and sheep are typically delivered to the premises five days per week for 52 weeks per year, with about 330 animals (140 cattle and 190 sheep) delivered to the premises per day. About 70 animals (>0.5%) arrive dead each year which are immediately removed from the delivery vehicle, skinned and disposed off-site to a rendering facility within 24 hours. Stock transport vehicles are not washed down at the premises.

Animals are directed through a concrete delivery race and typically kept in covered holding pens for 12 to 18 hours, prior to slaughter. The covered holding pens are approximately 548 m^2 in total and divided in two sections: the western half for cattle and the eastern half for sheep. The covered pens have a metal roof and non-slip metal floor grating installed to prevent animals from slipping, which prevents manure from being scooped by a front-end loader prior to wash-down. The floor is washed down daily using recycled water from the WWTS. There are no physical screens to capture manure and other solids in this wash water before it enters a series of four downstream concrete sumps designed to capture solids (Figure 1).

Six uncovered holding pens are located adjacent to the covered holding pens. The uncovered holding pens occupy about 500 m^2 in total. Four of these pens have an earthen floor and two pens have a concrete hardstand floor. A grated, concrete drainage channel runs along the northern perimeter of the covered and uncovered hardstand holding pens which conveys stormwater and wash-down waters to the four concrete sumps (Figure 1), prior to being discharged into one of two anaerobic ponds**Error! Reference source not found.**.

According to the licence holder, unsealed and uncovered stock yards north of the covered pens are occasionally used to accommodate an overflow of cattle and sheep livestock. Manure from these yards is removed twice a year and disposed off-site. There are no drainage channels servicing these yards.

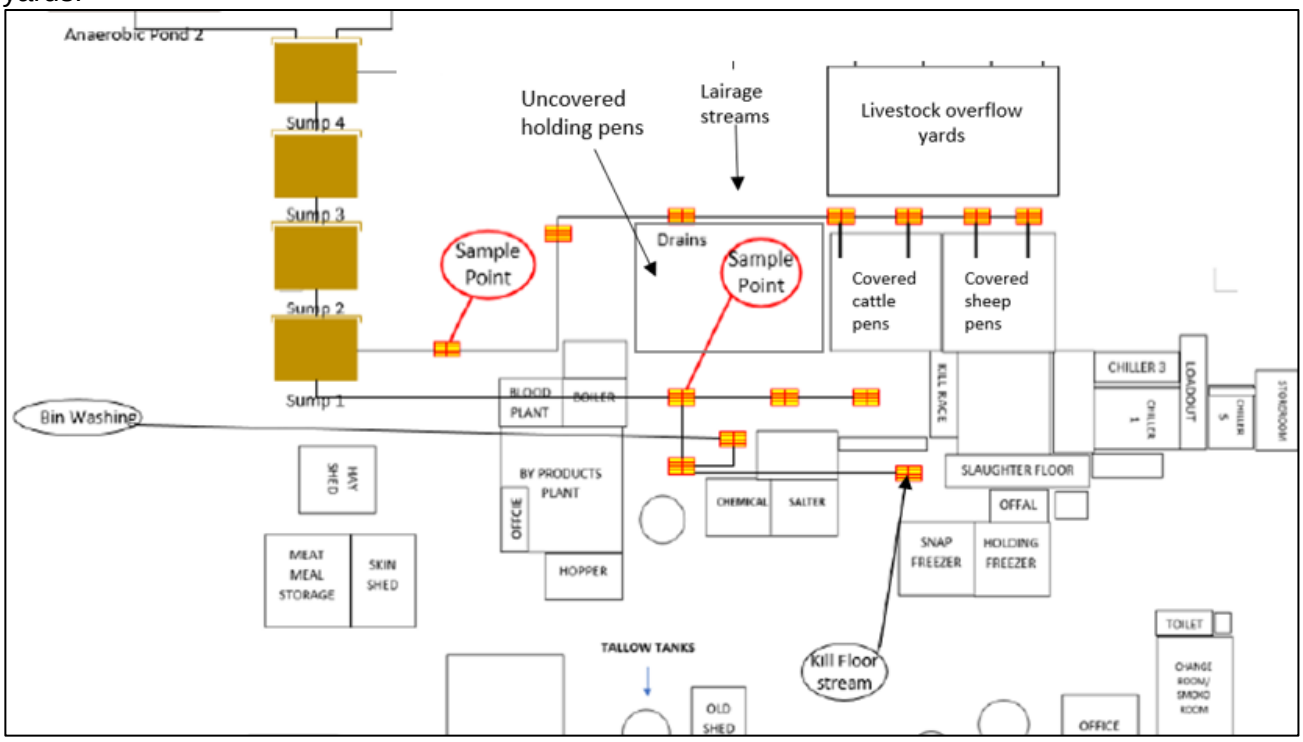

Figure 1 Wastewater drainage pathways from livestock yards, holding pens and slaughterhouse kill floor (Revisankar 2020)

4.1.2 Abattoir

The licence holder processes about 140 head of cattle and 190 sheep per operating day. There are two kill events per day, with cattle processed before sheep. Once killed, hides are removed followed

by internal organs, heads and hooves (offal). Carcass processing produces waste by-products including fat, offal, bone and blood, which are directed via chutes to tubs and tanks in a basement located directly below the slaughterhouse floor. Whole carcases are stored in chiller rooms, prior to transport off-site.

Blood, fat, offal and bone by-products were historically rendered on-site. However, following the rendering plant shut down on 23 May 2019 in accordance with Prevention Notice Condition 9b (amended 19 July 2019 version), all waste by-products are now removed off-site for rendering. Blood is temporarily stored in a 9,000 L raised polyethylene holding tank with a vent, prior to removal off-site.

Paunch material (partially digested grass and other feed products) and animal skins are additional by-products of the slaughtering process. Paunch is placed in a tub while the stomach itself placed in a raw material bin, both of which are in the basement beneath the slaughterhouse kill floor. Paunch and stomachs are disposed off-site daily, however, in circumstances where the disposal of paunch off-site is not possible, it is transferred to a small box trailer to dry on hardstand (the high bay area). Once dried, the paunch is spread across the designated solid waste disposal area (see Section 4.1.6). Cattle hides are packed untreated into steel crates and leave the premises within three hours of slaughter, whereas sheep skins are refrigerated within eight hours of slaughter and treated (salted) on-site.

The use of sterilisation water to clean the slaughterhouse floor contributes significantly to the wastewater loading entering the WWTS. Wastewater generated from wash-down activities in the kill floor and basement may contain offal, fat and carcase trimmings, which is directed to the series of four concrete sumps via drainage channels (Figure 1). No physical screens are currently installed to separate solids in wastewater from the slaughterhouse prior to entering the concrete sumps, though workers regularly skim the fats that enter the stream. Due to a lack of physical screens, retrieval of solids in the waste stream is dependent on manual removal by workers. Solid material captured by the workers in the basement and collected from the four sumps is stored in covered bins and disposed off-site daily.

Tubs used in the slaughterhouse basement are washed in an area between the chemical store shed and former rendering plant known as the “high bay area”. This area is washed down multiple times daily using a high-pressure hose, with wash-down water directed to the concrete sumps via underground piping from a grated drain in the centre of the high bay area.

Clean stormwater runoff from roofs, yards and hardstand areas may enter abattoir operational areas due to a lack of stormwater drainage and diversion infrastructure including roof guttering, kerbing and bunding, particularly around the high bay area (Revisankar 2020). Further, contaminated stormwater runoff from the high bay area may enter the WWTS during rain events, adding an additional volumetric loading to the WWTS (Revisankar 2020).

4.1.3 Fellmongering

About 1,000 sheep skins per week are treated in the fellmongering shed using a sheep skinning salt containing sodium fluoride. Following treatment in an agitator, skins are folded and stored on pallets for 48 hours to cure. Cured skins are then stacked in the adjacent skin storage shed prior to being removed off-site weekly for sale.

Waste produced from skin processing includes solid salt, brine and skin leakage. About five percent of salt (127 kg/week) is spilt in the process which is swept up and disposed of in the general waste bin. Brine produced through the curing process is washed down and directed from the floor of the fellmongering and skin storage sheds to an aboveground concrete sump via perimeter drains. The construction of a new evaporation pond solely for fellmongering wastewater that disposal was approved within the licence amendment granted by the department on 15 July 2020 following local Shire planning approval on 9 June 2020.

The licence holder advised the department that construction of the pond was underway in August 2021. The pond is to have a minimum capacity of 4.3 m^3, be lined with a minimum 1.5 mm thick

HDPE geomembrane liner with a coefficient of permeability of at least 1 x 10^{-9} m/s, be co completely covered by an extension to the skin storage room roof and engineered to prevent ingress of overland stormwater.

4.1.4 Wastewater treatment

Wastewater generated by wash-down activities in the covered lairage pens and abattoir and manure contaminated run-off from the outdoor holding pens is directed to the biological WWTS via a series of drains and sumps as outlined in sections 4.1.1 and 4.1.2. Daily water meter readings are recorded for wastewater entering the WWTS. Due to high organic material content, raw wastewater channelled to the treatment ponds typically contains elevated nutrients (including nitrogen and phosphorus), sediments and biochemical oxygen demand (BOD) concentrations. In addition, it may have other contaminants commonly found in abattoir wastewater such as major ions, heavy metals, *E. coli* and elevated total dissolved solids (TDS).

The WWTS comprises, in treatment order, two anaerobic ponds, two facultative ponds and one aerobic (oxidation) pond with a total capacity of 9,121 m^3. Treated wastewater in the final (oxidation) pond either evaporates or is pumped to the wastewater irrigation area via a travelling irrigator. A flow meter is connected to the outflow of the oxidation pond to monitor daily irrigation volumes.

The existing licence requires that all ponds are to be lined to achieve a permeability of at least 1 x 10^{-9} m/s. However, the licence holder is unable to verify the construction specifications of the ponds given they were installed by the previous owner. Consequently, the permeability and integrity of the liner in each pond is unknown.

The treatment process results in sludge forming in the anaerobic ponds from the decomposition of organic compounds such as polysaccharides, proteins and fats. Sludge build-up also occurs in the facultative ponds, though to a lesser extent than in the anaerobic ponds. The licence holder does not have a regular desludging schedule or trigger; however, a sludge drying bed exists where excavated sludge is intended to be dried prior to off-site disposal. Leachate from the sludge drying bed is designed to infiltrate back into anerobic pond 1.

4.1.5 Wastewater disposal

Treated wastewater is disposed on-site via irrigation to authorised irrigation areas A1 and A2 under the existing licence, which cover 10.7 ha in total.

The irrigation area is used for cropping in accordance with the abattoir cropping plan detailed in the Nutrient and Irrigation Management Plan (Strategen JBS&G 2021), which states that oats for hay/straw will be grown until 2023 with no crop rotation. Wastewater is applied to the irrigation area via a travelling irrigator when water levels in the pond approach the 500 mm freeboard buffer. Irrigation will typically operate for 24 - 30 hours per week (during daylight hours), 52 weeks per year. A travelling irrigator with a spray width of 25 m is used to irrigate 27 individual runs. Each run is irrigated for two weeks per year to ensure an even spread of nutrients over the irrigation area (Strategen JBS&G 2021).

The travelling irrigator has a fixed application rate of 12,000 l per hour and typically operates around 5 hours per day but up to 12 hours per day on warm, sunny days. Around 291 kl of wastewater is applied to the irrigation area per week, equating to around 15,100 kl per year (Strategen JBS&G 2021). The irrigator is manually controlled under the supervision of a designated employee, with movements and run-times recorded in a logbook. Weather conditions are also monitored to avoid irrigation immediately before, during and after rain events.

On 4 December 2020, the licence holder submitted an amendment application expand the irrigation area and the prescribed premises boundary to encapsulate an irrigation area within Lot 150.

4.1.6 Solid waste disposal

The existing licence permits the application of paunch and manure to a specified 10.9 ha “solid

waste disposal area" comprising a paddock south of the main abattoir facility. The solid waste disposal area has 12 pegged sub-areas where paunch is applied on a rotational basis, with a different sub-area used each month to allow the paunch material to degrade and improve the soil structure. The licence holder is planning to sow an annual oaten hay crop into the area to assist with nutrient uptake.

The licence holder reports that about 1,903 tonnes of paunch was generated from the slaughtering process and disposed on-site during the 2019/20 reporting period. However, following the reporting of several non-compliances in 2019 relating to the improper pre-treatment and stockpiling of paunch on-site, the department raised concerns over the management of on-site solid waste disposal and the risk of nutrient loading impacts. Consequently, the licence holder has ceased the disposal of raw manure on-site and proposed that that up to 327 tonnes of paunch be applied to the solid waste disposal area per year, as a contingency if off-site disposal of paunch is not possible (Avon Valley Beef 2020).

Paunch to be disposed off-site is stored in enclosed bins on the bunded high bay area hardstand. Paunch to be spread over the solid waste disposal area is temporarily stored in a box trailer on the high bay area hardstand which enables the paunch to dry and any free-flowing leachate from the trailer to be directed to the WWTS. Dried paunch is spread over the solid waste disposal area by a mechanical spreader. Manure is stored in bins on a sealed hardstand surface prior to off-site disposal.

4.2 Proposed activities

The licence holder is proposing to construct and operate a foetal blood and tripe processing room The processing of beef and lamb intestines has occurred historically at the premises and requires a small volume of wash-down water to clean blood and organic solids from the room floor. Given this activity has occurred historically at the premises, the licence holder has indicated that the wastewater stream generated by this activity has been taken into consideration in the current water balance for the premises. The extraction of blood from the foetus is a new activity which requires a small volume of water for the cleaning of tables and floors. The used foetus is stored in a trailer prior to daily disposal off-site for rendering.

The licence holder is also proposing to upgrade the existing chiller rooms to recommence boning. Boneless meat products will leave the site daily via refrigerated transport and any waste (fat and bone) will be disposed of in the trailers that go off-site daily for rendering. The boning room floor will be cleaned daily, with wash-down waters conveyed to the WWTS via existing drainage channels from the chiller rooms.

5. Legislative context

5.1 Planning approvals

Planning approval will be required for the construction of the proposed foetal blood and tripe processing room and the upgrades for the proposed boning room. The department is yet to receive evidence that these approvals have been granted.

5.2 Compliance history

5.2.1 Annual Environmental and Audit Compliance Reports

The licence holder has reported several non-compliances against licence conditions since commencing operations at the premises in 2017 which are detailed in Table 2.

Table 2: Non-compliances reported by the licence holder

Report	Non-compliance

2018 Annual Environmental Report (AER) 2018 AACR	• Wastewater monitoring (conditions 2.2.1, 2.2.2, 3.1 and 3.2) - The quality and volume of treated wastewater irrigated to land was not sampled during the 2017-2018 reporting period.
2019 AER	• Wastewater management (condition 1.2.7) – A leaking overflow pipe from the final evaporation pond resulting in treated wastewater being discharged to the authorised irrigation area; • Solid waste management (condition 1.2.1) - Animal waste not fully processed with 24 hours on six occasions between December 2018 and May 2019 due to breakdowns in the rendering plant; • Solid waste management (condition 1.2.9) – Solid waste (paunch material and manure) was not spread evenly in the prescribed solid waste disposal area and other rubbish was not removed before being spread; • Solid waste management (condition 1.2.9) – In March 2018, the blood pump failed which caused blood to be channeled directly into the WWTS rather than being captured and treated in the rendering facility. This led to a temporary spike in nutrient levels in the wastewater treatment ponds; • Wastewater monitoring (conditions 3.2.1) - The quality and volume of treated wastewater irrigated to land was not reported in 4 of the 12 months in the reporting period; and • Reporting requirements (condition 4.3.1) - The department CEO was not notified of breakdowns and failures in the rendering plant.

5.2.2 Prevention Notice

A series of odour complaints in early 2019 led to the department undertaking site inspections on 12 February 2019 and 2 May 2019 that identified several odour sources, including solid waste storage, wastewater treatment ponds and the solid waste disposal area. Inadequate pond and solid waste management practices were also observed that likely contributed to unreasonable odour emissions.

The department investigation resulted in a Prevention Notice being served to the licence holder on 21 May 2019 (amended 19 July 2020) to cease rendering activities, undertake clean-up activities, present a contingency plan for operational activities and develop a plan to manage waste at the site. The Prevention Notice conditions specified requirements with the intention of odour emission management and abatement from the premises, summarised as follows:

- Cease rendering operations and irrigation of treated wastewater;
- Remove all existing processed abattoir waste, including animal skins, off the premises within two weeks and remove all future animal processing bi-products off-site at the end of each working day;
- Ensure no blood or fellmongering wastewater enters the treatment ponds;
- Untreated skins are not to be stored on-site;
- Hardstand areas cleaned daily; and
- Develop a Waste Discharge Management Plan.

Key steps completed by the licence holder to address Prevention Notice conditions include closing the rendering plant on 23 May 2019, with all animal by-products now sent off-site daily to licenced rendering facilities. In addition, all solid wastes were removed within several weeks and a general clean up at the premises was undertaken. A Waste Discharge Management Plan (WDMP) and updated Nutrient and Irrigation Management Plan (NIMP) were submitted in late 2020 and early 2021, respectively. Weekly spot samples have also been collected from the final effluent treatment pond and tested for TN, TP, BOD and TDS to support nutrient loading calculations and monitor the WWTS performance.

Odour complaints ceased following shut-down of the rendering plant. On 9 October 2019, the delegated officer advised that should the licence holder intend to re-commence rendering operations, then this activity will need to be applied for through a works approval application.

6. Monitoring data

6.1 Treated wastewater quality

The licence holder is required to monitor treated wastewater quality from the outflow point of the final treatment pond for pH, TN, TP, BOD and TDS on a quarterly basis (condition 3.2). However, there are significant data gaps in wastewater quality data from 2015 to present due to non-compliances including failure of the licence holder to sample or report data during this period.

The collection and reporting of treated wastewater quality data improved from July 2019 following implementation of the Prevention Notice which set a requirement to collect weekly spot samples from the final effluent treatment pond. Figure 2 shows treated wastewater quality in the final treatment pond outlet from September 2018 to September 2020, using quarterly sampling results reported in AERs and weekly sampling results required under the Prevention Notice.

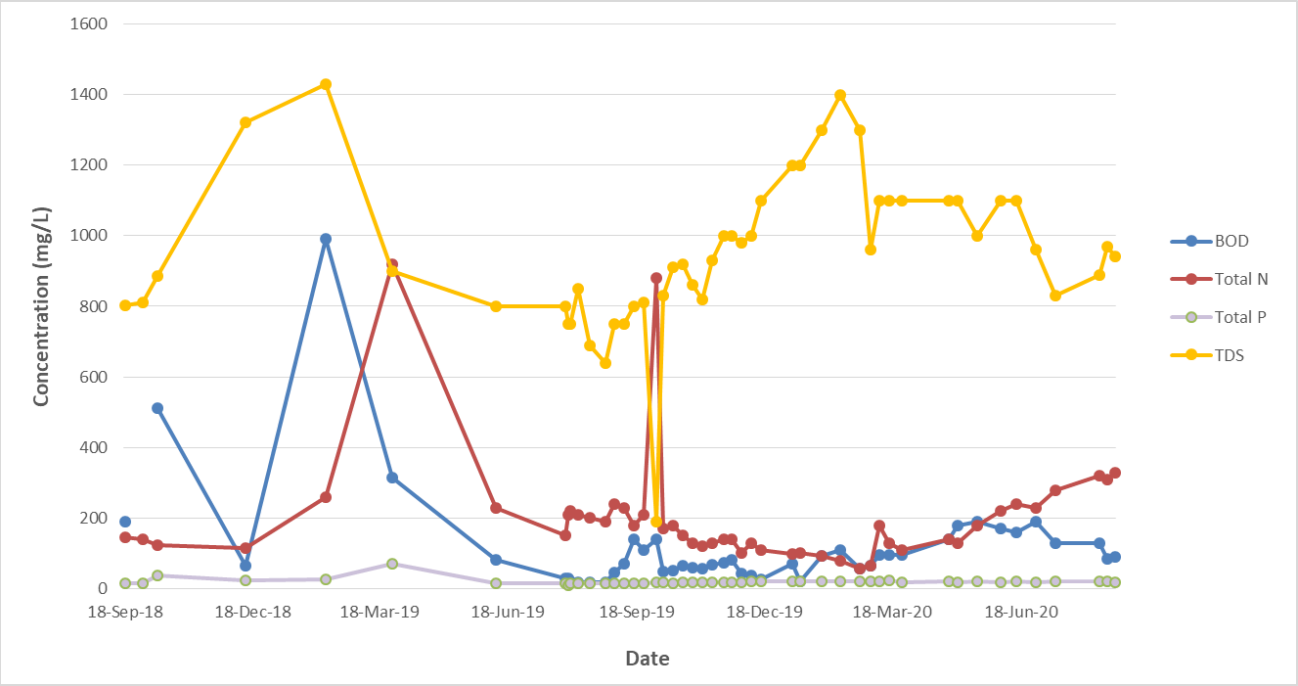

Figure 2 Treated wastewater quality from September 2018 to September 2020 for BOD, Total Nitrogen, Total Phosphorus and TDS

The average TN concentration during this period is considered high strength (NSW DEC 2004) and is relatively stable, except for elevated concentrations reported in March 2019 (918 mg/L) and October 2019 (880 mg/L). Removing the October 2019 outlier concentration produces an average nitrogen concentration of 172 mg/L following the rendering plant shutdown on 21 May 2019, which is considered representative of current effluent quality at the premises. TP concentrations are also considered medium to high strength following the rendering plant shutdown, with an average concentration of 18 mg/L during this period.

The elevated TN concentration reported in March 2019 is likely attributable to the direct discharge of untreated blood to the ponds following a breakdown in the rendering plant, resulting in a high organic load entering the WWTS. The cause of the second spike in October 2019 is unknown. There also appears to be a rise in TN concentration since June 2020, which may be attributable to a recent increase in animals processed at the facility.

BOD concentrations were elevated from September 2018 to March 2019, with a maximum concentration of 990 mg/L in February 2019. Average BOD concentrations decrease to less than 200 mg/L following the rendering plant shut-down, with an average concentration of 84 mg/L since June 2019.

TDS concentrations fluctuate throughout with an elevated average concentration of 960 mg/L and do not appear to have been impacted bye the rendering plant shut-down. Reported pH levels are neutral to slightly basic, typically ranging between 7.8 and 8.1.

6.2 Nutrient loading rates

Nutrient loading rate limits are specified in the existing licence to mitigate potential impacts to receptors from the disposal of wastewater to land with elevated nutrients at the premises. These loading rate limits were set using generic criteria in *Water Quality Protection Note 22: Irrigation with nutrient –rich wastewater* (DoW 2008) due to a lack of site-specific data. Historical loading rates at the premises cannot be determined with accuracy from 2016 to 2019 due to unreliable or absent monitoring data. However, a requirement under the Prevention Notice to report weekly irrigation wastewater quality and discharge rates has enabled TN, TP and BOD loading rates to be calculated for the 2019-2020 reporting period.

Using the nutrient concentrations detailed earlier in this section, an irrigation rate of 15,100 kl per year (Strategen JBS&G 2021) and the 10.8 ha area irrigated under the Prevention Notice (area A2 and B), nutrient loading rates for TN, TP and BOD in the 2019-2020 reporting period were calculated to be compliant with existing licence limits (Table 3).

Table 3 Estimated nutrient loading rates for the annual period 1 October 2019 – 30 September 2020

Parameter	2019-2020 reporting period				Licenced nutrient loading rate limit[1]
	Average concentration (mg/L)	Irrigation volume (kl)	Annual loading (kg)	Nutrient loading rate	
Total nitrogen	160	15,100	2,416	223 (kg/ha/year)	480 (kg/ha/year)
Total phosphorus	20		302	27.9 (kg/ha/year)	120 (kg/ha/year)
BOD	84		1,268	0.32 (kg/ha/day)	30 (kg/ha/day)

Note[1]: Nutrient loading rate limit is not site specific and is based on guidance provided in Water Quality Protection Note 22 (DoW 2008)

Key Findings:

- The licence holder has breached several licence conditions since obtaining the existing licence in 2017, primarily in relation to poor solid waste handling and disposal practices, operation of old rendering equipment causing odour emissions, ineffective wastewater treatment, uneven discharge of wastewater to land with suspected elevated nutrient content and poor record keeping and housekeeping;
- Department investigations in early 2019 led to the issue of a PN that prevents rendering operations at the premises. Treated wastewater quality improved following the termination of rendering operations; and
- Current nutrient concentrations reported in treated wastewater are classified as medium to high strength, however loading rates for TN, TP and BOD in the 2019-2020 reporting period were compliant with existing, generic licence loading limits.

7. Review of waste management and disposal practices

Following the issue of the Prevention Notice, the licence holder engaged third party consultants to review waste management and disposal practices at the premises. This led to the development of a Nutrient Management Report (Revisankar 2020), NIMP (Strategen JBS&G 2021) and WDMP (Avon Valley Beef 2020). This section summarises each report and provides a technical review of key findings and recommendations.

7.1 Nutrient Management Report

The Nutrient Management Report (May 29, 2020) provides a study on the abattoir wastewater streams and nutrient management at the premises. An assessment of waste streams identified that wash-down water from the sealed holding pens contributes about 60% of the nutrient loading channelled to the WWTS, which is likely due to a lack of controls to capture manure in wastewater.

Water samples were also collected from the treatment ponds to test WWTS performance. Nutrient and BOD concentrations in the final pond were found to be significantly lower than in the raw waste stream entering the WWTS. Based on the final pond water quality, TN, TP and BOD loading rates were calculated to be 58.84 kg/ha/year, 13.81 kg/ha/year and 0.29 kg/ha/day, respectively, which are within existing licence limits.

The study also identified that stormwater has potential to interact with hardstand areas and enter the treatment ponds in substantial quantities during rain events due to local topography and the absence of guttering on facility roofs and ground diversions away from pond drains. This would be of concern during winter months when irrigation water usage, evaporation from the ponds and biological activity rates in the ponds are at a minimum.

The following actions were recommended to reduce nutrient loading into the treatment ponds and improve effluent monitoring, water use efficiency and stormwater management:

- Install physical screens in wastewater streams and construct a purpose-built settling pond for the lairage wastewater stream (physical screens could reduce total suspended solids entering the ponds by up to 50% and BOD by 5 - 20%);
- Scoop manure from livestock yards and pens prior to washing hardstand areas;
- Install a dissolved air floatation tank to remove 20-75% of total suspended solids and fats from wastewater;
- Install roof gutters and piping to divert rainwater away from ponds;
- Install drive over bunding around hardstand areas;
- Re-route wastewater from final (oxidation) pond to the yard for wash down activities (given the demonstrated performance of the WWTS), which would reduce irrigation rates and scheme water usage; and
- Commence monitoring of BOD, total volatile solids, volatile fatty acids, total alkalinity and conductivity in the active anaerobic pond to assess ongoing pond performance. These parameters can be used as triggers to identify when it is appropriate to switch to using the other anaerobic pond.

7.1.1 DWER Technical Review

The department has reviewed the Nutrient Management Report and identified that:

- An appropriate sampling methodology was undertaken to determine the relative nutrient loading generated by each wastewater stream;
- The water balance calculation used to estimate the daily irrigation volume was based on a limited sampling program (four days over two weeks in summer), reducing confidence in the reliability of loading rates calculated for TN, TP and BOD; and
- The licence holder has adopted several of the management actions recommended in the Nutrient Management Report as proposed controls in their WDMP (Avon Valley Beef 2020),

including the installation of physical screens to capture solids upstream of the WWTS and the installation of kerbing and bunding around the high bay area hardstand. DWER has considered the remaining actions recommended in the Nutrient Management Report as new controls in the licence.

7.2 Nutrient and Irrigation Management Plan

The NIMP details the suitability of the receiving environment for treated wastewater disposal and describes how the irrigation of treated wastewater is managed to minimise potential impacts on the environment. The irrigation area used for the basis of the NIMP comprises paddocks authorised for irrigation under the existing licence and Prevention Notice (total 15.15 ha).

The NIMP also details a water balance and cropping plan, with oats for hay/straw selected given their expected higher nutrient uptake compared to wheat or barley. Nutrient loading rates for TN, TP and BOD were calculated to be 119 kg/ha/year, 18 kg/ha/year and 0.2 kg/ha/day respectively.

7.2.1 DWER Technical Review

The department has reviewed the NIMP (Revision 2, dated 8 January 2021) and identified that:

- The proposed expanded irrigation area (15.15 ha) is sufficient to discharge wastewater to land on a long-term basis without excessive seepage of water and dissolved chemical constituents into groundwater;
- Regional rainfall exceeds evaporation in July, indicating infiltration past the root-zone is likely during that period. Consequently, it is recommended that irrigation does not occur during this period, a new wastewater storage pond is constructed and irrigation is scheduled based on soil moisture measurements;
- The current wastewater irrigation scheme (10.7 Ha) at the site is not sustainable given nitrogen inputs in wastewater exceed crop uptake rates in the irrigation area. Using NSW wastewater irrigation guidelines (NSW DEC, 2004), the annual uptake rate of nitrogen in harvested biomass would be about 1020 kg (with oat crops producing about 4 tonnes/ha of dry matter each year containing 1.7% of nitrogen). By contrast, about 2,254 kg of nitrogen is discharged annually in treated wastewater from the abattoir facility, based on the concentration of nitrogen in the wastewater (149 mg/L) and the daily flow rate (41,450 L/day) provided in the NIMP;
- Assuming the above conditions apply, the concentration of nitrogen in the wastewater would need to be lowered from about 149 mg/L to about 67 mg/L to ensure that all of the nitrogen would be taken up by the irrigated crop on the available land area;
- Long-term, it is recommended that a site-specific wastewater treatment target for nitrogen concentrations is determined by undertaking leaf-tissue analysis and soil monitoring and that the WWTS at the abattoir site is progressively upgraded over several years to achieve this new target;
- The phosphorus uptake is in balance with the input rate in wastewater applied to the irrigation area. Although small amounts of phosphorus are likely to accumulate in the soil profile, soils in the area are likely to have a high sorption capacity for phosphorus, and leaching of this nutrient into groundwater is unlikely to occur;
- Insufficient information has been provided by the licence holder to indicate whether there is a risk that the soils will become sodic and dispersive on the site. It is recommended that sodium, calcium and magnesium ion concentrations ions are included in the chemical analysis suite for treated wastewater from the abattoir to enable the sodium adsorption ratio (SAR) of the wastewater to be determined; and
- A soil and groundwater quality monitoring program is recommended to assess baseline conditions, changes to soil and groundwater quality and wastewater irrigation system performance.

7.3 Waste Discharge Management Plan

A WDMP was submitted to the department on 12 November 2020 as a requirement of the Prevention Notice. The WDMP detailed the type and quantity of waste generated in the lairage, slaughterhouse and fellmongering shed and current waste treatment and disposal methods. In addition, the plan has a register of waste management actions that have been implemented, are underway or proposed. Several of these controls were recommended in the Nutrient Management Report (Revisankar 2020).

Following feedback from the department, the WDMP was revised and resubmitted on 14 May 2021 with a revised strategy to manage paunch and manure waste at the premises. Using industry data provided by the department of Primary Industries and Regional Development (DPIRD), a nutrient balance for the solid waste disposal area determined that the area could accommodate up to 6 m^3 paunch per week, without causing an excessive nitrogen and phosphorus loading.

It was acknowledged that further sampling and analysis is required to gain a better understanding of the nutrient content of manure and paunch at the premises. The licence holder proposed that until further work is done to determine the acceptability of applying all manure and paunch produced at the premises to the solid waste disposal area, all manure and paunch would be disposed off-site for reuse at a suitable facility. As a contingency, the ability to apply up to 327 tonnes of paunch per year would be retained in accordance with the nutrient balance conducted using industry standard data.

7.3.1 DWER Technical Review

The department has reviewed the revised WDMP and identified that:

- The revised licence should specify that only dried paunch is to be applied to the solid waste area;
- There are insufficient controls specified in the licence to manage the nutrient loading in the solid waste disposal area, such as limits to the volume of solid waste applied, removal of nutrients via harvesting, or monitoring potential impacts to soil and groundwater;
- A site-specific investigation is recommended to estimate current nutrient loadings from the application of paunch to land; however, the methods used in the WDMP based on industry data are acceptable in the interim; and
- The waste management actions register includes a register of licence holder proposed controls relating to the management of solid waste, wastewater and stormwater, which DWER has considered in determining new licence controls.

Key Findings:

- Additional controls are recommended to reduce the nutrient loading entering the WWTS, including the installation of physical screens and bunding in hardstand areas to prevent contaminated stormwater inflow;
- The wastewater irrigation scheme is not currently sustainable, as nitrogen inputs in wastewater exceed crop uptake rates. It is recommended that a site-specific wastewater treatment target for nitrogen concentrations is determined by undertaking leaf-tissue and soil testing and that the WWTS at the abattoir site is progressively upgraded over several years to achieve this new target;
- The phosphorus uptake rate by the irrigated crop is estimated to be in balance with the input rate of phosphorus to the irrigation area;
- The irrigation area proposed by the licence holder (15.15 ha) is sufficient to accommodate the estimated hydraulic loading from the discharge wastewater to land on a long-term basis. However, irrigation should not occur in July when rainfall exceeds evaporation rates;
- There is insufficient information to assess the risk of soils becoming sodic and dispersive at the premises from the application of salts in wastewater. Therefore, it is recommended that sodium, calcium and magnesium ion concentrations are included in the chemical analysis suite for treated wastewater from the abattoir to enable the SAR of the wastewater to be determined;
- A soil and groundwater quality monitoring program is recommended to assess baseline conditions and changes to soil structure, soil and groundwater chemistry and to ensure the wastewater irrigation system is working efficiently; and
- Site-specific testing is recommended to estimate the nutrient loading to the solid waste disposal area resulting from the application of paunch. Controls specified in the existing licence to manage the nutrient loading to the area are also considered to be insufficient.

8. Risk assessment

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

To establish a Risk Event there must be an emission, a receptor which may be exposed to that emission through an identified actual or likely pathway, and a potential adverse effect to the receptor from exposure to that emission.

8.1 Source-pathways and receptors

8.1.1 Emissions and controls

Emissions generated at the premises and potential exposure pathways that have been considered in this Decision Report are detailed in Table 4 below. Existing and proposed licence holder controls intended to prevent, control, abate or mitigate these emissions are also listed. Licence holder controls include those proposed in the WDMP and NIMP.

Table 4: Existing and proposed licence holder controls

Potential emission	Sources	Potential pathways	Licence holder controls
Odour	Abattoir facility: • Stored animal by-products • Build-up of rotting material (animal parts) on grated sumps • Blood tank	Air/ windborne	• Animal waste by-products including fat, offal, bone and blood are captured in tubs and tanks and transported off-site daily • Daily wash down of by-product storage tubs • Daily clean out of fats, grease and manure in sumps for off-site disposal • Daily wash-down of high bay hardstand area where bi-product tubs are temporarily stored
	Lairage: • Livestock in overflow yards and holding pens • Accumulated manure and urine		• Livestock are only kept in designated pens and yards • Livestock are temporarily held for a maximum of 18 hours • Daily wash-down of concrete floors in lairage areas to remove accumulated manure and urine • Weekly inspection and clean out (as required) of drainage channels serving the lairage, including removal of manure collected in sumps for off-site disposal • Manure in unsealed overflow yards is cleaned twice a year and disposed off-site
	Wastewater treatment ponds		• Proper operation of WWTS to avoid odour generation in treatment and holding ponds and during irrigation. • Daily monitoring of odours and wind direction • Ponds are appropriately sized to handle the premises wastewater requirements
	Solid waste disposal area		• Paunch material is disposed off-site daily and only spread on the solid waste disposal area as a contingency • Paunch material is dried prior to disposal
Wastewater with elevated nutrient, salt and BOD content	Wash-down water generated in the lairage, abattoir, foetal blood/tripe room and boning room	Direct discharge to land resulting in infiltration through soil profile and overland runoff	• All abattoir process water to be directed to the WWTS • Primary holding pens and abattoir basement and kill floor are sealed with hardstand floors • Sumps and drainage channels are lined with concrete to prevent leaks and capture solids in wastewater • Weekly inspection and clean out (as required) of drainage channels serving the lairage.
	Wastewater held in treatment ponds: • Pond overtopping • Leaks or seepage through wastewater containment infrastructure		• Ponds are lined with clay lining, with permeability unknown • Ponds have embankments to mitigate overflow events • Wastewater to be discharged from the oxidation pond when water levels approach the 500mm freeboard buffer • Daily freeboard measurements

Potential emission	Sources	Potential pathways	Licence holder controls
	Direct application of treated wastewater to land via irrigation		Wastewater quality improvement controls: • Channel wash-down waters through a series of four save-all sumps to capture solids, which will be cleaned daily • Install new sediment trap up-gradient of the anaerobic pond • Install kerbing and bunding around high bay area to divert clean stormwater away from WWTS Irrigation operational controls: • Expand irrigation area to 15.15 ha to decrease hydraulic and nutrient loading rates • 50 m buffer from the irrigation area to the ephemeral creek line and a 20 m buffer to the eastern and western premises boundaries • Set manually controlled irrigator to run along 27 fixed lines, with each line operated for two weeks per year to ensure even application of wastewater across the irrigation area • No irrigation generated runoff, spray drift or discharge is permitted to occur beyond the boundary of the irrigation areas Irrigation avoided immediately before, during and after rain events • Record locations and run-times of the irrigator in a logbook • Record exact volume of wastewater irrigated using flow meter Monitoring controls: • Sample treated wastewater monthly at the final pond discharge outlet to monitor water quality and calculate loading rates • Monitor scheme water used on-site to inform wastewater generation and disposal calculations
Sediment and Leachate with elevated nutrient and salt content	Accumulated manure and urine in unsealed livestock yards and holding pens (5,362 sqm in size)	Nutrient Infiltration through soil profile Sediment and nutrient via overland flow	• The holding pens used to hold majority of livestock are sealed with a concrete foundation to prevent leachate infiltration • All wash waters run into a grated drainage channel which is directed to the WWTS. • Daily inspection and wash-down of the sealed holding pens to remove manure and urine • Unsealed overflow stock yards are only used occasionally • Manure in overflow stock yards is cleaned twice a year and disposed off-site
	Solid waste (paunch) in designated solid waste disposal area		• Manure no longer disposed in solid waste are • Paunch material is disposed to a designated area only as a contingency if off-site disposal is not possible • Paunch material is dried on a bunded hardstand (high area bay) prior to disposal • The solid waste disposal area has been divided into twelve pegged sub-areas to be used in rotation, each for one month of the year. The area will be cropped using oats to assist nutrient uptake • A biannual soil monitoring program will be implemented to establish whether the solids application rate should be increased or decreased to produce a more sustainable outcome • A 25 m buffer has been incorporated between the solid waste disposal area and the property boundary, in which no solid waste will be placed. This buffer will be clearly delineated with stakes or fencing

Potential emission	Sources	Potential pathways	Licence holder controls
Stormwater with elevated nutrient, salt and BOD content	Stormwater interaction with: • Uncovered upstream infrastructure (drains, save-all sumps) • High bay area	Infiltration through soil profile Overland runoff	• High bay area hardstand is designed to achieve a permeability of $<1 \times 10^{-9}$ m/s or equivalent where surface run-off of leachate and contaminated stormwater is returned to the start of the WWTS • Install kerbing and bunding across hardstand areas and guttering on roofs to divert stormwater away from the high bay area and WWTS

8.1.2 Receptors

In accordance with the *Guidance Statement: Risk Assessment* (DER 2017), the delegated officer has excluded employees, visitors and contractors of the licence holder from this assessment. Protection of these parties often involves different exposure risks and prevention strategies and is provided for under other state legislation.

Table 5 provides a summary of potential human and environmental receptors that may be impacted because of activities upon or emission and discharges from the prescribed premises *(Guidance Statement: Environmental Siting* (DER 2016)). The new premises boundary proposed by the licence holder which includes Lot 150 was used in calculating the distance to receptors.

Table 5: Sensitive human and environmental receptors and distance from prescribed activity

Human receptors	**Distance from operational area or premises boundary**
Nearest residential dwellings	
Residence on Lot 2044	520 m east of the abattoir slaughterhouse 630 m east of the WWTS
Residence on Lot 16	920 m north of the abattoir slaughterhouse 840 m north of the WWTS
Additional residential dwellings within 2 km of premises boundary	
Residence on Lot 14	640 m north of premises boundary
Residence on Lot 1206	760 m northeast of premises boundary
Residence on Lot 304	980 m south of premises boundary
Residence on Lot 19	1200 m northwest of premises boundary
Residence on Lot 20	1400 m northwest of premises boundary
Residence on Lot 21	1650 m northwest of premises boundary
Residence on Lot 1	1650 m northwest of premises boundary
Environmental receptors	**Description and distance from prescribed activity**
Soil	Land slopes downward from the abattoir buildings to the north and south. Land rises again further north beyond the ephemeral creek. Soils beneath areas of higher elevation comprise a heavy clay layer about 1.5 – 2 m in depth, while soils beneath lower areas have a shallow sandy topsoil above heavy clay (Hepple and Sons 2013). However, no detailed geological or hydrogeological investigations have been undertaken at the premises.
Groundwater	The premises is located on weathered and fractured rock aquifers of the Yilgarn Craton within the Karri Groundwater Area. Local aquifers in this area tare typically thin and follow low points in the topography. Therefore, it is likely that groundwater beneath the irrigation area flows north toward the ephemeral creek and groundwater beneath the solid waste disposal are flows southwest. There are no groundwater bores within or near the premises. In March 2012, during desludging of one of the anaerobic ponds, no groundwater was encountered to a depth of 6 mbgl. State-wide groundwater salinity mapping (available on the Western Australian Local Government [WALGA] Environmental Planning Tool) suggests groundwater in the fractured rock aquifers is likely to be saline (7,000 to 14,000 mg/L TDS).

Surface water bodies	The premises is located within the Avon River catchment area. An ephemeral creek runs east to west across the northern section of the premises before draining into the Mortlock River North about 1.5 km downstream from the premises boundary. The Mortlock River North is 585 m west of the premises boundary at its nearest point and is tributary of the Avon River. The ephemeral creek that intersects the premises is: • 50 m north of the irrigation area • 270 m north of the WWTS • 380 m north of the abattoir drains, sumps and hardstand areas
Threatened Ecological Communities (buffers) - Eucalypt Woodlands of the WA Wheatbelt – Priority 3 (critically endangered)	Comprises vegetation along the ephemeral creek in the north west portion of the premises and vegetation in the surrounding area, particularly along the Mortlock River North.

8.2 Risk ratings

Risk ratings have been assessed in accordance with the *Guidance Statement: Risk Assessments* (DER 2017) for each identified emission source and considers potential source-pathway and receptor linkages as identified in Section 8.1. Where linkages are in-complete they have not been considered further in the risk assessment.

Where the licence holder has mitigation measures/controls, these have been considered when determining the final risk rating. Where the delegated officer considers the licence holder's proposed controls to be critical to maintaining an acceptable level of risk, these will be incorporated into the licence as regulatory controls.

Additional regulatory controls may be imposed where the licence holder's controls are not deemed sufficient. Where this is the case the need for additional controls will be documented and justified in Table 6**Error! Reference source not found.**.

Revised Licence L6010/1989/13 that accompanies this Decision Report authorises emission associated with the operation of the premises (i.e. abattoir operations, fellmongering and associated operational activities). The conditions in the issued Licence, as outlined in Table 6 have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

Table 6: Risk assessment of potential emissions and discharges from the premises during operation

Risk Event					Risk rating[1] C = consequence L = likelihood	Licence holder controls sufficient?	Regulatory controls imposed[2]	Justification for regulatory controls
Source/Activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Licence holder controls**				
Abattoir Category 15 operations, including: • Processing and storage of organic by-products/waste • Wash-down of kill floor, foetal blood/tripe room and basement floors	Odour from animal by-products, blood tank and organic material in sumps	Air/windborne dispersion causing impacts to health and amenity	Residential dwellings 520 m east and 920 m north of the abattoir slaughterhouse	See Table 4	C = Moderate L = Possible **Medium Risk**	Y	Condition 1 (Table 1, Row 4) – abattoir operational requirements	The risk rating was determined with consideration to historical odour emissions caused by storing significant volumes of partially rendered and un-processed animal bi-products across the premises. Although these odour sources have been removed in accordance with the Prevention Notice, the delegated officer considers that operational controls to clean hardstand areas and remove bi-products and animal residues from sumps daily is to be conditioned in the revised licence to reduce the likelihood of odour emissions impacting neighbouring residents.
	Direct discharge of raw wash-down wastewater to unsealed areas from runoff, spills or leaks in upstream drainage infrastructure (pipes, drains and sumps)	Infiltration through soil profile	Soil and groundwater	See Table 4	C = Slight L = Unlikely **Low Risk**	Y	Condition 1 (Table 1, Row 4) – abattoir operational requirements	Department site inspections in 2019 observed the build-up of oily and fatty discharges and solids clogging sumps and drains around the abattoir, indicating they were not cleaned at sufficient intervals. Therefore, to ensure that sumps will not overflow resulting in runoff to unsealed areas and ensure the performance of the sumps, the delegated officer has specified the daily clean out of sumps in the licence. In addition, the licence will specify that all wash-down waters generated from the abattoir are to be conveyed to the save-all sumps. The delegated officer considers that these two controls will keep the risk of impacts to unsealed areas low. In addition, given the age of upstream infrastructure and evidence of damage noted in site inspections (e.g. cracks in concrete sumps), the delegated officer has specified that upstream sumps and drainage channels are to be sealed and maintained to ensure all drainage infrastructure remains fit for purpose in capturing solids and preventing the leakage of raw wastewater to land.
Lairage, including: • Holding of livestock and wash-down activities in overflow yards and holding pens	Odour from livestock and accumulated manure and urine	Air/windborne dispersion causing impacts to health and amenity	Residential dwellings 610m east and 880 m north of the holding pens	See Table 4	C = Minor L = Possible **Medium Risk**	N	Condition 1 (Table 1, Row 1, 2 and 3) - lairage operational requirements **Condition 1 (Table 1, Row 2 and 3) – regular removal of manure from overflow stock yards and uncovered holding pens**	The delegated officer considers that the daily wash-down of lairage hardstand areas to remove animal effluent (manure and urine), in addition to weekly inspections and collection of manure in drainage channels for off-site disposal, will reduce the risk of significant odours impacting receptors to an acceptable level. The delegated officer also considers that the removal of manure in the unsealed pens and livestock overflow yards should be undertaken at least fortnightly in summer and weekly in winter (instead of twice a year as proposed by the licence holder), to reduce the likelihood of accumulated effluent causing odour impacts to neighbouring human receptors.
	Leachate from accumulated manure and urine in unsealed stock yards and unsealed holding pens (5,326 m^2 total area)	Infiltration resulting in soil and groundwater contamination	Soil and groundwater	See Table 4	C = Minor L = Unlikely **Medium Risk**	N	**Condition 1 (Table 1, Row 2 and 3) – regular removal of manure from overflow stock yards and uncovered holding pens**	There is potential for leachate with elevated nutrient content from the accumulation of animal effluent in the unsealed livestock overflow yards and unsealed holding pens to infiltrate to soil and groundwater. There is also a risk of nutrient-rich runoff, especially throughout winter, given the absence of drainage channels servicing the yards. The delegated officer considers that the regular removal of manure in the unsealed overflow stock yards on a weekly basis during May, June, July and August (monthly mean rainfall > 50 mm) and on a fortnightly basis throughout the remaining annual period, will reduce the risk of leachate seepage to soil and groundwater to an acceptable level.
	Direct discharge of raw wash-down wastewater to unsealed areas from runoff, spills or leaks in upstream drainage infrastructure (pipes, drains and sumps)	Infiltration through soil profile	Soil and groundwater	See Table 4	C = Slight L = Unlikely **Low Risk**	Y	Condition 1 (Table 1, Row 1, 2 and 3) - lairage operational requirements	The delegated officer has specified all wash-down waters generated from the lairage are to be conveyed to the sediment trap and that drainage channels are to be maintained to ensure they are fit for purpose. The delegated officer considers that these two controls will keep the risk of impacts to unsealed areas low. The delegated officer also considers that the weekly inspections and collection of manure in drainage channels for off-site disposal, which has been specified to manage odour emission, will reduce the risk of lairage drainage channels overflowing (causing raw wastewater runoff).

Risk Event					Risk rating[1] C = consequence L = likelihood	Licence holder controls sufficient?	Regulatory controls imposed[2]	Justification for regulatory controls
Source/Activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Licence holder controls**				
WWTS, including: • anaerobic, facultative and oxidation ponds • sludge bed • desludging operations	Odour from ponds, desludging operations and sludge drying bed	Air/windborne dispersion causing impacts to health and amenity	Residential dwellings 630 m east and 840 m north of the WWTS	See Table 4	C = Moderate L = Possible **Medium Risk**	N	Condition 1 (Table 1, Row 9) – wastewater treatment pond operational requirements **Condition 1 (Table 1, Row 9) – establishment of pond crusts** **Condition 16 (Table 8, Row 6) – reporting annual weight of dried sludge removed from premises and provision of invoices upon request**	The risk rating considered department site inspections in 2019 that reported poor pond management at the premises (e.g. excessive build-up of sludge reducing retention time) as having the potential to generate odour emissions impacting nearby residential receptors. The licence holder proposed daily monitoring of wind direction and odours from the ponds, a minimum desludging interval of five years and ensuring the proper operation of the WWTS to avoid unreasonable odours. The delegated officer considers that specifying controls to support the proper functioning of the ponds, including the establishment of crusts in the operational anaerobic ponds, is sufficient to lower the risk of unreasonable odours during normal operations. Additional controls specified to reduce the nutrient loading entering the anaerobic ponds (to improve water quality) will further support the proper functioning of the ponds and lower the risk of odours. Desludging activities also present an odour risk through the disturbance and stockpiling of sludge in preparation for off-site disposal. The delegated officer considers that a restriction on drying sludge only in the existing sludge bed will reduce the risk of odour emissions impacting neighbouring residents given the distance to receptors and temporary nature of the drying process. In addition, reporting requirements are to include the annual weight of dried sludge removed from the premises and provision of disposal receipts/invoices of that disposal at the CEO's request.
	Direct discharge of raw or partially treated wastewater to land via pond overtopping event or leak from pond pipework	Infiltration resulting in soil and groundwater contamination	Soil and groundwater	See Table 4	C = Minor L = Unlikely **Medium Risk**	Y	Condition 1 (Table 1, Row 9) – wastewater treatment pond operational requirements	The delegated officer considers that licence holder proposed controls including maintenance of a 500 mm freeboard and daily inspections are sufficient to keep the risk of a pond overtopping event or pipeline leak causing impacts to soil and groundwater to an acceptable level. A control will also be specified to avoid vegetation growth on pond inner embankments which could compromise bank integrity.
	Seepage or leakage of wastewater leachate through pond lining Seepage of leachate from excavated sludge on sludge drying bed	Infiltration resulting in soil and groundwater contamination Contaminant transport to surface water features	Soil and groundwater	See Table 4	C = Minor L = Unlikely **Medium Risk**	Y	Condition 1 (Table 1, Row 9) – sludge bed operational requirements Condition 11 – groundwater monitoring	The recommended permeability for pond liners to minimise the risk of wastewater leakage or seepage is at least 1 x 10^{-9} m/s as instructed in *WQPN 26 - Liners for containing pollutants using synthetic membranes* (DoW, 2009). However, given the integrity of the clay lining is unknown due to the age of the wastewater treatment ponds at the premises, it is not possible to assess performance against a permeability requirement. Given groundwater is likely saline and the distance to the nearest surface water feature, the delegated officer considers potential impacts to receptors from the seepage of wastewater through the pond liners to be minor and unlikely. Therefore, no permeability requirements are to be set. Further, the collection of groundwater data from a new bore to the north of the ponds will improve understanding of groundwater depth and quality beneath the ponds and enable ongoing monitoring of potential impacts to groundwater from pond seepage. The delegated officer has specified that any sludge excavated for off-site disposal must also be stored on the bunded sludge drying bed. Further, leachate from the sludge drying bed must be directed into anaerobic pond 1 where it will undergo treatment.
On-site irrigation of treated wastewater	Direct discharge of treated wastewater to land with elevated nutrients, salts and BOD	Infiltration resulting in soil and groundwater contamination Contaminant transport to surface water features	Soil and groundwater	See Table 4	*C = Minor* *L = Possible* ***Medium Risk***	N	**Condition 2 (Table 2, Row 4, 7 and 8) - installation of sediment trap, stormwater diversion infrastructure and groundwater monitoring bores adjacent to the irrigation area** **Condition 6 (Table 3, Row 1) – restriction on irrigation in July** **Condition 7 (Table 4, Row 1) – revised nitrogen and phosphorus loading rate limits** **Condition 9 (Table 5, Row 2) – additional monitoring parameters including cations, total alkalinity and volatile fatty acids** **Condition 10 – soil monitoring in the irrigation area** **Condition 11 – monitoring of groundwater adjacent to the irrigation area**	See Section 8.3.
		Overland runoff into ephemeral creek resulting in adverse impacts to ecosystem health or surface water quality	Ephemeral creek and species (including TEC habitat) 50 m north of the irrigation area					

Risk Event					Risk rating[1] C = consequence L = likelihood	Licence holder controls sufficient?	Regulatory controls imposed[2]	Justification for regulatory controls
Source/Activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Licence holder controls**				
							Condition 16 – Reporting emissions to land	
On-site solid waste (paunch) disposal	Odour from drying paunch and solid waste applied to land	Air/windborne dispersion causing impacts to health and amenity	Residential dwellings 340 m east and 930 m north of the solid waste disposal area	See Table 4	*C = Minor* *L = Unlikely* ***Medium Risk***	N	**Condition 6 (Table 3, Row 2) – paunch waste process requirements and application rate limit** **Condition 10 – soil monitoring**	The delegated officer considers the storage of paunch in enclosed bins prior to off-site disposal and the drying of paunch prior to on-site disposal is sufficient to manage the risk of unreasonable odour emissions from the solid waste disposal area. Paunch is to be dried prior to on-site disposal by storing it in a trailer on the high bay area hardstand until all free-flowing liquid is removed. All liquids drained from the trailer must be directed to the WWTS. Further investigation is required into the volume of paunch that can be applied to the solid waste disposal area without causing a nutrient imbalance and increasing the risk of leachate with elevated nutrient content infiltrating to soil and groundwater beneath the root zone. The licence holder has proposed to undertake further site-specific testing to demonstrate the nutrient uptake capacity of the solid waste disposal area. In the interim, the delegated officer considers that the licence holder proposed control to limit paunch application rates to 327 tonnes per year, based on industry data supplied by DPIRD, is acceptable on the condition that no more than 30 tonnes is applied per sub-area, per year. Soils will also be tested every two years monitor potential impacts from the historical and ongoing disposal of solid waste to the solid waste disposal area.
	Leachate from solid waste applied to land	Infiltration resulting in soil and groundwater contamination	Soil and groundwater	See Table 4	*C = Minor* *L = Possible* ***Medium Risk***			
Stormwater interaction with: • upstream wastewater infrastructure (drains, save-all sumps) • hardstand areas servicing the abattoir and lairage (e.g. high bay area)	Contaminated stormwater runoff	Infiltration resulting in soil and groundwater contamination	Soil and groundwater	See Table 4	*C = Minor* *L = Likely* ***Medium Risk***	Y	**Condition 2 (Table 2, Row 4) – installation of kerbing and bunding around high bay area** **Condition 5 – stormwater management plan**	Stormwater from non-operational areas is not currently diverted away from operational areas. Therefore, it may become contaminated with organic material prior to being discharged into the WWTS or other unsealed areas. In addition to the risk of contaminated stormwater infiltration on unsealed areas, this can result in an unnecessary increase in the nutrient and volumetric loading entering the ponds, reducing hydraulic retention time and treatment efficiency of the ponds, particularly in winter. The delegated officer has determined that the licence holder proposed engineering controls to install kerbing and bunding to reduce the volume of clean stormwater entering hardstand areas and prevent contaminated stormwater from flowing back into unsealed areas will lower the risk to receptors. Further, the delegated officer has specified the development of a Stormwater Management Plan outlining site-wide measures to prevent clean stormwater from entering operational areas and how the diverted stormwater will be managed or disposed.

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

Note 2: Proposed licence holder controls are depicted by standard text. **Bold and underline text** depicts additional regulatory controls.

8.3 Detailed risk assessment – discharge of TDS (salt) and nutrient rich wastewater to land (irrigation)

8.3.1 Overview of risk event

The primary risk event associated with the direct application of salt and nutrient rich wastewater to land via irrigation is the potential for infiltration of wastewater with elevated nutrients and salts past the root zone causing degraded soil structure and soil and groundwater contamination. In addition, there is a lesser risk of contaminant transport in groundwater or overland runoff leading to adverse impacts to the down-gradient ephemeral creek and fringing TEC vegetation.

8.3.2 Characterisation of emission

As detailed in section 4.1.5, about 15,100 kl of treated wastewater is irrigated to land per year. For the purposes of this assessment, the average concentrations of TN (149 mg/L), TP (18 mg/L) and BOD (65 mg/L) in treated wastewater are taken from the NIMP, while TDS (960 mg/L) is calculated using site monitoring data. An effluent stream with these levels can be classified as medium to high strength (NSW DEC 2004).

Wash-down activities in the proposed foetal blood and tripe processing room are not expected to notably increase the volume and strength of wastewater entering the WWTS given cleaning activities will only require a small volume of water for cleaning tables and floors. Cleaning the floors of the proposed boning room are also not expected to significantly increase the raw wastewater stream given the water balance for the premises already incorporates wash-down water from the room (currently used as a chiller).

8.3.1 Characterisation of potential impact

Excessive nutrient loading

The potential for soil and groundwater contamination in an irrigation setting is predominantly dependent on the long-term capacity for vegetation and the upper soil profile to accommodate the nutrient loading applied to the area. An excessive nutrient loading increases the risk of soil and groundwater contamination, especially during wetter months, via infiltration of wastewater with excess nutrients past the vegetation root zone to the water table. Other factors that determine the risk of seepage to groundwater are soil hydraulic conductivity and depth to water table, both of which have not been investigated at the premises. However, groundwater is anticipated to be greater than 6 m bgl toward the southern boundary of the irrigation area near the ponds and shallower closer to the creek.

The key nutrients of concern in abattoir wastewater are nitrogen and phosphorus. An excessive nitrogen loading in soil can alter plant (crop) morphology and leach to groundwater, which may impact beneficial use of groundwater. Excessive phosphorus can cause algal growth in water bodies while several native vegetation species are adapted to low-phosphorus soils.

Excessive BOD and salts loading

Abattoir wastewater typically has high levels of BOD which can lead to soil profiles being clogged by bacterial slimes. Wastewater may also have high TDS (salt) content which in the long-term could accumulate causing soils to become saline. Further, a disproportionally high concentration of sodium ions compared to calcium and magnesium ions may result in sodic and dispersive soils. However, these ions are not currently monitored at the premises and therefore cannot form part of this assessment.

Excessive hydraulic loading

An irrigation rate that exceeds the hydraulic loading capacity of a given area is likely to result in waterlogging, overland runoff and seepage, particularly during wetter months. An excessive hydraulic loading therefore increases the risk of impacts to surface water bodies via transport of contaminants through groundwater or overland runoff, especially if wastewater is not treated to a sufficiently high level.

8.3.2 Criteria and assessment

The existing licence specifies nutrient concentration limits in treated wastewater and nutrient loading limits to land based on criteria set out in *Water Quality Protection Note 22: Irrigation with nutrient –rich wastewater* (DoW 2008). However, these limits are not based on site-specific data. This section applies methods set out in the NSW guidelines for the irrigation of domestic wastewater (NSW EPA, 1998) using site data to estimate sustainable hydraulic and nutrient loading rates at the premises based on current irrigation volumes and treated wastewater quality. Salt content in premises wastewater will also be assessed based on irrigation water salinity ratings presented in the NSW guidelines.

Nitrogen loading assessment

DWER will generally not support wastewater irrigation at sites where the amount of nitrogen in discharged wastewater exceeds the capacity of vegetation to take up the nutrient in a given area. Nitrogen will be taken up by pasture in the proposed irrigation area.

A preliminary estimate of the land area required to ensure that a particular crop takes up all of the nitrogen applied in a disposal area is given by the following formula (NSW EPA, 1998; NSW DEC, 2004):

$$A_N = (C \times Q)/L_N$$

Where: $A_N = land\ area\ required\ for\ nutrient\ uptake\ by\ crops\ (m^2)$
$C = concentration\ of\ nutrient\ in\ the\ wastewater\ (mg/L)$
$Q = daily\ wastewater\ flow\ rate\ (L/day)$
$L_N = critical\ loading\ rate\ of\ nutrient\ (mg/m^2/day)$

As a first approximation, L_N can be considered to be about 25 mg/m^2/day. The average nitrogen concentration in the wastewater from the abattoir facility is about 149 mg/L and the daily flow rate of treated effluent is about 41,450 L/day. Substituting these values into the above equation gives a nitrogen loading rate of 149 kg/ha/year and a required land area of about 24 ha, which is greater than the irrigation area available (15.15 ha), indicating that the proposed irrigation area has insufficient capacity to accommodate the existing nitrogen loading.

A simple nitrogen balance using the nitrogen uptake rate of irrigated oat crops under Australian conditions provides a similar result. Irrigated oat crops produce about 4 tonnes/ha of dry matter each year, that contains on average about 1.7% of nitrogen (NSW DEC, 2004). Assuming this applies to the abattoir facility irrigation area, the annual uptake rate of nitrogen in harvested biomass would be about 1,020 kg. By contrast, about 2,254 kg of nitrogen is discharged annually in treated wastewater from the abattoir facility, if it is assumed that the concentration of nitrogen in the wastewater is 149 mg/L, and the daily flow rate is 41,450 L/day.

The nitrogen loading assessment above indicates that the concentration of nitrogen in the treated wastewater from the facility is too high to be completely taken up by the irrigated crop. Consequently, the wastewater irrigation scheme at the abattoir facility is not considered to be sustainable. Assuming the above conditions apply, the concentration of nitrogen in the wastewater would have to be lowered from about 149 mg/L to 67 mg/L to ensure all nitrogen is taken up by the irrigated crop.

Phosphorus loading assessment

Phosphorus is typically adsorbed by minerals in the soil and often relatively little of this nutrient is taken up by the crop. Therefore, the long-term sustainability of the wastewater irrigation scheme will depend on soil characteristics, including phosphorus sorption capacity and the extent to which the soil is saturated with phosphorus from previous land uses. However, neither of these soil characteristics have been assessed at the premises.

In the absence of site data, a phosphorus balance in the irrigation area can be estimated using the same nutrient balance calculation used above for nitrogen. Irrigated oat crops contain on average about 0.4% of phosphorus. Assuming oats produce 4 tonnes/ha of dry matter each year, the uptake rate of phosphorus in harvested biomass would be about 15.9 kg/ha/year. If it is assumed that the concentration of phosphorus in the wastewater is 18 mg/L and the daily flow rate is 41,450 L/day, the total amount of phosphorus that is applied annually in the irrigation area is about 272 kg (about 18 kg/ha/year).

This means that the phosphorus uptake rate by the irrigated crop is approximately in balance with the input rate of this nutrient in wastewater into the irrigation area. Small amounts of phosphorus are likely to accumulate in soil profiles in the irrigation area, however, leaching to groundwater is improbable given soils in the area likely have a high sorption capacity for phosphorus.

BOD loading assessment

DWER generally require that the BOD application rate from wastewater does not exceed 1,500 kg/ha/year to reduce the risk of soil profiles being clogged by bacterial slimes. The BOD loading of 0.32 kg/ha/day calculated in section 6.2 indicates there is a very low risk of BOD related impacts to soil.

Salt loading assessment

Since the rendering plant shut-down TDS concentrations have fluctuated with an average concentration of 960 mg/L, which is moderately saline (MLA 1996). The National Water Quality Management Strategy: *Australian Guidelines for Water Recycling and Managing Health and Environmental Risk* (2006) recommend a critical limit of 1,500 mg/L for TDS, above which operational corrective actions are recommended. Therefore, current TDS levels at the premises are not considered a risk to soils and crop growth.

Hydraulic loading assessment

A preliminary estimate of the land area required to ensure that wastewater can be applied to land at a suitable hydraulic loading can be calculated using the following equation (US EPA, 2006):

$$A = (365 \times Q)/(L \times T_{app})$$

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

The daily production rate of wastewater at the abattoir facility is about 41.5 m^3/day throughout the year. Additionally, as a first approximation, the acceptable hydraulic loading for soils can be assumed to be about 4 cm/week (US EPA, 2006). Substituting these values into the above equation gives a required land area of about 1 ha. Therefore, a sufficiently large irrigation area is available at the premises to enable wastewater to be discharged to land on a long-term basis without excessive seepage of water and dissolved chemical constituents into groundwater.

This assessment does not consider that local rainfall rates exceed evaporation rates in July. This means soils during this period are likely to be close to their saturation capacities, greatly

reducing the uptake of nutrients by vegetation. Consequently, there is an increased risk that wastewater applied to land in July could infiltrate beyond the crop root zone to groundwater.

8.3.3 Consequence

Based on site monitoring data, the sensitively of receptors (soil and groundwater) and current licence holder controls, the delegated officer has determined that the impact of discharging nutrient rich wastewater to land (leading to excessive nutrient or hydraulic loading) is low-level, on-site impacts. Therefore, the delegated officer considers the consequence to be ***minor***.

8.3.4 Likelihood

Based upon site monitoring data and current licence holder controls, the delegated officer has determined that the likelihood of low-level, on-site impacts or minimal off-site impacts from discharging nutrient rich wastewater to land (leading to excessive nutrient or hydraulic loading) is ***possible***.

8.3.5 Overall rating of discharge of treated wastewater to land

The delegated officer has applied the consequence and likelihood ratings described above to the Risk Criteria table in the *Guidance Statement: Risk Assessments* and determined that the overall rating for the risk of emissions to land (from excessive nutrient or hydraulic loading) on sensitive receptors is ***Medium***.

8.3.6 Regulatory controls (Licence Conditions)

The overall risk of discharging treated wastewater to land is considered “medium” due to the potential for excessive nitrogen loading to the irrigation area. To lower the risk of impacts to environmental receptors to an acceptable level several licence holder and delegated officer proposed controls are specified in the licence.

As detailed in Section 8.3.1, TN concentrations in wastewater need to decrease from about 150 mg/L to 90 mg/L to ensure the proposed 15.15 ha irrigation area can sustainably accommodate the long-term nitrogen loading to land. This equates to a maximum sustainable nitrogen loading of 90 kg/ha/year, which the delegated officer has set as the revised nitrogen loading limit.

The phosphorus loading rate has also been reduced from 120 kg/ha/year to 20 kg/ha/year, based on the estimated uptake of phosphorus in oat crops of 15.9 kg/ha/year. This revised phosphorus loading rate is achievable at the current volume and strength of wastewater irrigated at the premises.

To support a reduced nitrogen loading in effluent from the treatment ponds, the delegated officer has specified the licence holder proposed installation of upstream infrastructure to improve the screening of screen solids in wastewater from the slaughterhouse and lairage. This infrastructure includes a new sediment trap to capture solids, in addition to new bunding and kerbing to reduce the volume of contaminated stormwater entering the ponds from abattoir hardstand areas. These controls are also likely to reduce BOD in treated wastewater. A transition period of two years from the issue of the licence has been granted, during which the nitrogen loading rate limit will be 240 kg/ha/year.

The risk of excessive hydraulic and nutrient loading to land is to be further reduced by operational controls for the irrigation of treated wastewater, including the expansion of the irrigation area to 15.15 ha, the even distribution of wastewater and a ban on irrigation in July. These controls were also specified with consideration to historical non-compliances relating to the breakdown of irrigation equipment that led to surface water runoff to the ephemeral creek.

The performance of the WWTS will be monitored via sampling of effluent from the final pond

discharge outlet. Several additional parameters are to be included in the sampling program to assess pond performance, such as total alkalinity and volatile fatty acids. The addition of sodium, calcium and magnesium ions will enable the SAR value of wastewater discharge to land to be calculated to monitor the risk of soils becoming dispersive.

The establishment of a soil monitoring program within the irrigation area has been specified to monitor nutrient and salt concentrations in soils. An assessment of potential impacts to groundwater will also be enabled via the installation of two groundwater bores (up and down-hydraulic gradient to the irrigation area). Although regional groundwater is brackish to saline and therefore has limited beneficial use, it is important to understand groundwater flow as a potential pathway for transporting nutrients and other potentially harmful chemical constituents from the irrigation area to surface water drainage features. Groundwater is to be monitored on a six-monthly basis (before and after the wet season) for standing water levels, nutrients, major ions, pH, electrical conductivity and TDS.

All monitoring of emissions to land will be reported in the AER to enable nutrient and hydraulic loading calculations to be verified. The licence holder will also need to report scheme water used on-site to inform water balance calculations.

9. Decision

The delegated officer has reviewed the existing licence and has determined that several changes are required to ensure that ongoing operations at the premises do not pose an unacceptable risk of impacts to public health and the environment. This determination is based on the following:

- a review of AERs and site inspection reports from early 2019 identified poor pond management and animal by-product storage and disposal practices as potential sources of unreasonable odour emissions;
- a review of available treated wastewater quality monitoring data and irrigation scheme indicates that nitrogen levels in wastewater must decrease to ensure soils and crops can sustainably utilise the nitrogen loading applied to land via irrigation;
- a review of premises infrastructure indicates that solids in wastewater generated from cleaning the abattoir and lairage are not adequately screened prior to wastewater entering the WWTS. Further, key stormwater infrastructure is not in place to divert stormwater away from operational areas and therefore the WWTS;
- a review of on-site solid waste disposal practices identified a lack of controls to ensure there is no unacceptable risk to the environment from the application of dried paunch and manure to land; and
- no soil and groundwater monitoring program is currently in place to determine the extent to which soil and groundwater within the irrigation and solid waste disposal areas is being contaminated by wastewater constituents and leachate from dried paunch.

The delegated officer has specified several licence holder proposed controls and the following additional regulatory controls on the revised licence to minimise the risk of impacts to environmental receptors:

- infrastructure operational requirements to improve liquid and solid waste management, including daily off-site disposal of animal by-products, regular removal of manure from unsealed lairage areas and establishment and maintenance of a crust on the active anaerobic pond;
- design and installation requirements for proposed infrastructure, including a new sediment trap to improve the screening of solids in wastewater from the kill floor and lairage and kerbing and bunding to divert stormwater away from the high bay area and thus the WWTS;

- development of a Stormwater Management Plan, with a particular focus on measures to prevent clean stormwater from entering operational areas and how the diverted stormwater will be managed or disposed;
- expanded treated wastewater monitoring requirements including: total alkalinity, volatile fatty acids and sodium, calcium and magnesium ions;
- lower nitrogen and phosphorus loading rate limits for wastewater discharged to the irrigation area and a restriction on all irrigation in July;
- new soil and groundwater monitoring requirements, including the installation of two groundwater monitoring bores near the irrigation area; and
- restriction on the annual volume of dried paunch applied to the solid waste disposal area until the licence holder can demonstrate that there is no unacceptable risk of harm to the environment.

The delegated officer also recommends that the licence holder considers re-designing the covered holding pens to enable collection of manure prior to each wash-down to reduce the manure loading in wastewater. Given that the hardstand is already protected from rain, manure deposited in the area is likely to be dry enough to scrape and collect prior to wash-down. This would reduce the reliance on the sediment trap and concrete sumps to screen manure in the wastewater stream prior to treatment.

The delegated officer is satisfied the above controls, once implemented, will lower the overall risk profile of the premises, and ensure the abattoir can operate in a manner that does not pose an unacceptable risk of impacts to public health and the environment. In addition to the controls specified in the revised licence, the delegated officer has amended the premises boundary.

10. Consultation

The licence holder was provided with the draft decision report and draft revised licence on 15 November 2021 for comment. The licence holder's comments are summarised, along with DWER's responses, in Appendix 1.

11. Conclusion

This assessment of the risks of activities on the premises has been undertaken with due consideration of several factors, including the documents and policies specified in this decision report.

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

References

1. Australian and New Zealand Environment and Conservation Council Australia and New Zealand (ANZECC) 2000*, Guidelines for Fresh and Marine Water Quality (2000) - Volume 3 Primary Industries — Rationale and Background Information.*
2. Avon Valley Beef 2020, Waste Discharge Management Plan – Avon Beef Abattoir. Report dated 12 November, 2020.
3. Department of Environment and Conservation (DEC) NSW 2004, *Use of Effluent by Irrigation*, Sydney, New South Wales. Published October 2004. Available at: https://www.epa.nsw.gov.au/publications/water/effguide.
4. Department of Environment Regulation (DER) 2016, *Guidance Statement: Environmental Siting*, Perth, Western Australia.

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6. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
7. Department of Water (DOW) 2008, *Water Quality Protection Note 22 – Irrigation with nutrient-rich wastewater*, Perth, Western Australia.
8. Department of Water and Environmental Regulation (DWER) 2019, *Prevention Notice served to Prime Meat Processors Pty Ltd,* 19 July 2019.
9. Meat and Livestock Australia (MLA) 1996, *Effluent Irrigation Manual*, prepared by Lyle & Macoun Consulting.
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11. Revisankar 2020, Avon Valley Beef Abattoir Nutrient Management: Preliminary Report, May 29, 2020.
12. Strategen JBS&G 2021, *Avon Valley Beef Nutrient and Irrigation Management Plan (Revised)*, submitted to DWER on 8 January 2020.
13. US EPA 2006, *Process Design Manual, Land Treatment of Municipal Wastewater Effluents*. US EPA Report EPA/625/R-06/016. The report is available from web site https://www.researchgate.net/publication/264300380_Process_Design_Manual_Land_Treatment_of_Municipal_Wastewater_Effluents.

Appendix 1: Summary of licence holder's comments on decision report and draft conditions

Condition	Summary of applicant's comment	Department's response
Assessed production capacity Condition 16 (Table 8)	The licence holder requests that the assessed production capacity for Category 15 is amended to '*16,500 tonnes of sheep and cattle per year (~~live weight~~) (**carcase weight**)'* and that the Annual Environment Report requirements are amended accordingly. The proposed amended licence defines the assessed production capacity as '*16,500 tonnes of sheep and cattle per year (live weight)'.* The current licence has an approved premises production or design capacity of '*16,500 tonnes of livestock per year*'. The licence holder understands that the current assessed production capacity for Category 15 is based on carcase weight, not live weight. Basing the assessed production capacity on live weight would significantly impact the operation of the premises in that it would only be able to process approximately half the number of animals authorised under the current licence. The licence holder's understanding is reinforced by Condition 3.3.1 (Table 3.3.1) of the current licence which requires the monthly tonnages of carcases processed to be monitored. The licence holder has previously reported carcase weights in the Annual Audit Compliance Reports (AACRs) and Annual Environment Reports (AERs) for the premises as evidence that it is operating within the authorised limits. Carcase weight can also be easily measured (i.e., carcases can be weighed), whereas the weight of live animals would have to be estimated.	The delegated officer notes that the current licence defines the assessed production capacity as '*16,500 tonnes of sheep and cattle per year (live weight)'.* In the previous licence it was defined as "*16,500 tonnes of livestock per year*". In neither licence has the assessed production capacity been defined as "carcase weight". If the licence holder wishes to have the throughput reflected in hot carcase weight, they should provide the conversion rate so that 16, 500 tonnes liveweight can be converted to the equivalent hot carcase weight. Any increase to the approved throughput resulting from the conversion would need to be assessed and approved through a licence amendment application.
Condition 1, Table 1, Row 2 (uncovered pens)	The licence holder requests that the operational requirement for the removal of manure and sediment from drainage channels and earthen floors is changed from '*…**at least fortnightly***' to '*…**at least monthly***'. This change will fit in with the current cleaning and maintenance regime at the premises and is not expected to change the risk regarding emissions or discharges from the premises.	The delegated officer agrees that amending the minimum frequency of manure collection from the uncovered pens for off-site disposal to monthly will not increase the risk of odour emissions.
Condition 1, Table 1, Row 5	The licence holder request that part (a) of the operational requirements is	The delegated officer agrees that surface cracks pose no risk

Condition	Summary of applicant's comment	Department's response
(high bay area)	changed to '*Hardstand to be maintained ~~with no cracks~~ to prevent leakage to subsurface soils*.' The hardstand in the area does have some visible cracks; however, these are surface cracks only and do not penetrate to the depth of the slab and do not allow leakage to reach the subsurface soils. The licence holder will continue to monitor the condition of the slab and make necessary repairs to ensure that leakage to the subsurface does not occur.	and removing the reference to avoid cracks in the hardstand does not change the desired outcome of the condition. The reference to cracks has been removed.
Condition 1, Table 1, Row 7 (fellmongering wastewater evaporation pond)	The licence holder requests that the site infrastructure and equipment description is changed to *'Fellmongering wastewater evaporation pond with **minimum** 4 m_3 capacity lined with a 1.00 mm thick HDPE'*. The constructed pond is larger than 4 m_3 providing more operational capacity than that currently specified in the amended licence.	Amended pond capacity to "minimum 4m^3" and liner to 1 mm thickness. The delegated officer considers that the proposed amendments to infrastructure specifications do not change the risk profile associated with the storage of wastewater in the fellmongering evaporation pond. Further, a HDPE liner thickness of 1 mm is acceptable in accordance with *Water Quality Protection Note 26 – Liners for containing pollutants, using synthetic membranes*, which recommends "minimum thickness of 0.75 mm for low hazard waste containment with mechanical jointing".
	The licence holder requests that the minimum freeboard specified in part (a) of the operational requirements is changed from 500 mm to 200 mm as per engineers design specification A 500 mm freeboard requirement on a small pond such as the fellmongering wastewater evaporation pond will significantly reduce the operational capacity of the pond. A freeboard of 200 mm is considered sufficient to manager water levels in the pond preventing overflow.	Amended minimum freeboard to 200 mm given the size and depth (660 mm) of the pond, which the delegated officer considers reasonable to prevent overtopping during storm events.
Condition 1, Table 1, Row 8 (fellmongering and skin storage shed)	The licence holder requests that part (c) of the operational requirements is changed to '*Curing agent to only be stored on pallets in the fellmongering shed*'. Curing agent may not always be stored on pallets inside the shed. The requirement for pallets to be used is not related to the control of any emissions or discharges and can be removed with no consequence.	Removed requirement to only store curing agent in the fellmongering shed and on pallets. The delegated officer considers the risk of spilt curing agent is sufficiently managed by the requirement to collect all spilled curing agent prior to wash-down.
Condition 2, Table 2, Row 1 (fellmongering skin/hide curing tumblers)	The licence holder requests that the infrastructure and equipment description is changed to allow the installation of three hide/skin tumblers. The licence holder intends to install two tumblers to allow for greater operational flexibility, whilst a third tumbler will be used as a stand-by in case of maintenance/breakdown in any of the others. The addition of the extra tumblers will not increase the throughput of hides/skins through the	No change required. The delegated officer notes that fellmongering was excluded from the scope of assessment in this licence review given it was assessed in the previous licence amendment (issued 23 July 2020). Therefore, any changes to fellmongering infrastructure, equipment or operations are to be assessed via a new licence amendment

Condition	Summary of applicant's comment	Department's response
	fellmongering shed and the licence holder will continue to operate in accordance with the operational requirements specified in Condition 1, Table 1 of the amended licence. The addition of a second [operational] tumbler is expected to increase noise levels by approximately +3 dB (assuming both tumblers in operation at the same time). This increase will be insignificant when measured at the nearest noise sensitive premises.	or works approval application.
Condition 2, Table 2, Row 3 (fellmongering wastewater evaporation pond)	The licence holder requests that part (c) of the operational requirements is deleted to remove the need to extend the annex shed roof to cover the pond. As an evaporation pond, it is beneficial to have the pond open to the air to allow for maximum effect of solar heating and evaporation. Whilst the pond will be open to incidental rainfall, given the relatively small size of the pond, the input of rainwater will be minimal. Regardless of rainfall, the licence holder is also required to maintain a freeboard on the pond and prevent ingress of overall stormwater flow, thus minimising the risk of overtopping.	The delegated officer agrees and considers the risk of overtopping is sufficiently managed by the requirement to maintain a minimum 200 mm freeboard. Therefore, the requirement to extend the annex roof has been removed.
Condition 2, Table 2, Row 8 (groundwater monitoring wells)	The licence holder confirms that the timeframe by which the groundwater monitoring wells will be constructed, developed (purged), and determined to be operational is by 31 October 2022, in-line with the end of next year's annual reporting period.	The existing completion date for the new bores (30 April 2022) was selected to enable one round of groundwater sampling prior to the wet season and is considered to allow sufficient time to construct and purge the new groundwater monitoring bores.
Condition 5 (stormwater management)	The licence holder requests that the date by which a Stormwater Management Strategy must be submitted to the department is changed from 1 May 2022 to 31 October 2022 to allow sufficient time for funds to be allocated to the project and a suitably qualified consultant to be engaged to prepare the strategy.	The delegated officer recognises that additional time may be required to complete this task and has granted an extension to 31 October 2022.
Condition 6, Table 3, Row 1 (wastewater irrigation)	The licence holder requests that part (a) of the process requirements that states that no irrigation is allowed during the month of July is deleted. The DWER decision report calculates that the 15 ha irrigation area is more than sufficient to deal with the hydraulic loading of the applied treated wastewater (1 ha required). The requirement to cease irrigation in July is based on historical meteorological data that shows rainfall exceeds evaporation in that month. This approach does not consider the uptake of water by crops, which in July will be at their peak when water demand will be the highest. The current licence allows for year-round irrigation with no evidence of adverse environmental impacts occurring, including waterlogging or overland run-off beyond irrigation areas.	The delegated officer notes it is the departments preference that irrigation should not take place during periods of the year when rainfall exceeds evaporation as there is a high risk that the wastewater will percolate through the soil profile to the water table. If irrigation is to occur during wet periods, DWER considers this method of wastewater disposal to be a form of wastewater infiltration. Consequently, under these circumstances, DWER may require that proponents undertake a risk assessment to determine whether there is a risk of groundwater contamination due to the activity causing environmental harm or affecting nearby groundwater users.

<table>
<tr><th>Condition</th><th>Summary of applicant's comment</th><th>Department's response</th></tr>
<tr><td></td><td></td><td>Historical non-compliances relating to the breakdown of irrigation equipment (in some instances resulting in observed waterlogging) mean that the performance of the travelling irrigator applying wastewater evenly throughout the year is yet to be demonstrated over a satisfactory period. The new monitoring bores to be installed up and down-hydraulic gradient to the irrigation area will enable assessment of any potential impacts to groundwater.</td></tr>
<tr><td>Condition 7, Table 4, Row 1 (emission limits to land)</td><td>The licence holder notes an error in the commencement date for the amended limits for total nitrogen – the time frame for the reduced limit should be 'From 1 October 2022' and the timeframe for the current limit should be 'From date of this amendment until 30 September 2022'.

Notwithstanding the error noted in Row 1, the licence holder request that the total nitrogen limit is amended from 480 kg/ha in the current annual period and 90 kg/ha in the next annual period to 240 kg/ha for both the current and next annual period (i.e., from the date of the amendment until 30 September 2023), after which the proposed limit of 90 kg/ha/annual period would apply unless amended – see table below:
<table>
<tr><th>Emission point reference</th><th>Parameter</th><th>Limit</th><th>Commencement date</th></tr>
<tr><td rowspan="2">L1</td><td rowspan="2">Total nitrogen</td><td>240 kg/ha/annual period</td><td>240 kg/ha/annual period</td></tr>
<tr><td>From date of this licence amendment until 30 September 2023</td><td>From date of this licence amendment until 30 September 2023</td></tr>
</table>
The proposed reduction from 480 kg/ha/year to 90 kg/ha/year is a significant drop, and the amended limit of 90 kg/ha/year is less than the 120 kg/ha/year proposed in the Nutrient and Irrigation Management Plan (NIMP) prepared for the site. However, it is recognised that both the DWER and NIMP values have been calculated based on limited site information (specifically soil and crop data) and that the DWER assessment likely underestimates the nutrient uptake of the crops grown in the irrigation area. The licence holder proposes that that the current limit of 480 kg/ha/year is halved over the next two annual periods to allow</td><td>The delegated officer considers the justification provided to adjust the transitional nutrient loading rates to be reasonable without undermining the outcome to reduce the nutrient loading rate to a sustainable level. Therefore, the nutrient loading rate limit has been amended to 240 kg/ha/year until 30 September 2023, beyond which it will decrease to 90 kg/ha/year.</td></tr>
</table>

Condition	Summary of applicant's comment	Department's response
	time for more investigations to be completed, including soil sampling specified in the amended licence, for infrastructure improvements to be made, and for the NIMP to be updated. This proposed change will allow 480 kg/ha of total nitrogen to be applied to the land over the next two annual periods instead of the 570 kg/ha that would be allowed by the proposed amended licence, whilst the irrigation will continue to be managed in accordance with the NIMP.	
	The licence holder notes an error in the limit for total phosphorous which should be **120** kilograms/hectare/annual period (not 20 kilograms/hectare/annual period).	The delegated officer reduced the phosphorus loading rate from 120 kg/ha/year to 20 kg/ha/year based on the estimated uptake of phosphorus in crops (about 15.9 ka/ha/year) to ensure nutrient balance. It is also recognised that the revised phosphorus loading rate is achievable at current phosphorus concentrations and irrigation discharge rates.