# Decision Report

## Application for licence

**Division 3, Part V *Environmental Protection Act 1986***

| | |
|---|---|
| **Licence number** | L9330/2022/1 |
| **Applicant** | Koojan Downs Pty Ltd |
| **ACN** | 628 244 628 |
| **DWER file number** | DER2021/000020 |
| **Premises** | 'Koojan Downs' Cattle Feedlot<br>1131 Boundary Rd<br>YATHROO WA 6507 |
| **Date of report** | 23 June 2023 |
| **Status of report** | Final |

# 1. Purpose and scope of assessment

Koojan Downs Pty Ltd (the applicant) is seeking to transition from time-limited to full operations at its partially constructed cattle feedlot near Moora. An application for licence was submitted by the applicant under Division 3 Part V of the *Environmental Protection Act 1986* (EP Act) on 27 April 2022.

This report sets out the delegated officer's assessment of potential risk events arising from emissions and discharges that will be generated during feedlot activities on the premises.

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. Background

'Koojan Downs' is a large outdoor cattle feedlot being developed by the applicant in the Yathroo/Koojan area, about 22 km southwest of Moora, in the Shire of Dandaragan.

Works approval W6330/2019/1 was granted to the applicant in August 2020 for construction of a 40,000 head cattle feedlot in two stages and an animal feed manufacturing plant. Stage 1 of the proposed development comprises construction of cattle production pens for 20,000 head capacity along with manure storage and processing (with associated controlled drainage infrastructure – catch drains, sedimentation basins and effluent holding ponds), and a grain storage and processing facility. Stage 2 comprises construction of cattle production pens for an additional 20,000 head capacity with separate controlled drainage infrastructure.

Construction of stage 1 commenced in August 2020 and was completed in October 2021. The applicant advises there is currently no timeframe for development of Stage 2 of the project, and that significant design changes are being considered.

Table 1 describes the prescribed premises categories that the application is subject, as defined in Schedule 1 of the Environmental Protection Regulations 1987.

**Table 1: Prescribed premises categories**

| Classification of premises | Assessed design capacity (as per application) |
|---|---|
| Category 1: Cattle feedlot: premises on which the watering and feeding of cattle occurs, being premises –<br>(a) situated less than 100 metres from a watercourse; and<br>(b) on which the number of cattle per hectare exceeds 50. | 20,000 animals (18,750 SCU equivalent) at any one time (Stage 1) |

## 2.1 Application details

The proposal involves constructing and operating a large-scale beef cattle feedlot for growing and finishing prime beef cattle for slaughter at the 'Harvey Beef' abattoir, as part of the Harvest Road Group's vertically integrated farm-to-plate beef supply chain.

The applicant has given due regard to the *National Beef Cattle Feedlot Environmental Code of Practice* (MLA 2012a) (Code of Practice) and *National Guidelines for Beef Cattle Feedlots in Australia* (MLA 2012b) (National Guidelines), to ensure the feedlot is appropriately sited, designed, constructed and managed.

Key aspects of the proposal include the scale of the feedlot which, once constructed, will be the largest of its kind assessed under the EP Act, and separation to human receptors, which can be a common constraint for new and existing feedlot developments.

The documents considered in this assessment are listed in Table 2.

**Table 2: Documents and information**

| Document/information description | Author | Date/version |
|---|---|---|
| Application form and supporting document | RDC Engineers | April 2022 |
| Works approval application and supporting information for proposed beef cattle feeding facility on Koojan Downs | RDC Engineers | October 2019 |
| Appendix B – Manure assessment spreadsheets | RDC Engineers | October 2019 |
| Appendix D – Effluent holding pond sizing and effluent and solid waste utilisation assessment | Johns Environmental | October 2019 |
| Appendix E – Geotechnical study | Perth Geotechnics | September 2019 |
| Appendix H – Noise emissions screening analysis | RDC Engineers | October 2019 |
| Appendix I – Odour emissions screening analysis | RDC Engineers | October 2019 |
| Appendix J – Soil test results – agronomic | RDC Engineers | October 2019 |
| Works approval W6330/2019/1 – Amendment application A and supporting information | RDC Engineers | April 2021 |
| Appendix C – Geosynthetic liner options assessment | Golder Associates | April 2021 |
| Appendix E – GCL installation | Geofabrics Australia | April 2021 |
| Appendix F – GCL construction drawings | River Engineering | April 2021 |
| Appendix H – Monitoring bore completion report | Pennington Scott | February 2021 |
| Appendix I – MEDLI results | RDC Engineers | April 2021 |
| Environmental Compliance Report 1 – Stage 1 feedlot infrastructure – Row A & B, sedimentation basin 2 & 3 and feedmill | RDC Engineers | November 2021 |
| Environmental Compliance Report 2 – Stage 1 feedlot infrastructure – Row C and effluent holding pond 1 | RDC Engineers | December 2021 |
| Environmental Compliance Report 3 – Stage 1 feedlot infrastructure – Rows D & E, solid waste storage and carcass composting area, sedimentation basin 4 and effluent holding pond 2 | RDC Engineers | February 2022 |
| Environmental Compliance Report 4 – Stage 1 feedlot infrastructure – Rows D & E (fencing) | RDC Engineers | April 2022 |
| Koojan Downs Feeding Facility Stage 1 – Nutrient and Irrigation Management Plan (V1R5) | RDC Engineers | March 2023 |

# 3. Overview of Koojan Downs feedlot

The application seeks approval to transition from time-limited to full operation of Stage 1 feedlot infrastructure, including feedmill operations. A summary of the application is provided in Table 3.

**Table 3: Summary of the application**

| Element | Description |
|---|---|
| Premises name | 'Koojan Downs' |
| Feedlot status | Under development, stage 1 of 2 completed |
| Life of feedlot | +40 years |
| Land tenure | Lot 3559 is owned in freehold by Harvest Road Group Pty Ltd<br>Lots 102, 103 & 3556 are owned in freehold by Koojan Downs Pty Ltd, a wholly owned subsidiary of Harvest Road Group |

| | |
|---|---|
| Design capacity | Total 40,000 head (37,500 Standard Cattle Units, SCUs)<br>- Stage 1 – 20,000 head (18,750 SCUs)<br>- Stage 2 – 20,000 head (18,750 SCUs) |
| Total pen floor area | Stage 1 – 5 rows (A – E), total footprint 360,000 $m^2$<br>Stage 2 – 6 rows (F – K), total footprint 360,000 $m^2$ |
| Stocking density | 18 $m^2$/head (19.2 $m^2$/SCU) |
| Controlled drainage infrastructure | Each stage has separate controlled drainage, comprising effluent catch drains, sedimentation basins and effluent holding ponds |
| Solid waste | Each stage has separate manure and carcass composting pads with sedimentation basins and effluent holding ponds<br>Harvested manure and deceased animals will be composted on site.<br>Composted material will be spread over dryland cropping land (to be assessed under separate application) |
| Liquid waste (effluent) | To be initially stored in effluent holding ponds and evaporated. Future proposal to irrigate over dryland cropping land (to be assessed under separate application) |
| Grain storage and processing | 2 x grain processing roller mills, each with capacity of 20 t/hr<br>Grain intake rate of 250 t/hr<br>4 x 1,140 tonne grain storage silos |

The premises is located across three farming properties known as 'Koojan Downs', 'Avena Vale' and 'Damper Downs'. The combined total area of the premises, which includes the feedlot infrastructure and proposed waste utilisation areas, totals about 3,750 ha (Table 4).

The premises comprises four cadastral land parcels – one land parcel comprises part of the Koojan Downs property; two land parcels comprise part of the Avena Vale property, which adjoin part of the northern boundary of the western land parcel of Koojan Downs; and the fourth land parcel comprises part of the Damper Downs property, which adjoins part of the northern boundary of the western land parcel of Koojan Downs and the western boundary of Avena Vale (Figure 1).

The feedlot infrastructure is located central to the four land parcels combined. The remaining land within the premises is intended to be used for disposal of composted material and effluent.

**Table 4: Premises details**

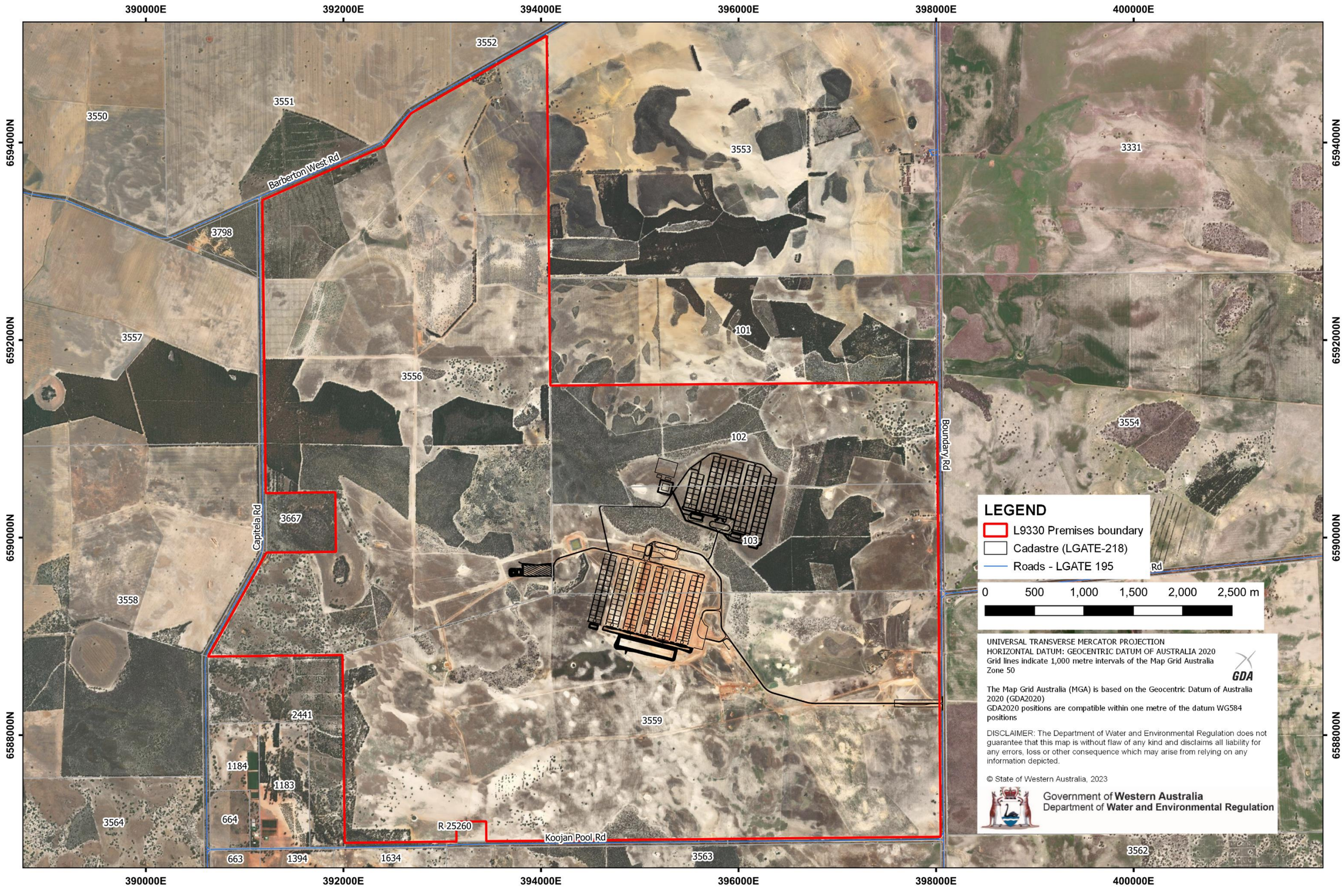
| Property name | Land description | Area (ha) | Local government area |
|---|---|---|---|
| Koojan Downs | Lot 3559 on Plan 206175 | 1,437 | Shire of Dandaragan |
| Avena Vale | Lot 102 on Plan 76331 | 418 | Shire of Dandaragan |
| Avena Vale | Lot 103 on Plan 76331 | 408 | Shire of Dandaragan |
| Damper Downs | Lot 3556 on Plan 206191 | 1,486 | Shire of Dandaragan |
| **Total** | | **3,748** | |

## 3.1 Construction and site development

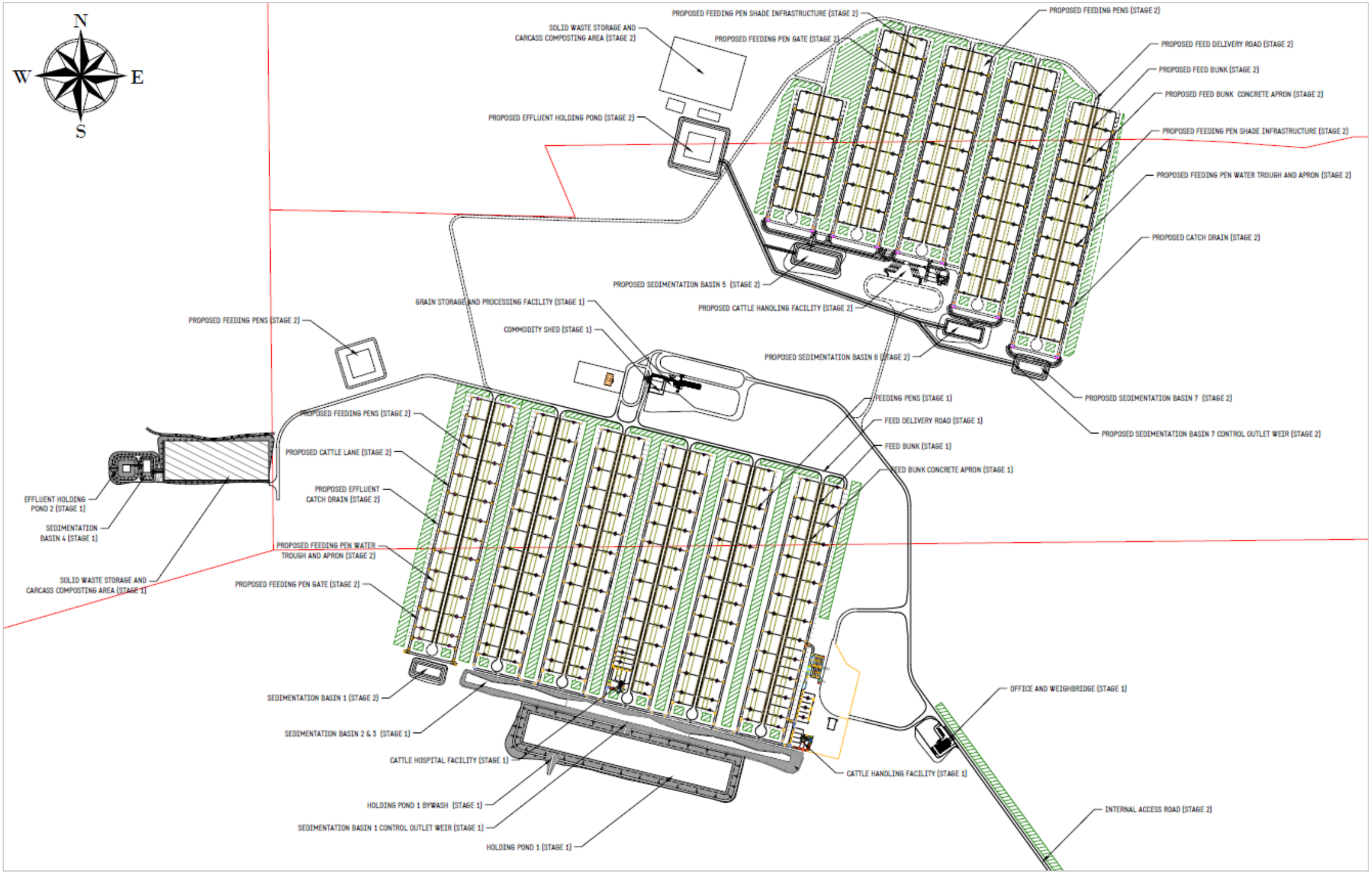
### 3.1.1 Works approval W6330/2019/1

W6330/2019/1 was granted to the applicant in August 2020, with Stage 1 works commencing shortly after.

The initial scope of works comprised controlled drainage area 1 (vegetation clearing, bulk earthworks, compacted clay lining of pen floors, concrete works, fencing and drainage works, sedimentation basin and effluent holding pond) and ancillary infrastructure (grain storage and processing mill) (Figure 2).




▲ *Figure 1: Location of proposed feedlot and premises boundary*




▲ ***Figure 2: Feedlot complex and site layout***

Provision for alternatives to clay lining

Following the commencement of construction, field trials conducted on-site to prepare a compacted clay liner (CCL) from site-won materials using bentonite enrichment were generally not successful in achieving the required permeability. The works approval was subsequently amended to include provision for a synthetic option to replace the requirement for a 300 mm thick CCL on feedlot pens, catch drains and main drains, sedimentation basins, effluent holding ponds, and solid waste stockpile and carcass composting areas (refer to October 2021 amendment report).

### 3.1.2 Environmental compliance

Four environmental compliance reports (ECRs) were submitted at the completion of key infrastructure milestones:

- ECR 1 (submitted November 2021) – Stage 1 infrastructure: Rows A & B, sedimentation basin 2 & 3 and feedmill. Full compliance declared for all requirements, no deviations or non-conformances noted. As-constructed plans provided, including full construction reports and QA/QC certification for all geosynthetic liner (GCL) installations;
- ECR 2 (December 2021) – Stage 1 infrastructure: Row C and effluent holding pond 1. Full compliance declared for all requirements, no deviations or non-conformances noted. As-constructed plans provided, including full construction reports and QA/QC certification for all geosynthetic liner (GCL) installations;
- ECR 3 (February 2022) – Stage 1 infrastructure: Rows D & E, solid waste storage and carcass composting area, sedimentation basin 4 and effluent holding pond 2. Full compliance declared for all requirements, no deviations or non-conformances noted. As-constructed plans provided, including full construction reports and QA/QC certification for all geosynthetic liner (GCL) installations;
- ECR 4 (April 2022) – Stage 1 infrastructure: Rows D & E (fencing). Full compliance declared for all requirements, no deviations or non-conformances noted.

The department has reviewed the ECRs and is satisfied that Stage 1 feedlot infrastructure has been constructed in accordance with the requirements specified in the works approval and deviations from requirements have not been identified.

### 3.1.3 Time limited operations

W6330 provides for time limited operations in Stage 1 feedlot rows (Rows A – E) once all the pens and effluent catch drains in those feedlot rows and sedimentation basin 2 & 3 had been constructed, and the ECR submitted for that infrastructure.

Stocking of Row A officially commenced on 4 December 2021, followed by Rows B & C in January and February 2022, respectively. The first group of cattle were dispatched from the premises in March 2022. There is currently a short supply of feeder cattle.

At the time of writing, about 9,200 head of cattle are being stocked within the feedlot. The feedmill has been operating since December 2021. Deceased animals are being composted within the Stage 1 solid waste storage and composting area. There was little manure build-up observed during the first quarter of 2022 due to the hot and dry weather conditions, with pen cleaning commencing in late June 2022 with GPS equipment.

Pond overtopping event

On 18 August 2022, the applicant submitted a s72 waste discharge notification regarding effluent holding pond 1 overtopping the previous night following sustained rainfall during the month of August.

The notification indicates the cause of the event relates to higher rates of runoff than expected, due to 40% of the production pens containing animals and the remainder hard exposed surface, i.e., lack of manure to soak up moisture, in addition to irrigation of effluent

not being permitted during time limited operations. The composition of the waste and estimated volumes discharged is currently being determined by the applicant.

# 4. Operational aspects

## 4.1 Key infrastructure

### 4.1.1 Feedlot complex

Stage 1 feedlot infrastructure comprises the following components in a functional configuration:

- pens – fenced areas for accommodating cattle (production pens), cattle arriving to or being dispatched from the premises (induction/dispatch pens), and sick cattle (hospital pens);
- livestock handling – infrastructure required for arrival, processing and dispatch of animals;
- feed processing and commodity storage – feed rations are prepared on the premises in a dedicated facility, with associated commodity storage, handling and ration delivery infrastructure;
- access and internal roads – all weather access to the site and within the complex;
- controlled drainage system – includes effluent catch drains, sedimentation system and effluent holding ponds for conveying and temporarily storing effluent runoff; and
- solid waste and effluent management areas – infrastructure for stockpiling solid waste (manure and mortalities) and effluent, prior to reuse on- or off-site.

### 4.1.2 Waste utilisation areas

The applicant has nominated a total area of about 2,060 ha of cropping land in which it proposes to apply aged manure and mortalities compost as a soil ameliorant. It is also intended to process excess manure such that it can be removed off-site and applied to cropping land owned by the applicant or related entities.

The applicant also proposes to apply effluent to land via centre pivot irrigation within two dedicated effluent utilisation areas that total about 50 ha.

## 4.2 Feedlot operations

### 4.2.1 Cattle management

Stage 1 is intended to be routinely operated 7 days per week, 365 days of the year.

Purchased feeder cattle are brought onto the premises and unloaded into the receival-dispatch pens, where they are inspected for fitness and grouped into feeding lots and placed in pens with other animals of similar weight and fed and watered for an average of 100 days. Animals initially start on high fibre rations, prior to transitioning over 3 weeks to a nutrient-dense finisher ration. Rations are prepared daily according to the appetite of the pens lots on feed.

Entry weight is about 450 kg and average exit weight about 645 kg, depending on market requirements. Once the animals have grown to the required criteria, they are trucked off-site directly to Harvey Beef for slaughter.

The applicant expects total throughput for Stage 1 to be about 69,000 head of cattle annually, based on an occupancy of 95% and an annual mortality rate of 0.5%.

### 4.2.2 Feed management

Due to the large scale of the feedlot and quantities of grain and other commodities required each day, rations are prepared on the premises using an on-site feedmill, with associated commodity storage, handling and ration delivery infrastructure.

Full capacity Stage 1 feedlot operations require up to 61,000 tonnes of grain, 17,400 tonnes of silage and 5,800 tonnes of finisher supplement and other commodities on an annual basis.

Grain is received via a drive-over, flatbed grain dump, with grain transferred to 4 x 1,140 tonne storage silos using enclosed elevators. A negative pressure, fully enclosed grain scalper and aspirator is in place to extract large particles and condense dust in the grain cleaning process. All augers and elevators are fully enclosed to minimise dust emissions.

Grain is currently being processed using a tempering system which is a 'wet' processing method that gives higher digestibility when compared to 'dry' methods such as dry rolling or grinding. Steam flaking may be installed at a later date, to further improve digestibility when compared to tempering, and requires energy to generate steam. An associated office is used to control and monitor system equipment.

## 4.3 Effluent management

### 4.3.1 Controlled drainage

Stormwater runoff from all manured surfaces and trough wastewaters within Stage 1 will be controlled within a system that conveys this runoff to dedicated sedimentation basins for settling of solids, prior to transfer to effluent holding ponds at the lower end of each catchment.

The applicant advises each effluent holding pond has been designed to temporarily store effluent runoff from major storm events and/or when extended wet periods prevent irrigation of effluent so that pond overtopping events are less than an average of one in 20 years.

A low permeability barrier has been installed on areas within the controlled drainage areas (CDAs) where the permeability of underlying soil strata exceeds 0.1 mm/day (3.5 cm/year). This barrier was created by using a geosynthetic clay liner. Refer to the October 2021 amendment report for details and specifications for this barrier.

The design details of the Stage 1 effluent containment infrastructure are summarised in Table 5. Note sedimentation basins 2 & 3 and effluent holding pond relate to CDA 1 (Stage 1 pens) and basin 4 and pond 2 relate to CDA 2 (Stage 1 manure storage and processing area).

**Table 5: Stage 1 CDA infrastructure specifications**

| Parameter | Unit | Sedimentation basin | | Effluent holding pond | |
|---|---|---|---|---|---|
| | | CDA 1 | CDA 2 | CDA 1 | CDA 2 |
| | | 2&3 | 4 | 1 | 2 |
| Volume at outlet (min) | $m^3$ | 8,205 | 1,000 | 107,000 | 3,000 |
| Freeboard at outlet | m | 0.9 | 0.9 | 0.9 | 0.9 |
| Depth at outlet | m | 1.0 | 1.0 | 2.1 | 3.0 |
| Internal embankment slopes | V:H | 1:4 | 1:4 | 1:4 | 1:4 |

CDA catchments

Stage 1 comprises two CDAs, each divided into sub-component areas depending on the runoff characteristics:

- pen area – areas containing cattle and covered with manure, e.g., production pens, holding pens, hospital pens, etc.;
- hard catchment – areas with a high runoff yield including access roads, feed roads, cattle lanes, effluent catch drains, roofed areas, solid waste storage/carcass composting area, sedimentation basins, etc.; and
- soft catchment – areas with a low runoff yield such as grassed and other vegetated areas within the controlled drainage area.

The applicant has calculated the design volumes for the Stage 1 sedimentation basins and effluent holding pond from the estimated runoff from each of the sub-catchment areas (Table 6).

Annual water balance

The applicant used a site specific small catchment daily time-step hydrological model (MEDLI)

to size the effluent holding ponds using the annual water balance method. A summary of the applicant's water balance is provided in Table 8.

Based on the annual water balance in Table 8, the applicant considers both effluent holding ponds are sufficiently sized to ensure the frequency of spill events are less than an average of one in 20 years, with pond 1 having 107,000 kL capacity and pond 2 having 3,000 kL storage capacity.

*Note: these calculations assume that irrigation of effluent is typically scheduled from November to March and that the ponds are empty at the start of each winter season.*

**Table 6: Stage 1 – CDA catchment details**

| Infrastructure | Runoff coefficient | Sub-catchment area ($m^2$) | | |
|---|---|---|---|---|
| | | CDA 1B | CDA 1C | CDA 2 |
| Pens | 0.8 | 213,760 | 144,425 | 0 |
| Feed roads, cattle lanes & drains, cattle handling facility | 0.8 | 85,970 | 72,665 | 30,000 |
| Sedimentation basin | 0.8 | 44,120 | - | 2,275 |
| Grassed area | 0.4 | 110,300 | 67,705 | 0 |
| Holding pond – outside crest area | 1.0 | 80,815 | - | 4,925 |
| **Total** | **-** | **534,965** | **284,795** | **37,200** |

**Table 8: Stage 1 Effluent holding ponds – water balance**

| Water movement | Unit | CDA 1 (Rows A – E) | CDA 2 |
|---|---|---|---|
| Runoff inflow | kL/yr | 35,200 | 1,400 |
| Rain | kL/yr | 39,800 | 1,200 |
| **Total in** | **kL/yr** | **75,000** | **2,600** |
| Evaporation | kL/yr | 34,700 | 700 |
| Seepage | kL/yr | 0 | 0 |
| Sludge accumulated | kL/yr | 350 | 0 |
| Irrigation | kL/yr | 38,100 | 1,800 |
| Overtopping | kL/yr | 1,600 | 30 |
| **Total out** | **kL/yr** | **74,750** | **2,530** |
| Overtopping events (no. per 10 years) | - | 1.0 | 0.6 |
| % reuse | % | 99.1 | 98.5 |

DWER technical review – initial

The delegated officer expressed concerns with the initial water balance submitted with the licence application, particularly around the water use input parameters used in the MEDLI model that indicated the pond for CDA 1 was not sufficiently sized to capture and store all winter season runoff (May to October), without effluent extraction.

The applicant was provided an opportunity to re-run the MEDLI model over the winter season, using water use parameters that were more applicable to the premises location and the proposed cropping program.

The applicant re-ran the MEDLI model over the winter season (May to October) for Stage 1 with crop use water parameters applicable to a barley crop and 47 ha of irrigation. The updated model predicts a holding pond with storage capacity of 107,000 kL and surface area of 8.08 ha will be sufficient to prevent overtopping more than once every 10 years.

Holding pond 1 has an as-built volume of 80,810 kL; therefore, to achieve an increase of 26,200 kL storage volume, the existing bywash level will be raised by 0.55 m. The increase in the top water level of holding pond 1 will be below the floor level of the sedimentation basin and should not impact on its operation.

DWER technical review – updated

The delegated officer has reviewed the revised site water balance and is satisfied a pond volume of 107,000 kL will be of sufficient size for CDA 1, if no effluent is extracted over the winter period (May – October) and all pens are stocked, to provide sufficient runoff threshold for the manure interface layer.

It is noted that numbers provided within the nutrient and irrigation management plan (RDC 2023) are contradictory – catchment area, annual rainfall and runoff coefficients indicate runoff in the order of 105,000 – 175,000 kL/yr; however, 38,100 kL/yr has been used to determine irrigation rates and nutrient application. The Department of Primary Industries and Regional Development (DPIRD) advises that annual runoff volumes from CDA 1 are in the order of 166,000 kL/yr and plant water requirements are around 12,000 kL/ha/yr.

It is also noted plant water requirements are not well defined in the MEDLI model for 'irrigation', and that it is likely that significant freshwater supplementation of the effluent will be required to maintain plant health.

Dilution may also be required to reduce the salinity and nitrogen of the irrigated effluent to ensure the water does not 'burn' plant leaves. The nutrient and irrigation management plan refers to testing the quality of effluent prior to application, where effluent would be diluted with fresh groundwater, if required. Plant health is considered critical for ensuring maximum plant growth, yield and nutrient removal rates.

### 4.3.2 Effluent utilisation

Feedlot effluent is commonly used as a source of nutrients for fertilising crops which the applicant intends on applying to dedicated areas, when available.

Effluent quality

The nitrogen and phosphorus concentrations of the effluent are required to model the nutrient and water balances of the system. As operations have only recently commenced and no effluent had been generated at the time of the licence application being submitted, typical effluent composition of beef cattle feedlots, as per the National Guidelines, were considered.

The MEDLI model predicts nutrient concentrations based on the mass balance calculations based on the concentrations of nitrogen (N), phosphorus (P) and potassium (K) from the BEEFBAL model. Concentrations of 235 mg/L N and 66 mg/L P with an average electrical conductivity of 5.7 dS/cm were predicted by MEDLI, which are within the range of those typically measured within beef cattle holding ponds.

Effluent utilisation area

The applicant has identified about 140 ha of land within the premises as being suitable for application of effluent, using centre pivot irrigation (Figure 3).

For Stage 1 operations, it is proposed to repurpose an existing centre pivot system on the premises (currently being used for irrigating crops with groundwater, "KDFF Pivot 1"), which can irrigate an area up to 20 ha. The applicant has procured an additional centre pivot system that can irrigate a further 30 ha ("KDFF Pivot 2").

Soil type

Broadscale mapping information (GSWA 1986) indicates the premises lies predominantly under the Capitella System (222Cp) which is described as 'subdued stripped lateritic plateau, undulating to gently undulating low rises with gently undulating plain including dunes; pale and yellow deep sands, sandy gravels, some duplex; from sandstones plus alluvial and aeolian deposits'.

A site-specific soil assessment was undertaken in the effluent utilisation area to validate broadscale soil mapping information (Pennington Scott 2021). A total of 18 boreholes were drilled to a depth of 1.5 m or to 6.0 m, with representative soil profiles sampled at 0-10, 20-30, 50-60, 90-100 and 140-150 cm depths.


▲ ***Figure 3: Effluent utilisation areas (green circles)***

The soil type within the effluent irrigation areas nominated by the applicant is consistent and classified as 'sandy gravel'; these areas are dominated by fine to medium sandy matrix containing ironstone gravel and increasing clay content at depth, and likely classified as 'Sand'.

Irrigation scheduling and application rates

Irrigation of effluent is proposed to be conducted in accordance with the determined nutrient balance, where there is a net uptake of nutrients. Evaporation-based irrigating scheduling is proposed initially via manual methods until the project is fully developed via remote access in-field moisture probes and crop specific computer software.

Irrigation of effluent will typically be scheduled from November to March when the demand for irrigation of crops is the highest, although the applicant indicates there may be times outside of this period where effluent can be irrigated onto crops depending on availability of effluent, soil-wetting needs and crop plantings.

The irrigation system will be designed to ensure the peak demand of the crop to be grown (forage sorghum, barley, etc.) can be met, which may be up to 20 mm/day gross irrigation.

The applicant estimates up to 28.7 t/yr N will be available from effluent, in addition to 28.1 t/yr P and 141.1 t/yr of salt.

The mass of nitrogen and phosphorus to be applied to each crop via irrigation will be

determined using the results of effluent analysis for that period. Nitrogen and phosphorus will be determined using the following equations:

*Nitrogen applied (kg/ha) = Total nitrogen (mg/L) – (volatilisation loss % x Ammonia nitrogen (mg/L) x volume irrigated (ML/ha)*

*Phosphorus applied (kg/ha) = Total phosphorus (mg/L) x volume irrigated (ML/ha)*

The applicant advises effluent application scheduling will be based on the nutrient levels in the soil, the nutrient needs of the crop, the daily water use of the crop, the water holding capacity of the soil and the lower limit of soil moisture for each crop. Additionally, the effluent utilisation area may need to be expanded if soil testing indicates elevated soil nutrient levels within an area, where new areas will need to be commissioned, and application of effluent may need to cease on individual utilisation areas until nutrient levels are returned to sustainable levels by crops.

DWER technical review – initial

The delegated officer has expressed concerns with the suitability of the proposed effluent irrigation areas, given:

- the characteristics of the soils within the proposed effluent irrigation areas (pale deep sands) will require careful management and regular monitoring to ensure that nutrient leakage to groundwater and other forms of land degradation do not occur from effluent irrigation;
- saturation of soil P levels within the initial effluent irrigation areas are expected after about 3 years of operation, meaning new irrigation areas will be required to support ongoing effluent irrigation after about year 3;
- groundwater levels beneath the proposed effluent irrigation areas are shallow; it is unclear how the applicant intends on maintaining groundwater levels below 2 mbgl and what remediation, management or operating procedures will be implemented should groundwater become contaminated with nutrients;
- the applicant expects irrigation will predominantly occur during November to March; however, the delegated officer expects that irrigation will more likely match effluent accumulation, including during winter due to storage limitations, enhancing the risk of over-application of irrigation and leaching; and
- it is noted that a utilisation area may be 'spelled' from effluent application until nutrient levels are returned to sustainable levels by crops. It is unclear whether the crops used to strip out elevated nutrient levels require irrigation.

Performance measure 1.5.1 of the Code of Practice states "*the feedlot should be sited on land that has sufficient suitable soil resources available to allow the sustainable utilisation of that portion of feedlot wastes intended for use on-site*".

In terms of the suitability of the proposed effluent irrigation areas, the National Guidelines (section 2.6.2) states that "*effluent re-use areas should be good quality agricultural land and have soil without serious limitations on plant growth; it may be possible to use land of lesser quality, but the constraints will generally need a higher level of management and monitoring*".

DPIRD reiterates previous advice provided for W6330 that the soil in this location is dominated by deep pale sands with rapid drainage and low nutrient and water holding capacity (i.e., not good agricultural land for this land use). Pale deep sands have low to extremely low capacity to store phosphorus and are generally acidic with high susceptibility to water repellence and require careful management and regular monitoring to ensure that nutrient leakage to groundwater or other forms of degradation do not occur.

In terms of the proposed application rates of effluent, the National Guidelines (section 2.6.2) states that "*the proposed location should have an area large enough to sustainably utilise the nutrients likely to be applied*".

DPIRD considers that as the existing soil P levels are so low, management of effluent in the

first few years of feedlot operation will be easily managed, as large volumes of effluent will initially be recommended (by nutrient modelling). However, the efficiency of plant use is quite low, especially when there is limited rainfall, resulting in a rapid increase in P levels in the soil over the first few years of operation. After about 3 years nutrient modelling will recommend significantly less application of P, meaning the effluent irrigation areas will require very little, or no, additional P. This may result in the effluent irrigation areas being saturated with P after about 3 years to the point that it will require very little to be applied, and that new area(s) will be required for ongoing effluent irrigation.

In terms of the potential for degradation to the natural environment, the National Guidelines (section 2.6.4) states that "*applying feedlot effluent and manure to land will increase soil salinity and this will directly or indirectly increase drainage and groundwater recharge. Areas that may not be suitable as manure and effluent utilisation areas, or that may require expensive or intensive management and mitigation measures include sites with a) shallow water tables, b) existing salinity, or c) very permeable soils*".

DPIRD has previously identified this site exhibits at least two of these characteristics, being:

- Shallow water tables:
  - the NIMP (RDC 2022) indicates that groundwater levels have become as shallow as 2.9 mbgl during the monitoring period (September 2020 to January 2022), and the standing water levels in most bores have risen between 0.9 to 2.0 m higher than baseline levels from September 2020 (discussed further in section 8.2);
  - a KPI defined in the NIMP (RDC 2022) states that "*a minimum depth to groundwater of 2 m is maintained*", however the NIMP does not detail any trigger mechanisms, intervention or remediation actions designed to keep, or return, groundwater levels to 2 m or deeper; it is therefore unclear how the applicant intends on maintaining groundwater levels; and
  - it is also unclear what groundwater remediation, management or operating procedures will be implemented should groundwater become contaminated by nutrients;
- Very permeable soils:
  - the NIMP (RDC 2022) outlines the strategy of managing wind erosion risk in irrigation areas by irrigating bare, cultivated sandy soil during the period between crops or whilst the next crop is establishing, however it is unclear whether irrigation water or effluent will be applied in these situations;
  - in most irrigation systems the rate of supply exceeds the requirements of the crops or pastures, with a significant proportion of the excess water contributing to groundwater recharge – particularly if there is no crop or only very young, emergent crops or pastures – with this additional recharge causing the watertable to rise;
  - where irrigation water is drawn from aquifers underlying the land being irrigated, the recycling of salts by evaporative concentration may be problematic, especially in highly permeable soils such as pale deep sands, as more salt can flush below the root zone and create a land and water quality risk.

In response, the applicant updated the nutrient and irrigation management plan (RDC 2023) to demonstrate how it proposed to manage the irrigation of effluent and ensure nutrient leaching to groundwater does not occur.

In summary, the applicant proposes to monitor soil phosphorus levels within the effluent utilisation area on an annual basis, prior to the first application of each season. Should monitoring indicate soils within the effluent utilisation area are becoming saturated with phosphorous, then effluent will not be applied to those areas until monitoring indicates a reduction to sustainable levels. Crops will continue to be grown within the affected areas to remove phosphorus and irrigation will be with clean groundwater.

Monitoring of groundwater levels and quality commenced under the works approval and will continue under the licence. Should monitoring indicate elevated levels of nutrients, an investigation will be conducted to determine whether the source is attributed to over

application of effluent. The NIMP indicates the proposed contamination management strategy would be groundwater recovery followed by monitored natural attenuation.

Additional storage capacity within the holding ponds will reduce the risk of overtopping during wet winters, and the requirement to irrigate during winter, when crops do not require it.

DWER technical review – updated

The delegated officer expects as a minimum for effluent irrigation management, effluent is irrigated in a manner that maximises effluent contact time in the plant root zone, using available resources such as integrating weather forecasts into the irrigation scheduling system. It is expected this will reduce the chance of rain events flushing the irrigated effluent below the root zone, prior to being used up by the crop.

In terms of extracting groundwater to maintain standing water levels below the effluent irrigation areas, and recovering groundwater in the event that monitoring indicates elevated levels of nutrients, the delegated officer is unclear how this additional groundwater would be managed, particularly if it is contaminated or is saline.

In terms of 'retiring' effluent utilisation areas should monitoring indicate standing water levels within 2 m of surface or soils are becoming saturated with phosphorus, it is recommended the 3 centre pivots currently nominated for Stage 2 of the project (CP 3-5) are not used for disposal of manure during Stage 1 operations and are instead held in reserve to substitute CP1 and/or CP2, should additional land be required for effluent disposal.

## 4.4 Solid waste management

### 4.4.1 Solid waste generation

The applicant has estimated the amount of manure generated from Stage 1 operations, based on 69,000 head turnover per year, and the mass of mortalities and the dry matter of composted mortalities, based on an average carcass moisture content of 60%.

The applicant expects losses of up to 40% of total solids from the stockpiled manure over time due to organic matter breakdown. Assuming no dry matter loss, at a moisture content of 25%, this equates to about 10,000 tonnes per year of solid waste available from Stage 1 operations (Table 6), although the applicant expects there to be considerable seasonal variation.

**Table 6: Stage 1 solid waste generation**

| Parameter | Unit | Mass | |
|---|---|---|---|
| | | t/day | t/year |
| Fresh manure excreted | Dry mass | 31.8 | 11,585 |
| | Wet mass @ 85% MC | 211.5 | 77,240 |
| Manure scraped from pad | Dry mass[1] | 20.6 | 7,525 |
| Manure removed from stockpile | Dry mass | 20.6 | 7,525 |
| | Wet mass @ 25% MC | - | **10,035** |
| Mortalities | Dry mass | 0.21 | 76.5 |
| | Wet mass @ 60% MC[2] | 0.52 | 191 |
| Mortalities removed from stockpile | Dry mass | - | 76.5 |
| | Wet mass @ 25% MC | - | **102** |

*Note 1: Assumes 65% volatile loss on the pad.*
*Note 2: The fluid content, including water, comprise an average of 60% of the total body weight of a beef animal.*

### 4.4.2 Solid waste management

Pen cleaning and maintenance

The applicant proposes to conduct regular cleaning and maintenance in and around the

feedlot, including:

- pen cleaning and maintenance – use of machines with control equipment installed (such as GPS) for removing manure accumulated on pen surfaces, scraping the surface down to the surcharge layer;
- under-fence cleaning – removing manure accumulated under fence lines, to be conducted at the same time as pen cleaning;
- pen maintenance – conducted after each pen cleaning event, including filling and compacting depressions/pot holes within the pen surface; elimination of wet spots in the pen surface; removal of spilt feed residues from around feed bunks;
- drain cleaning – removal of vegetation and accumulated manure to ensure free drainage.

Table 5 summarises the proposed cleaning and maintenance schedule during operations.

**Table 5: Schedule for cleaning and maintenance**

| Activity | Frequency and/or action |
|---|---|
| Removal of spilt feed / feed residues | Every two days |
| Elimination of wet patches in pens, repairs to potholes in pens, clean water troughs | Weekly |
| Under fence cleaning | Monthly (or after manure obstructs pen drainage) |
| Pen cleaning | At intervals not exceeding 10 weeks |
| Pen surface inspections, diversion banks and drains | After runoff events and repaired as required |
| Sedimentation basins | Check for clogging of outlet weirs up after runoff events |

Manure storage and processing and composting mortalities

The storage and/or processing of manure, and composting of mortalities, is undertaken on the Stage 1 manure stockpile and processing area within CDA 2.

The applicant will process (i.e., pasteurise) a large proportion of the manure generated on the premises, so that can be removed off the premises for reuse on the applicant's other landholdings within the district. The remaining portion of the manure generated will be managed via the traditional method of stockpiling, to produce an aged manure that will be spread over cropping land within the premises.

The processing of manure, manure stockpiling and composting of carcasses will all be conducted alongside one another on the one hardstand pad, which has been sized on the estimated volume of solid waste produced (30,000 $m^2$).

Manure will be processed in windrows that are typically constructed by forming into long piles with a triangular cross-section, base width of 3 – 4 m and 1.5 – 2 m height. The long axes are positioned perpendicular to the slope to promote drainage.

Sediment basin cleaning

Solids that build up within the sedimentation basins will be removed on an as-required basis to maintain the efficiency of the basin. Where practicable, the basin will be allowed to dry out prior to removal of settled solids. Once dried, the solids will be taken directly to the Stage 1 manure stockpile and processing area for management as part of the active manure and/or mortalities stockpile.

Mortalities

Based on an average mortality of 0.5%, the expected number of mortalities is about 695 animals per year (for Stage 1 operations).

Deceased animals are removed from the pens daily and taken directly to the Stage 1 manure stockpile and processing area. Carcasses are composted on the designed pad in separate

windrows to the bulk manure windrows. The construction and management of a carcass compost windrow generally comprises the following:

- a bed of at least 300 mm of sawdust, straw or other carbon-based compound is placed on the base of the composting area, for absorbing leachates;
- the carcass is placed on the bedding and covered with at least 500 mm of manure on all sides;
- each windrow is no more than 2 carcasses high, with 50 mm of manure cover between the carcasses;
- top of the windrow is shaped to an apex to shed rainfall runoff;
- carcasses are allowed to decompose for about 4 weeks before turning with a front-end loader;
- active composting can last for up to 4 – 8 months, turning at least once every 2 – 3 months; and
- after active composting the composted windrow is left to mature for at least another 3 – 4 months.

In the event of a large number of mortalities, the applicant has identified what it considers to be a suitable site for mass burial on the premises, in an area with low permeability soils and with sufficient separation to surface waters, drainage lines, gullies and the groundwater table. Pits will be dug deep and narrow, and will be progressively filled with carcasses until enough pit capacity remains for the pit to be sealed with clay and compacted to a depth of at least 1 m.

### 4.4.3 Manure utilisation

Aged manure and mortalities compost are proposed to be applied to land within a 'manure utilisation area' using a tractor drawn moving bed manure spreader or similar equipment or removed off-site to be used as a soil conditioner and organic fertiliser on cropping and pasture operations on adjoining landowner by the applicant or other cropping land in the local region.

Manure utilisation area

The applicant has identified about 2,060 ha of land within the premises that it considers being suitable for application of aged manure and mortalities compost, incorporating buffers to sensitive areas such as native vegetation stands, drainage lines and property boundaries (Figure 4).

Soil type

The applicant indicates that soils in the manure utilisation area are still being assessed, but then also refers to a soil assessment by Pennington Scott (2019) that confirms the soils are dominated by sandy gravel soil types.

Proposed crop management system

A year-round crop production system will be used across the manure utilisation area, which involves sowing winter crops into summer-active perennial pastures to improve year-round production. The applicant indicates that nutrient requirements will be based on historical crop nutrient removal determined from analysis values and soil nutrient levels.

Solid waste will be applied prior to planting of crops and when sufficient quantities of solid waste is available.

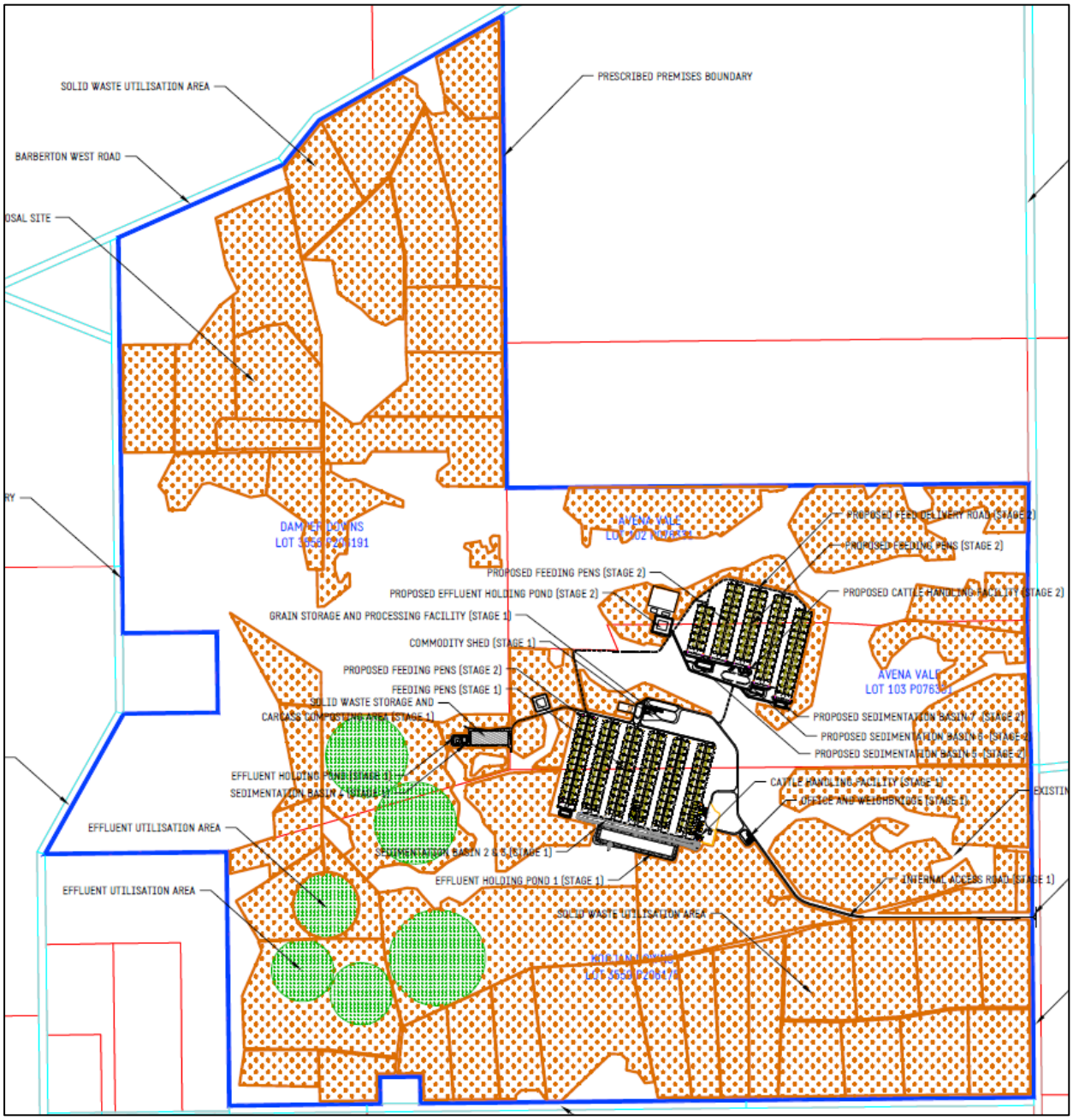
Manure scheduling and application rates

The applicant has calculated the annual application rate for N, P and K contained in the aged manure using the Nutrient Limited Application Rate (NLAR) mass balance equation, as per the National Guidelines. The typical composition of aged beef cattle feedlot manure, as per the National Guidelines, were considered, although the applicant indicates a sample of solid waste will be taken and analysed to establish the actual N, P and K concentrations, prior to application on the premises.

An initial estimate of the utilisation area required, as determined by the applicant using the NLAR method, indicates a winter cereal silage (barley) crop could remove up to 80 kg/ha N, 8 kg/ha P and 72 kg/ha K (Table 6).

With P being the limiting nutrient when growing cereal silage in winter, the estimated minimum area required for uptake of solid waste generated in Stage 1 is 7,525 ha. With only 2,060 ha of land available for solid waste utilisation within the premises boundary, there is insufficient land to sustainably use all the N, P and K in the solid waste generated by Stage 1 of the project.

The applicant therefore proposes to process a large proportion of the manure generated, so that can be removed off-site and applied to other cropping land owned by the applicant or related entities.




▲ ***Figure 4: Manure utilisation areas (orange dotted squares)***

**Table 6: Manure utilisation area – NLAR summary**

| Parameter | Unit | Code | N | P | K |
|---|---|---|---|---|---|
| Crop requirement | kg/ha | CR | 80.0 | 8.0 | 72.0 |
| Soil storage | kg/ha | SS | 0 | 0 | 0 |
| Allowable losses | kg/ha | EL | 0 | 0 | 0 |
| Nutrient concentration | mg/kg | NW | 13,300 | 6,400 | 10,000 |
| NLAR | t dm/ha | NLAR | 6.02 | 1.25 | 7.20 |
| Area required (Stage 1) | ha | - | **1,264** | **6,081** | **1,056** |

DWER technical review – initial

The delegated officer expressed concerns with the suitability of the proposed management of manure, given:

- the initial version of the NIMP (RDC 2022) identified the area required for disposal of manure and mortalities compost is 15,050 ha for the full project (Stages 1 & 2); therefore the land within the premises boundary (2,060 ha) is too small to sustainably dispose of the projected levels of manure by land application. The stated volumes of manure, and the nutrients it contains, exceeds the assimilative capacity of the soils on the premises to retain nutrients on-site;
- Like the effluent irrigation area, saturation of soil P levels within the manure utilisation area is expected after about 3 years of operation, which will restrict manure spreading. Additional properties used for manure spreading are likely to encounter the same issues; unless suitable alternatives or contingencies can be developed;
- For the first few years of operation where large amounts of manure will initially be spread (until application rates are limited by soil P levels), the characteristics of the soils within the manure utilisation area (pale deep sands) requires careful management and regular monitoring to ensure that nutrient leakage to groundwater and other forms of land degradation do not occur; and
- Like the effluent irrigation area, groundwater levels beneath the proposed manure utilisation area are shallow; there was no strategy provided within the initial NIMP to maintain groundwater levels at greater than 2 mbgl, nor did the initial NIMP include information on groundwater remediation, should groundwater become contaminated with nutrients.

In response, the applicant updated the nutrient and irrigation management plan (RDC 2023) to demonstrate how it proposed to manage manure and ensure nutrient leaching to groundwater does not occur.

In summary, the applicant has decided to process (i.e., pasteurise) a large proportion of manure generated from the feedlot operations (about 70%), such that it can be taken off-site for reuse on other properties within the district. The remaining portion of manure will be managed by the traditional method of stockpiling and ageing, for spreading over the manure utilisation area on the premises at rates per the NLAR calculation.

The processing of manure will require the addition of low-risk organic materials as a carbon source, which it is proposed to bring in straw, woodchips and other natural fibrous materials on a just-in-time basis. Effluent from the holding pond 1 will also be used in moisture conditioning the manure windrows, when required.

Like the effluent irrigation areas, the applicant proposes to monitor soil phosphorus levels within the manure utilisation area on an annual basis, prior to the application of manure in each season. Should monitoring indicate soils are becoming saturated with phosphorous, then manure will not be applied to those areas until monitoring indicates a reduction to sustainable levels. Crops will continue to be grown within the affected areas to remove phosphorus and irrigation will be with clean groundwater.

Monitoring of groundwater levels and quality commenced under the works approval and will continue under the licence. Should monitoring indicate elevated levels of nutrients, an investigation will be conducted to determine whether the source is attributed to over application of manure. The NIMP (RDC 2023) indicates the proposed contamination management strategy would be groundwater recovery followed by monitored natural attenuation.

DWER technical review – updated

The delegated officer is satisfied the proposal to process manure (i.e., pasteurise) so that it can be removed for off-site reuse addresses the issue of there being insufficient land available within the premises for manure utilisation. It is expected that testing of the processed manure will be conducted to demonstrate the level of pathogens are acceptable, prior to being removed off-site.

Like the comments on effluent irrigation, the delegated officer is unclear how groundwater that is extracted to maintain standing water levels below the manure utilisation area, and recovered groundwater in the event that monitoring indicates elevated levels of nutrients, will be managed.

# 5. Infrastructure

**Table 7: Cattle feedlot infrastructure**

| **Prescribed activity – category 1** | |
|---|---|
| Cattle feedlot: Stage 1 full capacity 18,750 SCU (20,000 head) @ maximum stocking density 19.2 $m^2$/SCU (18 $m^2$/head) | |
| 1 | Cattle handling facility – one area for processing animals at arrival/dispatch |
| 2 | Feedlot pens – rows A to E, each 4,000 head capacity |
| 3 | Effluent catch drains, constructed on either side of each feedlot row |
| 4 | Sedimentation basin 2 & 3 – minimum holding capacity 5,800 kL |
| 5 | Effluent holding pond 1 – minimum holding capacity 80,000 kL |
| 6 | Solid waste storage and carcass composting area – minimum surface area 30,000 $m^2$ |
| 7 | Sedimentation basin 4 – minimum holding capacity 1,000 kL |
| 8 | Effluent holding pond 2 – minimum holding capacity 3,000 kL |

Exclusions to this assessment

The following matters are out of the scope of this assessment and have not been considered within the risk assessment detailed in this report:

- other general farming activities being conducted on the premises, including but not limited to machinery movements, centre pivot irrigation (with groundwater); and
- vehicle (i.e. livestock truck) movements on private or public roads.

The licence is related to category 1 activities only and does not offer the defence to offence provisions in the EP Act (see sections 74, 74A and 74B) relating to emissions or environmental impacts arising from non-prescribed activities, including those listed above.

# 6. Other approvals

## 6.1 Planning approvals

The Midwest Wheatbelt Joint Development Assessment Panel granted development approval for the full feedlot proposal (Stages 1 & 2) in February 2020, subject to compliance with the works approval application (W6330) and other conditions relating to the applicant's use of local roads to support activities on the premises.

The approval requires the design and operation of the feedlot to be generally in accordance with the Code of Practice and National Guidelines, in addition to the Biosecurity & Agriculture (Stable Fly) Management Plan 2013 to minimise the effects of stable flies on the community.

Condition 4 of the approval states the maximum head of cattle is not to exceed 40,000 at any one time.

## *6.2 Rights In Water and Irrigation Act 1914* (RIWI Act)

The applicant has existing groundwater licences that allow abstraction of up to 1.8 GL/yr from the Leederville-Parmelia aquifer and 57,960 kL/yr from the Superficial aquifer for irrigated cropping operations, general aquacultural purposes and stock watering.

# 7. Consultation

The application was referred to relevant public authorities and advertised for public comment on the department's website during June 2022. No public submissions were received in the timeframe specified.

## 7.1 Public authorities

DPIRD advises that, in principle, it supports the expansion of the beef industry in Western Australia, providing that activities comply with the Code of Practice and National Guidelines.

DPIRD has provided technical advice on the proposal for applying effluent and solid waste over the premises in terms of compliance with the Code of Practice and National Guidelines, with a summary of this advice provided in sections 4.3.1, 4.3.2 and 4.3.3. It has also responded to some statements made by the applicant in the NIMP (RDC 2022), as seen throughout this report.

# 8. Location and siting

## 8.1 Siting context

### 8.1.1 Land use and sensitive receptors

The premises has historically been used for extensive grazing and supplementary feeding of beef cattle on improved pastures, broadacre dryland winter cereal cropping and irrigated fodder production. As a result, most of the arable land has been cleared; some fragmented stands of native remnant vegetation remain, predominantly along lateritic ironstone hills and ridges, along drainage lines and rivers and areas that are unsuitable for grazing and cropping.

Adjoining properties to the south and north are of similar size landholdings (1,200 – 1,500 ha) and comprise agricultural activities such as dryland cropping with low intensity grazing of sheep and beef cattle. The surrounding area is also experiencing intensification of agricultural activities with a range of piggeries, horticultural and aquaculture activities being established.

The premises is well separated from populated areas; there are several single rural dwellings within a 15 km radius of the premises, with the nearest not associated with the premises about 2.2 km to the southwest of the feedlot pens and others at least 4 km away. The nearest town of Moora is about 19 km northeast.

No areas of high conservation value have been identified in proximity that may be directly impacted by the feedlot activities.

### 8.1.2 Climate

The Moora area experiences a Mediterranean-type climate with hot dry summers and cool wet winters. Weather patterns are dominated by the regular passage of rain-bearing cold fronts from the Indian Ocean in winter, and dry easterly air flows from inland areas in summer.

Average annual rainfall is about 493 mm, with most rainfall occurring between April and October with little or no rain during the summer months (SILO Climate data – Site No. 9167 –

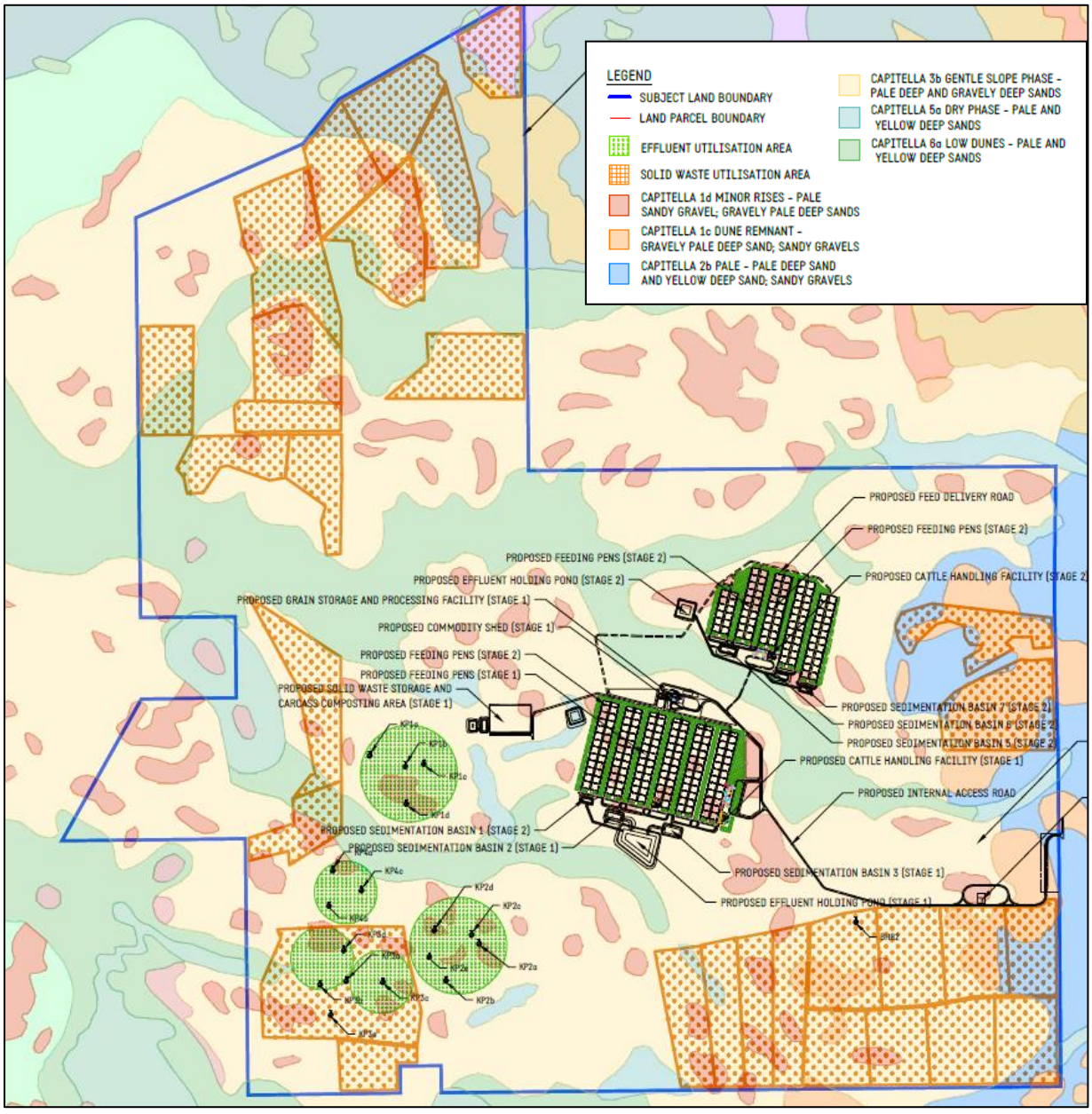
Mogumber Farm, 2000 – 2022). Average annual pan evaporation is about 2,456 mm per year and exceeds rainfall for all months except June and July.

### 8.1.3 Physiography

The premises lies upon the Dandaragan Plateau, which is a sand and laterite capped, flat to gently undulating plateau developed upon Cretaceous age sedimentary deposits with many sporadic and ephemeral watercourses. The Gingin Scarp forms the western boundary, and the Yarra Yarra Region and Darling Scarp mark the eastern boundary of the plateau.

### 8.1.4 Soils and landscape

Soil landscape mapping (DPIRD 2021) indicates the premises lies almost entirely within the Capitella soil-landscape system (Cp), which is described as '*subdued, stripped lateritic plateau, undulating to gently undulating low rises with gently undulating plain including dunes; pale and yellow deep sands, sandy gravels and sand over gravel; from sandstones plus alluvial and aeolian deposits*'. Very few slopes in this system exceed 3% and almost all the system is well drained (Figure 5).




**▲ *Figure 5: Soil-landscape systems of the premises***

An investigation of the soils present on the site within the effluent utilisation areas indicates a

dominance by fine to medium sandy matrix containing ironstone gravel and increasing clay content at depth. The proposed solid waste utilisation areas are also dominated by sandy gravel soil types.

The delegated officer sought technical advice from DPIRD on the applicant's characterisation of soils on the premises and was advised the characterisation of soils within the solid waste utilisation area is very confusing, poorly described and inadequate, as only a single profile is given to represent the entire (+2,000 ha) area. In addition, 'Sand' is a description of the soil particle size or texture and is not a classification of a soil profile.

As mentioned in section 4.4.3, DPIRD reiterates that pale deep sands have rapid drainage and low nutrient and water holding capacity. In addition, they have low to extremely low capacity to store P and are generally acidic with high susceptibility to water repellence and require careful management and regular monitoring to ensure that nutrient leakage to groundwater or other forms of degradation do not occur from application of nutrient-rich wastewater or solid waste.

## 8.2 Groundwater

### 8.2.1 Depth to groundwater

The premises is underlain by the Henley Sandstone Member which is part of the Leederville-Parmelia aquifer, a significant multi-layered aquifer system in the Northern Perth Basin.

A hydrogeological assessment (Pennington Scott 2020) identifies the Henley Sandstone underlying Kardinya Shale over much of the premises, with a regional water table less than 10 m depth; there is also a seasonal perched water table present within the shale and several areas on the premises may be susceptible to waterlogging (water table less than 5 m depth).

Eleven groundwater bores were installed at specific locations across the premises in August 2020 for monitoring the depth and quality of the shallow groundwater table. Bores KMB08, KMB09 and KMB15 are located within the proposed solid waste utilisation areas; bore KMB10 is within the proposed effluent utilisation area; bores KMB11, KMB12, KMB13, KMB16 and KMB17 are for monitoring potential seepage from effluent holding ponds.

Table 8 shows groundwater levels have become as shallow as 2.9 m bgl during the monitoring period to January 2022; standing water levels measured at most bores have risen between 90 cm and 2 m compared to baseline measurements from September 2020.

**Table 8: Koojan Downs – standing groundwater levels**

| Date | KDMB 08 | KDMB 09 | KDMB 10 | KDMB 11 | KDMB 12 | KDMB 13 | KDMB 15 | KDMB 16 | KDMB 17 |
|---|---|---|---|---|---|---|---|---|---|
| 14/8/20 | 8.82 | 11.5 | 7.62 | - | 12.81 | 4.25 | - | 8.36 | - |
| 16/9/20 | 8.94 | 11.43 | 7.44 | 5.6 | 8.18 | 4.23 | 6.13 | 8.28 | 6.84 |
| 4/2/21 | 8.82 | 11.5 | 7.5 | 5.61 | 8.33 | 4.35 | 5.33 | 8.41 | - |
| 21/3/21 | 8.84 | 11.5 | 7.4 | 5.5 | 8.3 | 4.1 | 5.3 | 8.4 | 7.32 |
| 28/4/21 | 8.78 | 11.5 | 7.4 | - | 8.2 | 4.2 | 5.2 | 8.3 | 7.34 |
| 26/5/21 | 8.85 | 11.5 | 7.4 | - | 8.3 | 4.2 | 5.1 | 8.4 | 7.43 |
| 30/6/21 | 8.69 | 11.3 | 7.2 | 6.4 | 8.1 | 3.9 | 5.0 | 8.1 | 7.01 |
| 3/8/21 | 8.15 | 10.9 | 6.4 | 5.9 | 7.2 | 3.1 | 4.1 | 7.1 | 6.36 |
| 26/10/21 | 7.57 | 10.4 | 5.2 | 5.7 | 6.4 | 2.9 | 3.8 | 6.5 | 6.25 |
| 27/1/22 | 7.66 | 10.5 | 5.7 | 5.8 | 6.8 | 3.3 | 4.1 | 7.0 | 6.87 |

DPIRD has drilled and constructed several monitoring bores within and in the immediate vicinity of the premises. Lithological and geophysical logs from two of these bores indicates a dominance of sandstone to a depth of about 60 m. Gamma logs for these bores indicate that siltstone/shale units are also present within the sandy lithology, however these units appear to

be thin and are not likely to be laterally extensive.

The logs also do not indicate the presence of an extensive aquitard that would protect deeper groundwater from the seepage of contaminants from the land surface. The logs also do not suggest that a perched water table is present; it is more likely there is a direct hydraulic connection between shallow groundwater and the deeper regional aquifer system. The monitoring of depth to groundwater by DPIRD indicates there is a strong downward head gradient in the aquifer, which suggests the premises is located within a recharge area for deeper aquifers.

### 8.2.2 Groundwater quality

Baseline sampling within the solid waste utilisation areas indicates good quality groundwater with pH slightly acidic to acidic ($pH_w$ 3.5 – 6.1), low salinity (<0.6 dS/m) and low nutrients (4.7 – 7.3 mg/L N; 0.01 – 0.04 P; 2.2 – 10 K).

It is noted there are inconsistencies in the sampling results presented in the NIMP (RDC 2022), in terms of the reported values for electrical conductivity being inconsistent with the reported concentrations of sodium and chloride, and the reported values of EC and total dissolved solids are inconsistent with the assertion that salinity (conductivity) is very low in all samples.

## 8.3 Surface water

There are no permanent surface water features on the premises; the closest are non-perennial watercourses and drainage lines that flow from the Darling Scarp to the east and are part of the Moore River surface water catchment area. Elevation declines around these watercourses, bringing the water level of the Leederville-Parmelia aquifer to within 20 m of the land surface in some locations.

DPIRD's soil-landscape mapping identifies much of the solid waste and effluent utilisation areas comprise deep pale sands of the Capitella system. There are many surface water catchment areas on the premises that direct rainfall runoff to natural drainage lines and eventually to the valley floors, where infiltration occurs through the sandy soils or evaporates.

There is one mapped wetland within the premises that has been classified as 'dampland' and is about 700 m from the initial effluent irrigation area. Additional damplands are located to the west of the premises, with a large dampland about 700 m from the most southwestern solid waste utilisation area on the premises.

## 8.4 Separation distances

The applicant has calculated the minimum separation distances to nearby sensitive receptors using a readily applied formula (the 's-factor' formula) outlined in the National Guidelines (MLA 2012b).

The s-factor method was originally devised in Queensland and allows for a rapid and simple assessment of potential air quality impacts (mainly odour) that does not require technically specialised and complex air quality modelling.

For Stage 1 of the project (18,750 SCUs at stocking density 19.2 $m^2$/SCU), the calculated separation distance to the nearest receptor, being a single rural or farm dwelling, is 1.4 km, which is within the actual distance of 2.3 km. The calculated separation distance to the nearest town, being the medium-sized town of Moora (~1,800 persons), is 5.6 km, which is well within the actual distance of about 19 km.

# 9. Risk assessment

### 9.1.1 Determination of emission, pathway and receptor

The department assesses the risks of emissions from prescribed premises and identifies the potential source, pathway and impact to receptors in accordance with the *Guideline: Risk*

*Assessments* (DWER 2020).

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.

### 9.1.2 Risk ratings

Risk ratings have been assessed in accordance with the *Guideline: Risk Assessments* (DWER 2020) for each identified emission source and takes into account identified potential source-pathway and receptor linkages. Where linkages are in-complete they have not been considered further in the risk assessment.

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

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

### 9.1.3 Risk assessment table

The table below describes the risk events associated with the proposal consistent with the *Guideline: Risk Assessments* (DWER 2020). The table identifies whether the risk events are acceptable and tolerated, or unacceptable and not tolerated, and the appropriate treatment and degree of regulatory control, where required.

| Risk Event | | | | Consequence rating[1] | Likelihood rating[1] | Risk[1] | Reasoning | Regulatory controls |
|---|---|---|---|---|---|---|---|---|
| **Source/ Activities** | **Potential emissions** | **Potential receptors, pathway and impact** | **Applicant controls** | | | | | |
| ***Construction works*** | | | | | | | | |
| ***Category 1: Feedlot operations*** | | | | | | | | |
| Holding, feeding and watering of animals within uncovered pens | Nutrient-laden leachate from manure, urine, mobilised by surface water runoff | Seepage/infiltration, causing contamination of shallow groundwater that is likely to be hydraulically connected to the deeper regional aquifer | Pens and controlled drainage infrastructure constructed with GCL lining (Elcoseal X800), overlain by a drainage layer and 450 mm capping (300 mm compacted clay and 150 mm compacted gravel) | Mid-level on-site impacts<br>Low-level off-site impacts on local scale<br>**Moderate** | Would only occur in exceptional circumstances<br>**Rare** | **Medium**<br>Acceptable, subject to regulatory controls | To protect the underlying groundwater resource, the feedlot has been constructed in accordance with the requirements outlined in the Code of Practice, namely pen and yard surfaces and cattle alleys, effluent catch drains, sedimentation basins, holding pond floors and manure storage pad have been constructed with a multiple lining system that complies with a permeability of at least 1 x $10^{-9}$ m/s.<br>Although the lining of pens with GCL is technically consistent with the Code of Practice, the delegated officer is unaware of any precedence of GCL being used as a liner for cattle feedlot pens in Western Australia, with the main concerns being the risk of the GCL being damaged by cattle hooves and/or cleaning machinery, and the potential for the GCL to cause saturation of the overlying surcharge and capping layers.<br>The applicant proposes to implement operational controls to ensure the as-constructed thickness of the surcharge and gravel capping later above the GCL is maintained, such as using machine control equipped mobile plant for critical operations within the GCL areas, such as pen cleaning and maintenance, and annual verification of the surcharge thickness.<br>The delegated officer considers these controls will ensure the risk of groundwater contamination from ongoing feedlot activities is acceptable, providing an appropriate surcharge layer is maintained.<br>To ensure an acceptable level of risk is maintained during ongoing operations, these controls will be listed on the licence and required to be maintained as minimum infrastructure requirements. | - Infrastructure design and operational requirements specified in infrastructure table<br>- All infrastructure within controlled drainage area must be maintained to ensure integrity is sustained;<br>- Must use machine control-equipped mobile plant for cleaning<br>- Must ensure minimum 450 thick surcharge protection layer on all pen surfaces |
| | | Uncontrolled discharge, causing soil contamination or groundwater contamination | Feedlot infrastructure constructed within a controlled drainage area, comprising a bunded hardstand that diverts surface water runoff to the sedimentation system | Mid-level on-site impacts<br>Low-level off-site impacts on local scale<br>**Moderate** | Would only occur in exceptional circumstances<br>**Rare** | **Medium**<br>Acceptable, subject to regulatory controls | All Stage 1 feedlot infrastructure is located within bunded controlled drainage areas, which comprise a sloped hardstand in which all contaminated or potentially contaminated surface water runoff is contained and diverted to a sedimentation basin and effluent holding pond.<br>The delegated officer considers the above controls ensure the risk of uncontrolled discharges, resulting in soil or groundwater contamination, is acceptable.<br>To ensure an acceptable level of risk is maintained during ongoing operations, these controls will be listed on the licence and required to be maintained as minimum infrastructure requirements. | - Controlled drainage area must be maintained to ensure all contaminated surface water runoff is fully contained within. |
| | | Overtopping of sedimentation basin or effluent holding pond, causing soil contamination or groundwater contamination | Sedimentation basin and effluent holding pond designed with sufficient storage capacity during a 95$^{th}$ percentile rainfall year | Mid-level on-site impacts<br>Low-level off-site impacts on local scale<br>**Moderate** | Not likely to occur in most circumstances<br>**Unlikely** | **Medium**<br>Acceptable, subject to regulatory controls | Sedimentation basin 2 & 3 and effluent holding pond 1 have been constructed with design volumes based on estimated runoff from each of the CDA catchments within Stage 1.<br>The annual water balance determined by the applicant indicates both ponds are sufficiently sized to ensure the frequency of spill events are less than an average of one in 20 years, assuming that most of the stored effluent is irrigated during the spring and summer period and the ponds are empty at the start of each winter season.<br>The delegated officer has reviewed the revised water balance and is satisfied the proposed increase in capacity to pond 1 to 107,000 kL mean it is sufficiently sized to capture and store all winter season (May to October) runoff without effluent extraction.<br>To ensure an acceptable level of risk is maintained during ongoing operations, freeboard controls will be listed on the licence, as per design. | - Operational freeboard requirement of 0.9 m must be maintained on the effluent holding pond |
| | Odour, from manure accumulated in feedlot pens | Unreasonable interference with the health, welfare, convenience, comfort or amenity of nearby | Stocking density 19 m$^2$/SCU<br>Pens cleaned about every 13 weeks, to ensure manure build up | Low level impacts to amenity on local scale<br>**Minor** | Likely to occur only in exceptional circumstances<br>**Rare** | **Low**<br>Acceptable, based on applicant controls being | The delegated officer considers there is sufficient separation in place (>2.2 km to nearest rural dwelling, >19 km to nearest town). Providing the stocking density in pens does not exceed the assessed density (19.2 m$^2$/SCU) and pens are cleaned in accordance with the Code of Practice (i.e., at least once every 13 weeks, to ensure manure build up does not exceed 50 mm), the | - Stocking density must not exceed 19.2 m$^2$/SCU in pens;<br>- Pens must be cleaned once the depth of dry manure on the pen surface exceeds 50 mm, or at least |

| Risk Event | | | | Consequence rating[1] | Likelihood rating[1] | Risk[1] | Reasoning | Regulatory controls |
|---|---|---|---|---|---|---|---|---|
| **Source/ Activities** | **Potential emissions** | **Potential receptors, pathway and impact** | **Applicant controls** | | | | | |
| | | sensitive receptors (>2.2 km) | does not exceed 50mm | | | implemented | delegated officer considers it unlikely that odour from feedlot operations will significantly impact on the amenity or health of off-site human receptors.<br>To ensure an acceptable level of risk is maintained during ongoing operations, these requirements will be imposed on the licence as operational controls. | once every 13 weeks, whichever is sooner. |
| | Odour, from manure and nutrient-laden leachate build up in effluent catch drains and sedimentation basin | | Effluent catch drains constructed with at least 0.5% long fall to facilitate drainage during rainfall events | Low level impacts to amenity on local scale<br>**Minor** | Likely to occur only in exceptional circumstances<br>**Rare** | **Low**<br>Acceptable, based on applicant controls being implemented | The delegated officer considers there is sufficient separation in place (>2.2 km to nearest rural dwelling, >19 km to nearest town). Providing the effluent catch drains are maintained in accordance with the Code of Practice (i.e., all leachate and surface water runoff from the feedlot pens can freely flow to the sedimentation basin without scouring), the delegated officer considers it unlikely that odour from effluent catch drains or the sedimentation system will significantly impact on the amenity or health of off-site human receptors.<br>To ensure an acceptable level of risk is maintained during ongoing operations, these requirements will be imposed on the licence as operational controls. | - Effluent catch drains must be maintained to ensure all leachate and surface water runoff from the feedlot pens is diverted to the sedimentation system without scouring. |
| | Odour, from effluent holding ponds | | Sedimentation system in place to settle solids, to ensure cleaner water is stored within holding ponds | Low level impacts to amenity on local scale<br>**Minor** | Likely to occur only in exceptional circumstances<br>**Rare** | **Low**<br>Acceptable, based on applicant controls being implemented | The delegated officer considers there is sufficient separation in place (>2.2 km to nearest rural dwelling, >19 km to nearest town). Providing the sedimentation system is maintained in accordance with the Code of Practice (i.e., basins flow freely after rainfall events, basin cleaned of solids before sludge takes up more than 10% of the basin capacity), the delegated officer considers it unlikely that odour from the effluent holding ponds will significantly impact on the amenity or health of off-site human receptors.<br>To ensure an acceptable level of risk is maintained during ongoing operations, these requirements will be imposed on the licence as operational controls. | - Sedimentation system must be maintained to ensure basins are free flowing after rainfall;<br>- Basins must be cleaned of solids before 10% buildup of sludge; |
| | Noise, from animals and machinery movements<br>Fugitive dust, from truck movements on gravel/unsealed roads | | Sufficient separation distance in place to nearby human receptors | Minimal impacts to amenity on local scale<br>**Slight** | Likely to occur only in exceptional circumstances<br>**Rare** | **Low**<br>Acceptable, not subject to controls | The delegated officer considers there is sufficient separation in place (>2.2 km to nearest rural dwelling, >19 km to nearest town), and therefore does not reasonably foresee that noise and dust from vehicle movements as part of feedlot operations will impact on the amenity or health of off-site human receptors. | None specified. |
| ***Category 1: Manure storage and processing (manure and mortalities)*** | | | | | | | | |
| Transfer of manure and dead animals from feedlot pens, generation of manure and mortalities windrows, disturbance of stockpiles and windrows, etc. | Nutrient-laden leachate from manure, urine, mobilised by surface water runoff | Uncontrolled discharge, causing soil contamination or groundwater contamination | Manure storage and processing area located within a controlled drainage area, comprising a bunded hardstand that diverts surface water runoff to a separate sedimentation and pond system | Mid-level on-site impacts<br>Low-level off-site impacts on local scale<br>**Moderate** | Not likely to occur in most circumstances<br>**Unlikely** | **Medium**<br>Acceptable, subject to regulatory controls | The manure storage and processing area comprises a bunded hardstand pad that slopes toward a sedimentation basin and effluent holding pond, to ensure all surface water runoff is contained and diverted to the holding pond.<br>The delegated officer considers the above controls will ensure the risk of uncontrolled discharges, resulting in soil or groundwater contamination, is acceptable.<br>To ensure an acceptable level of risk is maintained during ongoing operations, these controls will be listed on the licence and required to be maintained as minimum infrastructure requirements. | - Manure storage and processing area must be maintained to ensure all contaminated surface water runoff is fully contained within. |
| | Odour, from manure storage area (stockpiled manure and processing operations, etc.) | Unreasonable interference with the health, welfare, convenience, comfort or amenity of nearby sensitive receptors (>2.2 km) | Manure stockpiled in low profile windrows, consistent with National Guidelines<br>Processing manure and dead animals in accordance with National Guidelines | Low level impacts to amenity on local scale<br>**Minor** | Not likely to occur in most circumstances<br>**Unlikely** | **Medium**<br>Acceptable, subject to regulatory controls | The delegated officer considers there is sufficient separation in place (>2.2 km to nearest rural dwelling, >19 km to nearest town). Providing the manure is handled, stockpiled and composted in accordance with the Code of Practice (i.e. using an aerobic composting process, turning and aerating the material, maintaining suitable moisture levels and temperature, having a suitable C:N ratio, etc.), the delegated officer considers it unlikely that odour from manure storage or composting operations will significantly impact on the amenity or health of off-site human receptors.<br>This also assumes that only low risk feedstocks are brought onto the premises for incorporating into the composting process, such as green waste, untreated timber and natural fibrous organics, which all have low odour potential.<br>To ensure an acceptable level of risk is maintained during ongoing operations, these requirements will be imposed on the licence as operational controls. | - Only low risk feedstocks brought onto the premises for incorporating into composting process |

| Risk Event | | | | Consequence rating[1] | Likelihood rating[1] | Risk[1] | Reasoning | Regulatory controls |
|---|---|---|---|---|---|---|---|---|
| **Source/ Activities** | **Potential emissions** | **Potential receptors, pathway and impact** | **Applicant controls** | | | | | |
| ***Category 1: Manure management*** | | | | | | | | |
| Spreading of aged manure and mortalities compost over 2,060 ha of dryland cropping land | Leaching or runoff of nutrients from spread manure | Contamination of soil, particularly in sand-filled valleys, causing contamination of shallow groundwater<br>Soil acidification<br>Excessive build-up of soil P | Manure to be evenly spread, with bespoke yearly application rates determined based on soil and cropping requirements | Mid-level on-site impacts<br>**Moderate** | Could occur at some time<br>**Possible** | **Medium**<br>Acceptable, subject to regulatory controls | The applicant recognises the land available on the premises is too small to spread all the manure generated by Stage 1 of the project in a sustainable manner, therefore, proposes to process up to 70% of the manure generated per year to enable off-site reuse.<br>Assuming only sustainable amounts of manure are applied to land within the manure utilisation areas, the delegated officer still considers there is a risk of nutrient leakage to groundwater and other forms of land degradation, based on the following:<br>• The soils present on the premises being pale deep sands with rapid drainage, low nutrient and water holding capacity, low to extremely low capacity to store P, and are generally acidic with high susceptibility to water repellence;<br>• Groundwater levels within the manure utilisation areas are as shallow as 2.9 mbgl, with rising watertable trends; and<br>• After about 3 years of manure application, nutrient modelling is likely to indicate saturation of soil P levels, which means parts of the premises will not need any additional P (or very little P) to be spread, thereby restricting manure spreading and enhancing the risk of over-application and nutrient leaching.<br>Given the above, careful management and regular monitoring is required to maintain the soil's capacity to absorb nutrients and limit water repellence and ensure that nutrient leakage to groundwater and other forms of land degradation do not occur. Such controls will be imposed on the licence as operational controls as they are critical for ensuring an acceptable level of risk is maintained during ongoing operations.<br>Controls include the requirement for soil testing before and after the application of manure, to allow the ability to track movement of P and other nutrients down the soil profile and indicate if there is leaching at greater depth. Limits will also be applied to the licence regarding P application rates, to address the risk of over-application and nutrient leaching. | - Manure must applied at a rate of not more than 1.25 t/ha/yr;<br>- Manure must only be applied within the delineated manure utilisation areas, with even distribution and only onto areas growing crops or pasture;<br>- Must conduct soil testing of nutrients, before and after first application;<br>- Soil testing must be conducted at regular depths down the soil profile;<br>- Excess manure must be processed (i.e., pasteurised) for off-site reuse |
| | Odour, from spread manure | Unreasonable interference with the health, welfare, convenience, comfort or amenity of nearby sensitive receptors (6 dwellings within 200 m of southern extent of proposed manure utilisation area) | Not specified | Mid-level impacts to amenity on local scale<br>**Moderate** | Could occur at some time<br>**Possible** | **Medium**<br>Acceptable, subject to regulatory controls | The delegated officer notes there are several receptors within close proximity to the southern extent of the proposed manure utilisation area and that careful management and timing of spreading is required to minimise off-site amenity impacts.<br>The National Guidelines provide detailed recommendations on the optimal times and conditions for spreading, such as not spreading if heavy rain is expected or has fallen over the past 48 hours, spreading during conditions that maximise odour dispersion, incorporating spread manure into the soil as soon as practicable after application, etc.<br>To ensure an acceptable level of risk is maintained during ongoing solid waste spreading operations, these requirements will be imposed on the licence as operational controls. | - Must only spread during optimal weather conditions, as per National Guidelines;<br>- Composted manure must be incorporated into the soil profile within 7 days of spreading. |
| ***Category 1: Effluent utilisation*** | | | | | | | | |
| Centre pivot irrigation of effluent over 50 ha of forage sorghum crop | Leaching or runoff of nutrients from irrigated effluent | Contamination of soil, shallow groundwater<br>Soil acidification<br>Excessive build-up of soil P | Effluent to be applied evenly across utilisation area, with bespoke application rates determined based on soil and cropping requirements | Mid-level on-site impacts<br>**Moderate** | Will probably occur in most circumstances<br>**Likely** | **High**<br>May be acceptable, subject to multiple regulatory controls | The delegated officer considers there is a significant risk of nutrient leakage to groundwater and other forms of land degradation, based on the following:<br>• The soils present within the effluent utilisation areas being pale deep sands with rapid drainage, low nutrient and water holding capacity, low to extremely low capacity to store P, and are generally acidic with high susceptibility to water repellence;<br>• Groundwater levels within the effluent utilisation areas are as shallow as 5.2 mbgl, with rising watertable trends; and<br>• After about 3 years of effluent application, nutrient modelling is likely to indicate saturation of soil P levels, which means the effluent utilisation areas will not need any additional P (or very little P), thereby restricting effluent irrigation and enhancing the risk of over-application and nutrient leaching.<br>Given the above, careful management and regular monitoring is required to maintain the soil's capacity to absorb nutrients and limit water repellence and | - Effluent must be applied at a rate that does not exceed the nutrient and daily water requirements of the crop being grown, the water holding capacity of the soil and the lower limit of the soil moisture for each crop;<br>- Effluent must only be applied within the delineated effluent utilisation areas, with even distribution and only onto actively growing crops;<br>- Must conduct soil testing of nutrients, before first application each season;<br>- Soil testing must be conducted at regular depths down the soil profile. |

| Risk Event | | | | Consequence rating[1] | Likelihood rating[1] | Risk[1] | Reasoning | Regulatory controls |
|---|---|---|---|---|---|---|---|---|
| **Source/ Activities** | **Potential emissions** | **Potential receptors, pathway and impact** | **Applicant controls** | | | | | |
| | | | | | | | ensure that nutrient leakage to groundwater and other forms of land degradation do not occur. Such controls will be imposed on the licence as operational controls as they are critical for ensuring an acceptable level of risk is maintained during ongoing operations.<br>Controls include the requirement for soil testing before the application of effluent each season, to allow the ability to track movement of P and other nutrients down the soil profile and indicate if there is leaching at greater depth. Limits will also be applied to the licence regarding P application rates, to address the risk of over-application and nutrient leaching. | |
| | Odour, from effluent application | Unreasonable interference with the health, welfare, convenience, comfort or amenity of nearby sensitive receptors (6 dwellings within 2.5 km of the effluent utilisation areas) | Not specified | Minimal impacts to amenity on local scale<br>**Slight** | Likely to occur only in exceptional circumstances<br>**Rare** | **Low**<br>Acceptable, not subject to controls | The delegated officer considers there is sufficient separation in place (>2.2 km to nearest rural dwelling, >19 km to nearest town), and therefore does not reasonably foresee that odour from effluent irrigation will impact on the amenity or health of off-site human receptors. | None specified. |

*Note 1: Consequence ratings, likelihood ratings and risk descriptions are detailed in the Guideline: Risk Assessments (DWER 2020).*

# 10. Decision

### 10.1.1 Stage 1 operations

The delegated officer has determined the proposal to operate Stage 1 of the Koojan Downs cattle feedlot, with an assessed design capacity of 18,750 SCUs, may pose an unacceptable risk of impacts to groundwater and other forms of land degradation from the proposed management of manure and effluent. This determination is based on the following:

- the characteristics of the soils within the proposed effluent irrigation and manure utilisation areas (pale deep sands) having rapid drainage, low nutrient and water holding capacity, low to extremely low capacity to store soil P, are generally acidic with high susceptibility to water repellence;
- saturation of soil P levels within the effluent irrigation and manure utilisation areas are expected after about 3 years of operation, meaning that irrigation of effluent and manure spreading will be significantly restricted, and alternatives will be required for managing the volumes of effluent and solid waste generated by Stage 1 operations after about year 3; and
- groundwater levels beneath the proposed effluent irrigation and manure utilisation areas are shallow; the applicant proposes to recover groundwater in the event that levels exceed 2 mbgl and/or monitoring indicates nutrient contamination. It is unclear how the abstracted groundwater will be managed.

To address the identified risks, the delegated officer has determined to impose controls through the licence in the form of management actions and regular monitoring, to ensure that nutrient leakage to groundwater and other forms of land degradation do not occur from effluent irrigation and manure utilisation activities.

The remaining aspects of the proposal, such as the siting, design and day-to-day management of the feedlot have been assessed as being consistent with the Code of Practice and National Guidelines and do not pose an unacceptable risk of impacts to on- and off-site receptors. This is based on the following:

- sufficient separation to nearby (human) sensitive receptors;
- proposed stocking density of 19.2 $m^2$/SCU;
- feedlot pens, bunks, cattle alleys, effluent catch drains, sedimentation basins and the effluent holding pond have been constructed with an impermeable barrier (GCL and clay liner with maximum permeability of $1x10^{-9}$ m/s);
- an appropriate controlled drainage system being in place to manage surface runoff; and
- manure storage and processing, and mortalities composting, will be conducted on a suitably constructed composting pad within its own controlled drainage area.

The above controls proposed by the applicant are considered critical for maintaining an acceptable level of risk of environmental impacts and will be imposed on the licence as infrastructure design and operational controls.

The delegated officer has also considered advice provided by DPIRD regarding the management and monitoring of solid waste and effluent application, including soil testing, and has imposed additional controls based on that advice to ensure the risk is acceptable and sustainable.

### 10.1.2 Draft decision and applicant comments

A preliminary draft of this report was provided to the applicant on 23 August 2022, which sought a response to a number of key issues around the proposed management of effluent and manure at the premises.

The applicant provided a response on 14 March 2023, including an updated NIMP (RDC 2023) that outlined changes to the proposal to address the key issues raised by the department in its preliminary draft. The delegated officer considered the applicant's response,

prior to providing a final draft of the licence and this report to the applicant on 17 May 2023. The applicant raised concerns about nutrient spreading limits and the restriction of backgrounding outside of the feedlot complex, which it was agreed the applicant will provide additional information upon and have assessed under future amendment(s) to the licence.

## Conclusion

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

In accordance with the *Guidance Statement: Licence duration* (DER 2016), the duration of the licence will be 20 years.

# 11. References


1. Department of Primary Industries and Regional Development (DPIRD) 2021, Soil Landscape Mapping (DPIRD-027). Accessed from www.data.wa.gov.au.
2. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
3. DER 2016, *Guidance Statement: Licence duration*, Perth, Western Australia.
4. Department of Water and Environmental Regulation (DWER) 2019, *Guideline: Industry Regulation Guide to Licensing*, Perth, Western Australia.
5. DWER 2020, *Guideline: Risk Assessments*, Perth, Western Australia.
6. MLA 2012a, *National Beef Cattle Feedlot Environmental Code of Practice, 2nd Ed.* Meat & Livestock Australia Limited.
7. MLA 2012b, *National Guidelines for Beef Cattle Feedlots in Australia, 2nd Ed.* Meat & Livestock Australia Limited.
8. Pennington Scott, 2019, H3 Hydrogeological Report, Koojan Downs Agricultural Project, report prepared for Koojan Downs Pty Ltd by Pennington Scott, Perth, Western Australia.
9. RDC Engineers Pty Ltd (RDC) 2022, *Koojan Downs Feeding Facility – Nutrient and Irrigation Management Plan, Rev4 (Jun 2022)*. Report prepared for Koojan Downs Pty Ltd by RDC Engineers Pty Ltd, Toowoomba, Queensland.
10. RDC 2023, *Koojan Downs Feeding Facility – Nutrient and Irrigation Management Plan, Rev5 (Mar 2023)*. Report prepared for Koojan Downs Pty Ltd by RDC Engineers Pty Ltd, Toowoomba, Queensland.