



Application for licence

Division 3, Part V *Environmental Protection Act 1986*

Licence number	L9364/2022/1
Applicant	Westpork Pty Ltd
ACN	009 148 789
DWER file number	DER2022/000470
Premises	Westpork Moora 3 Piggery 898 Agaton Road DANDARAGAN WA 6507
Date of report	19 March 2024
Status of report	Final

1. Purpose and scope of assessment

Westpork Pty Ltd (the applicant) is seeking to transition from time-limited to full operations at its partially completed piggery complex near Moora. An application to licence the recently completed Moora 3 module was submitted under Division 3 Part V of the *Environmental Protection Act 1986* (EP Act) on 8 September 2022.

This report sets out the delegated officer's assessment of potential risk events arising from emissions and discharges that will be generated during operations at 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. Application details

Overview of existing premises

The Moora 3 module is one of two large indoor piggery modules being developed by Westpork in the Dandaragan area, about 19 km northwest of Moora.

The two piggery modules, known as 'Moora 2' and 'Moora 3', are located separately, and will be constructed separate to one another, but operated as one piggery complex. The two modules will have a combined design capacity of about 68,000 pigs, or 71,350 standard pig units (SPUs), which once constructed, will be the largest operating piggery complex in Western Australia.

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 category

Classification of premises	Assessed design capacity (as per application)
Category 2: Intensive piggery: premises on which pigs are fed, watered and housed in pens.	Not more than 34,000 animals (35,675 Standard Pig Units (SPUs) (Moora 3)

Background

Works approval W6006/2016/1 (W6006) was initially granted to Westpork in December 2017, for construction of the following infrastructure:

- two separate piggery modules, each with 24 conventional pig sheds and capacity to house up to 34,000 pigs (35,675 SPUs);
- individual wastewater treatment systems (WTS) for each module, each comprising a covered anaerobic pond (CAP) with biogas collection and flaring, and a series of biological treatment ponds including settlement trenches, a facultative and final evaporation pond; and
- individual bunded hardstand pads for each module, for the stockpiling of pond sludge, each with its own runoff collection pond.

Construction of Moora 3 commenced in January 2022 and was completed in July 2023. Westpork advise there is currently no timeframe for development of the Moora 2 module.

Environmental compliance – Moora 3

W6006 is an older style approval that predates the inclusion of time-limited operational conditions (i.e., stocking sheds with pigs), where all works must firstly be completed and the relevant construction compliance reports submitted, before operations can commence under a licence.

A first (partial) compliance report was submitted for Moora 3 in July 2022, which included the first six pig sheds, effluent transfer pipelines and storage tank, base liner of the CAP

(excluding the cover liner and commissioning of the associated flare), both settlement trenches, the first facultative pond, carcass burial pit, and groundwater monitoring bores.

The report mentioned that stocking of the initial pig sheds had commenced in February 2022 following their completion, prior to the submission of the required compliance documentation and without the necessary authorisation through the works approval, or a licence being issued.

Further supplementary details were provided in September 2022 that included construction of a further two pig sheds and associated effluent pipelines (total 8 sheds) and installation of the biogas flare.

A second (partial) compliance report was submitted in February 2023 for a further 10 pig sheds and cover liner installed on the CAP.

A third (and final) compliance report was submitted in November 2023 for the remaining two pig sheds and completion of the biogas flare.

The department has reviewed the reports and is generally satisfied the piggery infrastructure has been constructed to an appropriate standard; however, notes the relocation of key infrastructure and design changes to WTS infrastructure have been made that were not in accordance with the requirements specified in the works approval, including:

- not constructing a bunded hardstand pad for drying of solids – this aspect differs from the original application. Westpork advise that installation of a biodigester (CAP) negated the requirement for a primary solids separator, and the need for a hardstand pad for stockpiling primary separated solids;
- a revised liner system being installed on the settlement trenches (1.5 mm thick HDPE geomembrane liner over the top of the 300 mm thick compacted clay liner) – this aspect was not included in the original application. Westpork advise the revised liner system was installed as a precaution after the clay liner failed the compaction tests in one top area (Westpork advise it was too late to re-test due to wet weather);
- construction of a co-generation plant, where the collected biogas is now being used for power generation instead of being flared off – this aspect was not included in the original application. Additional design and construction certification details on the co-gen plant were provided on request, however, this aspect was not assessed or approved under W6006; and
- the location of the carcass burial pit has changed from the site that was proposed in the original application. The existing pit to the east of the Moora 3 pig sheds is much lower in the landscape than the originally proposed site; recent groundwater monitoring results indicate the shallow groundwater table is less than 4 mbgl in this location.

Works approval amendment and appeal

An amendment to W6006 was granted in January 2023 to include time limited operational provisions for the infrastructure that had already been constructed at the time, and for the remaining infrastructure for Moora 3. Staging of the works between Moora 2 and Moora 3 was also included.

The amendment was subsequently appealed by a third party, who considered there were insufficient controls to address nuisance odour from the piggery; the department's assessment (of odour) from a piggery of this size was inadequate; and concerns the addition of a second piggery module would worsen the potential for nuisance issues for nearby landowners.

At the time of this report, the appeal remains under investigation by the Appeals Convenor, on behalf of the Minister for Environment.

Odour complaints

The department has received odour complaints from surrounding landowners since February 2022, which coincides with the commencement of stocking the first sheds with pigs.

Complaints escalated throughout the construction and commissioning of Moora 3.

In response to the complaints, Westpork commissioned an odour impact assessment that was conducted in March 2023 (EAQ 2023a). The findings of the assessment indicated the odour footprint of the piggery was most likely a direct result of the unfinished construction of the site; and that once the site is fully constructed, including the automated controls for the ventilation system, observable odours should not be able to be detected at off-site receptors under normal operating conditions.

The frequency of complaints has significantly decreased following the completion of commissioning works in July 2023; however, Westpork commissioned a second, follow-up odour impact assessment that was conducted in October 2023 (EAQ 2023b).

The findings of the follow-up assessment indicated that odours from the piggery were of a lesser strength and frequency when observed in comparison with the early 2023 survey, most likely due to the site now being fully operational, including operation of the biogas generator, and that whilst odour was at times obvious, it was mostly of a strength typically less than 'distinct' and in a single transient moment.

Piggery design and operation – Moora 3

Moora 3 comprises a 2,800 sow 'farrow to finish' operation, in which pigs are bred and initially reared with their mother, before being transferred to separate sheds for weaning and grow out.

Shed design

There are 24 prefabricated modular sheds with walls that comprise sandwich panels (two sheets of metal with insulation between them), iron roofing and slatted flooring over concrete under-floor pits.

The sheds are a combination of fully enclosed sheds with extraction fans and cooling pads, providing ventilation and climate control, in addition to sheds with a "combi system" that allow natural ventilation during autumn/spring whilst being fully enclosed during winter/summer.

All sheds are oriented with their long axis north-south, which differs from typical indoor piggery setups that are oriented east-west to minimise heat load in the summer months; however, it is understood this change was made to address concerns raised by nearby landowners in the design phase.

Wastewater treatment system (WTS)

The Moora 3 WTS comprises a closed loop, pond-based system with no discharge to the environment.

Piggery effluent stored in underfloor pits is released on rotation every 1 to 4 weeks via a 'pull-plug' drainage system, which flows via gravity into a central effluent sump. Following each effluent release event, clean water is then used to partially refill the pits to dislodge any solids that may be stuck to the floor.

Effluent is pumped from the central sump to the CAP for primary treatment, in which up to 70% of solids are expected to be consumed during the anaerobic digestion process. Treated effluent from the CAP then flows out to the operational settlement trench at around 35°C to facilitate the removal of any remaining solids, prior to transfer to a large facultative pond, and a final evaporation pond. The ponds are sufficiently sized to contain the volume of treated effluent produced at full capacity, with disposal via on-site evaporation only.

Biogas generated from the enhanced anaerobic digestion process is extracted from the CAP using negative pressure created by gas blowers and transported through underground pipes to a 500 kW co-generation plant, which is used to generate 100% of the power and heating requirements for the premises.

Herd size and housing

Table 2: Moora 3 – average and maximum stock numbers

Pig class	SPU factor	Average numbers		Maximum numbers	
		Pigs	SPUs	Pigs	SPUs
Gilt (100 – 160 kg)	1.8	240	432	246	443
Boar (100 – 300 kg)	1.6	98	157	101	162
Dry sow (160 – 230 kg)	1.6	2,278	3,645	2,334	3,734
Lactating sow (160 – 230 kg)	2.498	450	1,124	461	1,152
Sucker (1.4 – 8 kg)	0.09	5,006	450	5,131	462
Weaner (8 – 25 kg)	0.514	8,072	4,149	8,274	4,149
Porker (25 – 55 kg)	1.075	5,091	5,473	5,218	5,609
Grower (55 – 100 kg)	1.476	5,054	7,460	5,180	7,646
Finisher (100 – 120 kg)	1.729	6,892	11,916	7,064	12,214
Total		31,181	34,086	34,009	35,571

Solid waste management

The two settlement trenches are designed to be used on a rotational basis, where effluent overflow from the CAP continually flows into the operational trench, while the non-operational trench is drying out.

Sludge accumulation in the operational trench is regularly monitored and the duration of operation before rotating will be refined over time based on operational experience. Westpork expects the first trench will require management of the sludge after about 18 months (mid-2025); it is anticipated the trenches will eventually require rotating every 12 to 24 months, and desludging the CAP once every 25 years.

At this stage, Westpork are considering several disposal options for dried pond solids:

- off-site removal – if the material contains >15% total solids it will be considered ‘spadeable’ and be excavated from the trench directly into trucks and taken to a licensed composting or organics recycling facility or a solid waste facility; or
- application to land – the existing nutrient management plan submitted with the original application will be updated to include testing results of the actual sludge and nutrient loadings revised. The potential for smaller volumes of sludge to be applied to land will be assessed, with the remainder to be removed off-site;
- composting the material on-site – Westpork are conducting a cost benefit analysis into setting up composting infrastructure on the premises, including importing a carbon source to achieve the necessary C:N ratios and daily monitoring and turning of the windrows.

Deceased animals

Mortalities are currently being buried in a large pit on the premises. Dead pigs are removed from the sheds each day by front end loader and deposited directly into the pit. According to Westpork the base of the pit is more than 2 m above the water table, and dead animals are covered with 500 mm of sand at the end of each day.

3. Location and siting

Siting context

The premises is located on farming land north-west of Moora, about 160 km north of Perth. It is located within the intensive land-use zone of the Moore River catchment, which has been largely cleared of native vegetation for crop and pasture production in dryland agricultural systems.

The piggery infrastructure is located on the northern boundary of Lot 3616 and is not visible from Agaton Rd. This land title has a total area of 1,481.27 ha, is zoned rural under the local town planning scheme and has been predominantly used for low intensity cattle grazing and cereal cropping.

Land use and sensitive receptors

The surrounding land has been historically used for extensive cereal cropping and livestock grazing and as a result, is largely cleared with only scattered blocks of remnant vegetation remaining.

There are three sensitive receptors (rural dwellings) within a 6 km radius of the Moora 3 piggery infrastructure, to the north-west and north. The nearest populated area is Moora (19 km south-east).

An unnamed lake is located about 1.3 km south-east of the evaporation pond, which appears to be an expression of a shallow (unconfined) groundwater table. No other specified ecosystems or areas of high conservation value have been identified in proximity that may be directly impacted by the piggery operations.

Climate

The Moora area experiences a dry Mediterranean climate with hot dry summers and cool wet winters. Average annual rainfall is about 544 mm/yr, with most falling in the winter months during the passage of cold fronts and little or no rain during the summer months. Annual evaporation is about 2.45 m per year and exceeds rainfall for all months except July.

Physiography

The premises lies upon the Dandaragan Plateau, which is a sand- and laterite-capped, gently undulating plateau that overlies Cretaceous sediments, with elevation ranging from 140 to 300 m AHD. It is bound by the Dandaragan and Gingin scarps to the west and south-west respectively, and the Yarra Yarra region to the east. The Gingin Scarp is a fairly prominent topographic feature up to 75 m high, while the Dandaragan Scarp reaches up to 90 m high.

Valleys within the Dandaragan Plateau are infilled with deep yellow sands that capture most rainfall, causing streams to be highly ephemeral. The plateau is characterised by ephemeral streams and swamps, and flat-bottomed valleys that flood after exceptionally heavy rains.

The premises is situated on the eastern fringe of the plateau, on an undulating property that ranges from depressions of about 240 m AHD and rising hills to 280 m AHD. The eastern portion of the premises is lower than the western portion, at about 240 m AHD that slopes down to 235 m AHD around the unnamed lake. The piggery infrastructure is specifically located on high and low points within the landscape, to allow gravity flow of effluent from the sheds to the treatment ponds.

Soils and landscape

Soil landscape mapping (DPIRD 2021) indicates the main cropping paddocks on which it was initially proposed to spread dried pond solids are mainly located on yellow deep sands on the Rowes 3 typical phase (222Rw_3a), interspersed with gravelly sands, pale deep sands and yellow deep sands on the Rowes 2 subsystem (222Rw_2).

The soil-landscape change in the eastern portion of the premises is associated with the low-lying landscape of the Agaton, Capitella and Coalara soil-landscape systems. The main subsystem in the east is the Capitella 5 plain phase (222Cp_5c), consisting of broad sand filled open depressions with very low dunes of yellow and pale deep sands. The uncleared land on the eastern boundary is mapped as Agaton 5 damp Swales phase (222Ag_5d) and is described as dune swales with open and closed depressions, commonly waterlogged.

Groundwater

Depth to groundwater

The premises is underlain by the Molecap Greensand Formation, which unconformably overlies the Leederville-Parmelia Formation, a significant multi-layered aquifer system in the northern Perth Basin.

A hydrogeological assessment (Water Direct 2017) identifies the Molecap Greensand overlying Kardinya Shale over much of the premises, with a regional water table less than 5 m depth in low lying areas; recharge areas tend to be at the hilltops of yellow and pale sands, and the soaks are in naturally damp areas in mid to lower slopes. Transects of the property landscape suggest the unnamed lake on the eastern portion of the premises is likely an expression of a shallow (unconfined) groundwater table.

Eight groundwater monitoring wells have been installed at the premises for monitoring the depth and quality of the shallow groundwater table:

- MW1 – MW4 were installed in early 2016 around the proposed location of the Moora 1 WTS, prior to Westpork's decision to build Moora 3 instead of Moora 1; these wells were initially monitored by Westpork to gather background data but this has since been discontinued. These wells are located high in the landscape (254 m) with depth to groundwater around 15 mbgl (or 239 m AHD);
- MW5 – MW8 were installed in November 2021 at the Moora 3 site, for monitoring potential seepage from the pig sheds, CAP, settlement trenches, and evaporation ponds.

Table 4 shows standing groundwater levels are much shallower than reported in the original application, with 3.4 m bgl measured within MW8 on the eastern flank of the evaporation pond and near the carcass burial pit. Standing water levels measured at three of the four wells have shown moderate seasonal fluctuations within 0.5 m, with MW5 to the west of the piggery showing a fluctuation of around 2 metres.

Table 4: Moora 3 piggery – standing groundwater levels (mTOC)

Date	MW5	MW6	MW7	MW8
	246.32 mAHD	248.88 mAHD	242.95 mAHD	241.17 mAHD
15/12/2022	5.25	10.05	5.25	3.40
17/3/2023	5.50	10.10	5.30	3.50
24/04/2023	7.42	10.41	5.83	4.07
22/06/2023	7.02	9.87	5.41	3.62
21/09/2023	7.16	10.30	5.45	4.02
06/12/2023	7.28	10.39	5.58	3.78

Groundwater quality

Baseline sampling within the four wells indicates good quality groundwater with pH slightly acidic to slightly alkaline (pH_w 5.9 – 8.1) and low salinity (<0.65 dS/m); however, nutrient levels indicate nutrient leaching is already occurring (7.6 – 33 mg/L N; 0.03 – 1.3 mg/L P).

Surface water

There are no permanent surface water features on the premises; the closest is the unnamed lake about 1.3 km south-east of the evaporation pond, with other minor, non-perennial watercourses and drainage lines that flow west from the base of the Darling Scarp across the Dandaragan Plateau and are part of the Moore River catchment.

DPIRD's soil-landscape mapping identifies much of the premises comprises yellow and pale deep sands of the Rowes soil-landscape system; there are many surface water catchment areas on the premises that direct rainfall runoff to natural drainage lines, where infiltration occurs through the sandy soils or evaporates.

Separation distances

Westpork has calculated the minimum separation distances to nearby sensitive receptors using a readily applied formula (the 's-factor' formula) outlined in the NEGIP.

The s-factor method was originally devised in Queensland for the cattle feedlot industry and has since been adopted for other intensive livestock industries, including sheep feedlots and piggeries. It 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.

When considering Moora 3 in isolation, the calculated separation distance to the nearest receptor, being a single rural or farm dwelling, is 1.83 km, which is within the actual distance of 3.0 km. The calculated separation distance to the nearest town, being the medium-sized town of Moora (~600 persons), is 3.39 km, which also is well within the actual distance of about 16 km.

4. Industry guidelines

The [National Environmental Guidelines for Indoor Piggeries](#) (NEGIP) (Australian Pork Ltd 2018) provides a general framework for managing the environmental issues associated with indoor piggeries in Australia.

The environmental risk tool in Appendix A of the NEGIP has been used as a baseline for rating the vulnerability of major natural resources from the piggery operation and the risk of environmental impacts from the design and operational features.

Table 3 provides a summary of the risk of Moora 3 using the NEGIP criteria, where 1 is low risk and 4 is high risk.

Table 3: Summary of Moora 3 against NEGIP criteria

NEGIP aspect	Risk criteria	Risk rating
<i>Amenity and natural resources vulnerability</i>		
Soils of reuse areas	Not applicable – dried solids have not been assessed as being spread on the premises at this stage	N/A
Groundwater quality and availability	Depth to groundwater always at least 20 m below the ground surface or the base of any piggery infrastructure	1
	There is sufficient allocation of groundwater and supply that is of a suitable quality to meet requirements	3
Surface water quality and availability	The piggery is located at least 200 m from the closest watercourse	1
	The piggery is located at least 800 m from the closest major water supply storage	1
	The piggery is located above the 1:100 year flood line	1
Community amenity	The piggery has received four or more complaints per year from the public or regulators	4
	Levels of odour, dust and noise around the property boundary area checked at least weekly	1
	Surrounding land is all designated rural and is not designated for future development or rezoning	1
	The piggery is fairly well concealed from roads and neighbours	2
	Vehicle movements and other noisy activities occur only during the day, except under exceptional circumstances	1
	Mechanical equipment used on-farm is generally fitted with manufacturer specified exhaust devices	2

	Dust from traffic movements is not specifically controlled but dust does not seem to cause nuisance	2
	A complaints management procedure is in place that includes complaints recording, investigation and corrective action, along with appropriate consultation	2
	Mediation is used to try to settle disputes with neighbours	1
Design and operation		
Pig housing	Sheds are constructed to maintain temperatures within the required range but require significant mechanical heating or cooling to maintain temperatures at the required range	3
	The sheds bases are concreted	1
	Feeding systems minimise feed wastage	1
	Naturally ventilated sheds are reasonably well ventilated, as they are separated by a distance of at least 3 times their height	3
	Stocking densities meet the requirements of the Model Code of Practice for the Welfare of Animals: Pigs	1
	Sheds are frequently cleaned to maintain very clean lanes, pens and handling areas: pigs are clean	1
	The inflow or outflow of effluent from sheds is prevented by controls	1
Nutrient content of manure	Not required – manure will not be spread on the premises	N/A
Effluent collection system	Stormwater runoff, including roof runoff is excluded from entering the effluent collection system	1
	Effluent collection systems (e.g. channels, drains, pipes and sumps) are impervious (no significant cracks)	1
	Effluent pits, sumps, pipes and drains are sized and managed so that they do not spill	1
	Effluent pits and drains are not self-cleaning, but are cleaned at least weekly to remove manure solids	2
	There are appropriate contingency measures to prevent spills from the system	1
	Flushing channels are flushed at least twice a week, and pull plugs are emptied at least once every 4 weeks	3
	Drains, pits and sumps are inspected after each flush for solids accumulation, leakage and deterioration	1
Effluent pre-treatment system	Not applicable – all solids will be broken down by the biodigester, hence there is no requirement for pre-treatment	N/A
Effluent treatment system	The effluent treatment system:	
	<ul style="list-style-type: none"> is designed to capture and store all effluent. It has no significant isolated sections. Inlets and outlets are positioned to prevent short-circuiting 	1
	<ul style="list-style-type: none"> sometimes produces strong odours that can be detected beyond the property boundary 	4
	<ul style="list-style-type: none"> is designed to store at least ten years sludge 	1
	<ul style="list-style-type: none"> is lined with an impervious synthetic liner 	1
	<ul style="list-style-type: none"> is designed for an overtopping frequency not exceeding 1 in 20 years where effluent disposal is by 	1

	evaporation	
	The depth to the water table from the base of the effluent treatment system is at least 2 m	1
Manure storage areas	Not applicable – the operation does not produce manure that requires storage – all solids will be broken down by the biodigester	N/A
Mortalities management	Dead pigs are always removed from the sheds or pens within 12 hours of death	1
	Mortalities management always occurs within 24 hours of death	1
	Mortalities management is by burial	3
	Mortalities management areas always provide at least 2 m depth between base level and groundwater	1
	Mortalities are always promptly covered with at least 300 mm of spent bedding and continuously kept covered	1
	Mortalities management does not occur within a controlled drainage area	4
	In the case of a mass mortalities event, there is a suitable site selected but no real plan for managing mass mortalities	3
Reuse areas	Not applicable – effluent or solids are not reused on the premises	N/A

Comparison with the NEGIP

Siting and design

- The piggery complex is sited on priority agricultural land and is well separated from populated areas. Its location in a climate with high annual moisture deficit (i.e., low rainfall and high evaporation) further reduces the risk of common environmental issues associated with wet conditions, such as managing effluent during the wetter months; however, it is noted that nuisance odour complaints have been received by the department and the shire from receptors up to 9 km away from the piggery sheds.
- The design and operation of the piggery sheds and WTS infrastructure is consistent with modern day best practice standards and the environmental protection standards under the NEGIP.

Waste management

- The effluent management system in place is consistent with modern day best practice standards and the environmental protection standards under the NEGIP. The facultative and evaporation ponds have been sufficiently sized to facilitate evaporation as the only disposal method, which is the department's preferred option for managing piggery effluent (i.e., no on-site discharges).
- Installation of a CAP/biodigester and the use of captured biogas to generate on-site power requirements is also consistent with modern day best practice piggery operations.
- The applicant initially proposed to spread raw dried sludge from the settlement trenches over dryland cropping land on the premises.
The department has reviewed the premises' soil-landscape characteristics and considers the soil types on the premises are unsuitable for spreading high rates of nutrients (low PBI, low pH with toxic levels of aluminium in the subsoil, high risk of wind erosion and water repellence, shallow watertable, etc.), and that it would be difficult for the nutrient management plan provided with the application to be implemented without unacceptable impacts to the environment (see section 8 of this report).
- Given the above, Westpork are considering their options in terms of management of dried

pond solids. At least 12 months prior to the first desludging event being required, Westpork proposed to either submit a works approval application to construct infrastructure for composting of the material or provide an updated solid waste management plan.

Due to the high efficiency of the biodigester in breaking down solids, Westpork expects it will take at least 18 months before the first settlement trench will require desludging (mid-2025).

- Disposing dead animals by burial is an accepted, but not preferred, option under the NEGIP for managing mortalities.

5. Other approvals

Planning approvals

Due to the size and overall cost to construct and operate the premises, planning approval was issued by the Mid West/Wheatbelt Joint Development Assessment Panel (JDAP) in May 2017.

The approval issued by the JDAP included several significant modifications to key design parameters of the piggery.

6. Consultation

The application was referred to relevant public authorities and advertised for public comment on the department's website during December 2022.

Public authorities

The Department of Primary Industries and Regional Development (DPIRD) advised on compliance with the environment and design aspects of the existing piggery, and the applicant's initial proposal to manage manure on the premises. DPIRD's commentary is summarised for each of these aspects in the risk assessment table below.

The shire did not provide a response within the requested timeframe.

Public submissions

Several submissions were received during the public comment period, which indicated the piggery operations are impacting on nearby neighbouring premises in the form of nuisance odour. Concerns were also raised about the potential for contamination of groundwater from piggery operations.

Other concerns were raised that are not directly related to emissions and discharges from the proposal and are beyond the scope of Division 3 Part V of the EP Act, including property devaluation, deterioration of local roads, and impacts from feral animals.

7. Risk assessment

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.

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 licence 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.

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;
- vehicle (i.e., livestock truck) movements on private or public roads; and
- land use zoning and compatibility with surrounding land uses

The licence is related to category 2 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 prescribed and non-prescribed activities, including those listed above.

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					
Category 2: Intensive piggery operations								
Holding, feeding and watering of animals within conventional sheds	Nutrient-laden effluent (spilt feed, water, urine, faeces) accumulated in pig sheds	Seepage/infiltration causing contamination of shallow groundwater with raw effluent	Pig sheds are constructed with slatted flooring over a concrete base with a pull-plug flushing system Effluent is flushed to a central sump before being pumped to the CAP via enclosed pipes Sump comprises a concrete tank; all ponds are appropriately lined	Low-level on-site impacts Minor	Not likely to occur in most circumstances Unlikely	Medium Acceptable, subject to regulatory controls	The pig sheds have been constructed with slatted flooring over concrete under-floor pits, which is consistent with the NEGIP environmental protection standards. Effluent is released from beneath the sheds to a central sump using a "pull-plug" system, before being pumped to the CAP via PVC effluent transfer pipelines. The CAP and other WTS infrastructure (settlement trenches and evaporation ponds) have all been constructed with a 1.5 mm thick HDPE liner (construction standard has been certified). Results from recent monitoring indicate depth to the shallow water table being around 4 m, with quality generally fresh (<0.6 dS/m EC). Soils are yellow deep sands, with poor water and nutrient holding capacity. Providing the integrity of this infrastructure is maintained and managed according to the NEGIP, the ongoing risk of groundwater contamination from operation of the pig sheds appears to be acceptable.	- Infrastructure design and operational requirements - All infrastructure must be maintained to design specifications
	Odour, from pig sheds	Unreasonable interference with the health and amenity of nearby sensitive receptors (>3.5 km)	Sheds constructed with automated mechanical ventilation Maximum stocking rate of 34,000 pigs Flushing of underfloor pits every 1 – 4 weeks, then flushed with clean water Sheds to be regularly swept and hosed Mortalities to be removed daily	Low-level impact to amenity at local scale Minor	Could occur at some time Possible	Medium Acceptable, subject to regulatory controls	The minimum separation distances for Moora 3, determined using the s-factor calculations, are 1.83 km to rural dwellings and 3.4 km to a townsite, with the actual distances being 3.0 km and 16.0 km respectively. Both the department and the shire have received numerous nuisance odour complaints about this piggery since the stocking of the initial sheds commenced (without approval) and throughout a portion of the construction phase of Moora 3. The delegated officer notes the findings of the second odour impact assessment (EAQ 2023b) which identifies the mechanical venting of the pig sheds as a key odour source for receptors to the north and south, due mainly to the north-south orientation of the sheds. Complaint numbers have significantly decreased since the site has reached full production; the delegated officer understands the complainants have acknowledged to Westpork the frequency and intensity of odour events have significantly reduced compared to earlier times. The delegated officer acknowledges the design of Moora 3 is current best practice for indoor piggery operations, and the reduction in nuisance odour complaints indicates that odour levels can be adequately controlled when the site is operated in accordance with design specifications. The delegated officer also acknowledges Westpork's consultation with the community and in particular, the main complainants, and their commitment to investigate and understand the potential causes of the odour issue and remedy the situation. The delegated officer therefore considers the applicant's controls for minimising the generation odour within the pig sheds to be critical, including maximum stocking rates, regular flushing out of effluent and cleaning of pens, and removal of mortalities. As such, these controls will be imposed on the licence as ongoing operational controls.	- Maximum stocking numbers specified - Odour controls specified, in accordance with the NEGIP
	Noise, from animals, piggery operations and machinery movements							Ensuring sufficient separation to nearby receptors
Effluent treatment and management of solids	Nutrient-laden raw effluent	Overtopping of central effluent sump and/or rupture of effluent transfer pipelines, causing contamination of soil and shallow groundwater with raw	Continuous (automatic) feed of effluent to the CAP, via float switch Daily inspections of drainage channels and collection sump	Low-level on-site impacts Minor	Not likely to occur in most circumstances Unlikely	Medium Acceptable, subject to regulatory controls	Effluent drainage lines connecting the pig sheds to the WTS are enclosed in 300 mm uPVC pipes; the pipelines have 'Y' pieces at regular intervals along the length of the pipe for access, should blockages occur. The central effluent sump comprises a 125 kL concrete tank that operates on a float switch to transfer (pump) effluent up to the CAP when the underfloor pits are flushed every 1 – 4 weeks. There has already been an overtopping incident of the central sump, in Jan 2023, in which an estimated 65 kL overflowed	- Ongoing inspections of WTS infrastructure for integrity and other issues, with inspections recorded - Identified issues must be rectified - Improvement condition – construct secondary containment around the central effluent sump

Risk Event				Consequence rating ¹	Likelihood rating ¹	Risk ¹	Reasoning	Regulatory controls
Source/ Activities	Potential emissions	Potential receptors, pathway and impact	Applicant controls					
		effluent					<p>following an equipment malfunction.</p> <p>As the system is automated, it is critical that routine checks and balances are in place to ensure any issues are identified to enable early detection and appropriate action to be taken. As such, these controls have been imposed on the licence as operational controls.</p> <p>Additionally, an improvement condition has been added to the licence to require the construction of secondary containment for the central effluent sump, as a contingency should an equipment failure lead to overtopping of the sump in the future.</p>	
	Nutrient-laden effluent (raw, partially treated and treated)	Overtopping of WTS ponds, runoff causing contamination of soil and shallow groundwater with raw effluent	<p>WTS is designed for ponds to flow from one to the next with storage in final evaporation pond</p> <p>WTS has been designed with sufficient capacity to manage expected volumes of water generated under full operations</p>	Low-level on-site impacts Minor	Not likely to occur in most circumstances Unlikely	Medium Acceptable, subject to regulatory controls	<p>The WTS has been constructed with a design volume based on a 2,800 sow operation, in which 433 m³/day of effluent will be generated and takes into account incident rainfall entering the pond system. Water balance calculations show the water level in the evaporation pond would only marginally encroach on the 500 mm freeboard during a 90th percentile wet year. The freeboard allows the ponds to receive 50% of the annual rainfall (544 mm) in a single event without overtopping.</p> <p>The combined freeboard capacity provides 50 kL which is sufficient for over 100 days of effluent production, excluding evaporation losses. The size of the WTS meets the NEGIP which requires a spill frequency of not more than once every 10 years.</p> <p>To ensure an acceptable level of risk is maintained during ongoing operations, freeboard controls will be imposed on the licence for the evaporation pond, as per design.</p>	<ul style="list-style-type: none"> - Operational freeboard requirement of 500 mm must be maintained on the evaporation pond - Daily inspections for freeboard and integrity issues
	Odour, from central effluent sump and CAP	Unreasonable interference with the health and amenity of nearby sensitive receptors (>3.5 km)	CAP is covered with 2.0 mm thick HDPE and maintained gas tight	Low-level impact to amenity at local scale Minor	Could occur at some time Possible	Medium Acceptable, subject to regulatory controls	<p>All infrastructure used in the conveying of raw effluent to the WTS, including the central effluent sump and anaerobic treatment ponds, can be significant sources of odour if not constructed, operated, or maintained properly.</p> <p>The central effluent sump is operated without a cover, which the delegated officer understands is due to the propensity for methane gas build up and the potential explosion risk. The agitation of raw effluent is therefore a key odour source at this premises.</p> <p>The CAP operates with a 2.0 mm thick HDPE cover liner, which is sealed against the pond walls and is effectively gas tight, with the exception of the safety vents, agitators and overflow weir to the settlement ponds. The covering of the CAP effectively eliminates a significant source of odour at the site, and this has been substantiated through the odour impact assessment (EAQ 2023b).</p> <p>As the cover on the CAP is a critical control for minimising odour from the primary (anaerobic) stage of treatment, maintaining it will be imposed on the licence as an infrastructure control. Monitoring of pH and salinity will also be imposed, to ensure optimum pond chemistry is being maintained (i.e., anaerobic conditions).</p>	<ul style="list-style-type: none"> - Infrastructure design and operational requirements specified - All infrastructure must be maintained to design specifications
	Odour, from WTS ponds		Large storage ponds for treated effluent	Low-level impact to amenity at local scale Minor	Could occur at some time Possible	Medium Acceptable, subject to regulatory controls	<p>The settlement trenches and facultative pond were identified as key odour sources during the initial construction phase, whilst the ponds were filling and partially treated effluent discharging above the normal pond operational water level. This issue appears to have been resolved now that the CAP has stabilised and is in full operation and the ponds are operating as per design.</p> <p>The ponds are only expected to be a source of odour if there are issues with the biodigester, where partially treated effluent is being discharged. Controls on maintaining efficient operation of the CAP are therefore critical for ensuring the ponds do not present an odour risk.</p>	<ul style="list-style-type: none"> - Infrastructure design and operational requirements specified - All infrastructure must be maintained to design specifications
Operation of co-gen power plant	Odour, from transfer and processing of biogas		Installation of scrubber to reduce concentration of H ₂ S	Low-level impact to amenity at local scale Minor	Not likely to occur in most circumstances Unlikely	Medium Acceptable, subject to regulatory controls	<p>The cogeneration plant at this premises was not assessed by the department and it was constructed by Westpork without approval; only the flaring of collected biogas has been assessed and approved at this site. Whilst the benefits of cogeneration are acknowledged, i.e., providing a source of electricity and heat for the piggery, in addition to reducing odour emissions (in theory), no information has been provided in terms of expected air quality to inform an assessment of risk to off-site receptors.</p> <p>In the absence of information, the delegated officer considers there is sufficient separation in place to the nearest dwelling (>3.5 km) and that odour from the cogeneration plant would only be a potential issue for off-site receptors under</p>	<ul style="list-style-type: none"> - Infrastructure design and operational requirements specified - All infrastructure must be maintained to design specifications

Risk Event				Consequence rating ¹	Likelihood rating ¹	Risk ¹	Reasoning	Regulatory controls
Source/ Activities	Potential emissions	Potential receptors, pathway and impact	Applicant controls					
	Noise, from cogen plant operating		Ensuring sufficient separation to nearby receptors	Minimal impact to amenity at local scale Slight	Not likely to occur in most circumstances Unlikely	Low Acceptable, not controlled	<p>upset or abnormal operating conditions. Controls on maintaining efficient operation of the cogen plant are therefore critical for ensuring it does not present an odour risk.</p> <p>The cogeneration plant was not assessed by the department, and it was constructed by Westpork without approval; no information was provided in terms of expected noise emissions to inform an initial assessment of risk to off-site receptors.</p> <p>The delegated officer notes that noise complaints have been received by the department from a rural dwelling (which is further away than the closest receptor), in which the complainants state they can clearly hear the piggery generator at their house during the evenings and quiet periods, and it can at times can keep them awake.</p> <p>Westpork subsequently commissioned a noise impact assessment, which was conducted in October 2023 (HSA 2023), in which noise levels were measured at 3 locations (the piggery site, the northern boundary of the premises, and the complainant's dwelling). The results indicated that noise levels associated with the piggery are unlikely to be audible at the complainant's dwelling (including at night-time) and comply with the Environmental Protection (Noise) Regulations 1997.</p> <p>Whilst the complainant's dispute the findings and are adamant they can hear the piggery generator, noise levels measured at their residence and in accordance with the Noise Regulations indicate full compliance with the assigned levels, which therefore cannot be considered to be unreasonable.</p>	- None specified
Operation of biogas flare	Odour, from flaring events		Flare is designed to combust methane and other gases, including odorous gases	Low-level impact to amenity at local scale Minor	Not likely to occur in most circumstances Unlikely	Medium Acceptable, subject to regulatory controls	<p>All CAPs must be fitted with a safety flare for combustion of surplus biogas, which is burnt at high temperature. This process eliminates a significant proportion of odorous gases.</p> <p>Automatic controls on the gas management system direct the biogas to the cogen plant or the flare, as required.</p> <p>The delegated officer considers there is sufficient separation in place to the nearest dwelling (>3.5 km) and that odour from the flare would only be a potential issue for off-site receptors under upset or abnormal operating conditions. Controls on maintaining efficient operation of the flare are therefore critical for ensuring it does not present an odour risk.</p>	- Infrastructure design and operational requirements specified
Desludging settlement trenches and CAP	Nutrient-laden effluent (should pond lining be damaged during desludging)	Uncontrolled seepage, causing contamination of soil and shallow groundwater with effluent	None specified	Low-level on-site impacts Minor	Not likely to occur in most circumstances Unlikely	Medium Acceptable, subject to regulatory controls	<p>Westpork advise that following a long period of drying in the settlement trenches, pond solids will be suitable for mechanical removal from the trench - this differs to the department's assessment of the works approval application, in which a) the trenches were to comprise a compacted clay liner, and b) the sludge would be pumped to a hardstand pad for drying (i.e., not dried in situ).</p> <p>Given the trenches have now been installed with a HDPE liner, with this comes the inherent risks of causing damage to the liner from the use of machinery (presumably a long-reach excavator).</p> <p>It is unclear how exactly the dried pond solids will be removed and what measures will be in place to avoid damage to the liner, noting the absence of a protective layer over the HDPE liner.</p> <p>An improvement condition has therefore been added to the licence to require Westpork to prepare and submit a pond solids management plan, detailing how the solids will be removed and measures to protect the liner.</p> <p>Alternatively, the integrity of the liner must be properly inspected and certified as being fit-for-purpose after the solids have been removed from each trench, or the trenches are to be re-lined after each desludging event.</p>	- Improvement condition to prepare and submit a pond solids management plan
Mortalities management	Odour, from deceased animals burial pit	Unreasonable interference with the health and amenity of nearby sensitive receptors (>3.5 km)	Ensuring sufficient separation to nearby receptors	Low-level impact to amenity at local scale Minor	Not likely to occur in most circumstances Unlikely	Medium Acceptable, subject to regulatory controls	<p>The delegated officer considers there is sufficient separation in place (>3.5 km) to nearby receptors, and therefore does not reasonably foresee that odour from the mortalities pit will impact on the amenity or health of off-site human receptors, providing the mortalities are placed into the pit daily and immediately covered with 500 mm of sand/clay. As these controls are critical for maintaining an acceptable level of risk, they will be imposed on the licence as operational controls.</p>	- Deceased animals must be placed into the pit daily and immediately covered
	Nutrient-laden leachate from decomposing	Seepage/infiltration causing contamination of	Ensuring minimum 2 m separation to shallow	Low-level on-site impacts	Expected to occur in most	High Maybe	<p>The department's assessment of the works approval considered a minimum 2 m separation to groundwater and an assumption the depth to groundwater in</p>	- Improvement to require investigation into alternative carcass burial locations

Risk Event				Consequence rating ¹	Likelihood rating ¹	Risk ¹	Reasoning	Regulatory controls
Source/ Activities	Potential emissions	Potential receptors, pathway and impact	Applicant controls					
	animals	shallow groundwater Soil acidification Excessive build-up of soil P	groundwater	Minor	circumstances Almost certain	acceptable, subject to multiple regulatory controls	<p>the area was about 15 mbgl.</p> <p>Monitoring well MW7 located in proximity to the carcass burial pit, indicates a standing water level of around 5 mbgl; a review of the bore log indicates the soils in the location of the pits are deep yellow sands to a depth of 14 mbgl.</p> <p>Assuming the pits are excavated to a depth of 3-4 m, there would be insufficient separation to the seasonal groundwater table, and an inherently high risk of groundwater contamination as the carcasses decompose.</p> <p>The delegated officer therefore has imposed an improvement condition for Westpork to investigate more appropriate burial sites on the premises where there will be sufficient separation to groundwater, that is demonstrated by drilling results. A timeframe of 3 months will be imposed to ensure a timely cessation of the existing pit/s.</p> <p>Alternatively, it is preferred that mortalities are composted on-site to generate a useful by-product or taken off-site to a licensed composting or rendering facility.</p>	
Solids management	Nutrient-laden dried pond solids, following desludging		Dried pond sludge to be applied across utilisation area, with application rate based on NMP	Low-level on-site impacts Minor	Expected to occur in most circumstances Almost certain	High Maybe acceptable, subject to multiple regulatory controls	<p>The department has reviewed the premises' soil-landscape characteristics and considers the soil types on the premises are unsuitable for spreading high rates of nutrients (low PBI, low pH with toxic levels of aluminium in the subsoil, high risk of wind erosion and water repellence, shallow watertable, etc.), and that it would be difficult for the NMP provided with the application to be implemented without unacceptable impacts to the environment (see section 8 of this report).</p> <p>The delegated officer notes Westpork will analyse the dried pond solids prior to the first desludging event being required and will update the NMP; and is also investigating other options, such as off-site removal, on-site composting.</p> <p>In the interim, a control will be imposed on the licence to require to off-site removal of the solids to a licensed composting facility.</p>	- Dried pond solids must be removed off-site to a licensed composting facility

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

8. Solids management

Suitability of the premises' soil-landscape for spreading solids

The suitability of soil-landscapes for spreading solid waste depend on the productivity of the soils and the land degradation hazards associated with the practice.

The most common soils on this premises are yellow deep sands, interspersed with gravelly sands and pale deep sands, which occur on the slopes of rises across most of the property with landscapes to the east and south-east changing from rises to broad sandy filled valley and dune fields.

The key limitations to growing high yielding crops and pastures on this premises are therefore low water storage and low pH in the topsoil and subsoil, in addition to having a high risk of further acidification due to their relatively low pH buffering capacity.

The department is aware of the past agricultural use of this property and that historic crop yields have been constrained by the property's challenging soils (i.e., not by poor fertiliser use). A review of historical aerial imagery of the property indicate large areas of deep white sands high in the landscape which have poor water and nutrient holding capacity, and in addition to being prone to wind erosion, crop establishment is inherently difficult.

The soil's low water storage is related to the lack of clay in the root zone – which is confirmed by the bore logs for wells drilled on the property indicating sand extending to at least 14 m. The extra organic matter in the dried pond sludge may improve soil water holding capacity in the topsoil; but could also exacerbate the soils' inherent risk of water repellence.

During a soil capability assessment of the Midlands area in 2011 (Griffin et al 2019), a temporary soil pit was created on this property, with laboratory analysis of the soils indicating topsoil (0-10 cm) and subsoil (10-40 cm) pH (CaCl₂) of 5.4 and 4.4 respectively, which is well below the target threshold for soil pH, with aluminium levels of 0 and 7.1 ppm, respectively. In most Wheatbelt soils, aluminium reach toxic levels when subsurface pH (CaCl₂) falls below 4.8. Soil aluminium concentrations above 5 ppm are toxic to tolerant species, causing root pruning, resulting in poor crop and pasture growth, crop yield reduction and smaller grain size.

It is difficult to assess the capacity of the soils across the premises to assimilate nutrients, specifically phosphorus (P), from the limited soil testing from four drill holes (MW1 – MW4) provided in the nutrient management plan (NMP; Aurora Environmental 2017). Twelve soil samples at two depths (0-10 cm and 40-50 cm), collected from a sub-area of about 36 ha, is not an adequate representation of the property for environmental monitoring purposes – the pale deep sands in the eastern portion of the property have not been sampled or analysed.

The NMP includes Phosphorus Buffering Index (PBI) data which provides a measure of the P holding capacity of the soils. The reported PBI is generally less than 10, with 75% of samples rated as 'exceptionally low'. Two samples at 10 cm have 'exceedingly low' PBI of less than 5 and two samples at 40 cm have extremely low PBI of just above 10. Soils rated as having 'exceedingly low', 'exceptionally low', or 'extremely low' PBI only bind small amount of P, leaving most of the applied solid waste available for plant uptake and offer little to no buffering to the downward or sideways movement of P.

This is supported by the observation of the groundwater P concentrations of up to 1.3 mg/L in wells MW5 – MW8, which indicates that leaching of P is already occurring as this is relatively high, especially for soil with low topsoil P levels. In low PBI soils, once P moves beyond the root zone, it will leach to groundwater.

The NMP does not describe how nutrients will be removed from the soil profile, below the crop root zone.

Proposed rates of solids application

The spreading rates in the NMP are based on the assumption that P storage of the soil profile

above the groundwater is high. Section 5.4.4 of the NMP provides an estimate of the soil P storage potential of 9,000 kg/ha, based on a CSIRO methodology developed for irrigating tree plantations with treated wastewater – this example was also based on a uniform sandy loam soil (not uniform sand), and assumes storage occurs to a depth to groundwater.

The delegated officer does not agree with this estimate of P holding capacity on the following grounds:

- the CSIRO report states “some coastal sands have negative P retention and could release P when irrigated with effluent”. The paper CSIRO references is [Phosphorus sorption in relation to soil properties for the major soil types of south-western Australia](#). As this was a study of WA soils, a comprehensive soil study of this property would likely find these soils present;
- the depth to groundwater of 15 m does not account for the topographic variation across the property or the presence of the lake and surface expression of groundwater on the eastern boundary. It is also at variance to the most recent groundwater monitoring data for MW5 - MW8, which indicate standing water levels of less than 3.5 m;
- consequently, the P storage calculations (p28), which assume 15 m between the soil surface and the water table for the entire spreading area, are incorrect;
- perennial trees have a very deep root system and can extract nutrients throughout the year;
- annual crops and pastures have a shallow root system (0.6 m) and only have a winter nutrient extraction period; and
- the soils on the premises are uniform deep sands (75% of samples tested had exceptionally low PBI), not sandy loams (higher PBI).

P accumulation should only occur within the plant root zone, and only up to 95% of maximum soil storage capacity. Once P concentrations in soil have reached 95% of maximum soil storage capacity, no more P should take place. The proposed soil monitoring program does not quantify the soil P storage capacity.

Nutrient balance calculation

The executive summary of the NMP has an application rate of 50 kg of P per year, while the risk category allowance has the application rate at 70 kg of P per year (140 kg every 2 years), by assuming 20 kg of P is removed in cropping each year – both of which are very high.

Additionally, both application rates appear to be based on an incorrect assumption of [Water Quality Protection Note #22](#). The limited soil test results establish the PBI is below 10 in 83% of samples; therefore, the selection from Table O should be either category A or B, not category C. Based on Table O, an application of 10 or 20 kg of P would be the correct rate.

Whatever the case, Table O is a simplified nutrient risk assessment based on the inherent characteristics of the soil, independent of the method of applying nutrients, and is not appropriate for sites greater than 10 ha in area, in which a proven, scientifically based contaminant fate and transport model should be used.

For this premises, it is recommended that a Nutrient Mass Balance model is established based on the [Piggery Manure and Effluent Management and Reuse Guidelines](#), with the nutrient application rate based on nutrient content of the dried pond sludge. As the composition of pond sludge varies from piggery to piggery, a representative sample should be analysed annually, just before the main spreading time. Nutrient removal is the product of the crop yield and nutrient content of the harvested crop. As crop yields can also vary widely, historical yield data from this farm or other farms in the district can provide a guide. Nutrient application rates will need to be adjusted following dry seasons, which reduce yields.

The NMP assumes only 50% of applied nutrients is plant available – whilst this is correct for the first year of application, the remaining nutrients will become available in subsequent years. For year two and sequential years, in effect, all 50 kg or 70 kg of P is available and should be removed by cropping.

The assumptions in the NMP mean the nutrient balance overestimates the sustainable application rates of P and removal would require unrealistically high crop yields. A much larger area would be needed to sustainably spread the dried pond solids. If P application rates are based on assumptions made in the NMP, this site will already be leaking P into the groundwater.

Potential for degradation to the natural environment

The premises is composed of a number of soil types that have characteristics that are not suitable for spreading high rates of manures or synthetic fertilisers. The soils have low PBI, low pH with toxic levels of aluminium in the subsoil, high risk of wind erosion and water repellence which impact crop establishment, and in the east, a shallow water table. Groundwater monitoring results also indicate that P leaching is already occurring.

Given the soil constraints for this property, there is insufficient land area available for the spreading of all dried pond sludge generated from on-site activities.

There is also concern that concentrative effects through anaerobic digestion will increase the concentration of metals in the sludge.

9. Decision

Moora 3 operations

The delegated officer has determined the proposal to operate the Moora 3 piggery module, with an assessed design capacity of 34,000 pigs (35,675 SPUs equivalent), may pose an unacceptable risk of impacts to groundwater and other forms of land degradation from the proposed management of dried pond sludge and disposal of deceased animals.

The remaining aspects of the proposal, such as the siting, design, construction, and operation, have been assessed as being consistent with the current national environmental guidelines for the indoor pig industry (NEGIP), and do not pose an unacceptable risk of impacts to public health or the environment.

Pond solids removal

The delegated officer has concerns with the proposal to mechanically remove dried sludge from the settlement trenches; it is unclear how this can be done in a manner that does not pose a risk of causing damage to the underlying HDPE liner.

An improvement condition has therefore been added to the licence to require Westpork to prepare and submit a pond solids management plan, detailing how the solids will be removed and measures to protect the liner.

Following removal of the solids, it is expected the integrity of the liner will be properly inspected and certified as being fit-for-purpose after the solids have been removed from each trench, or alternatively, the trenches are to be re-lined after each desludging event.

Solids spreading

The delegated officer has concerns the NMP submitted with the original application can be implemented without environmental degradation occurring; there is contradicting information within and between the documents submitted in relation to waste management, insufficient information provided within the NMP, and the various test results, which indicate the premises has serious constraints, appearing to have been ignored (refer section 8).

Westpork recognise the NMP is not approved for implementation, and that the licence will not permit application to land. Given this is the first of Westpork's sites to install a CAP, Westpork plan on testing the solids in the first settlement trench to understand the waste characteristics before revisiting the nutrient balance calculations, to determine whether a revised NMP can be acceptable.

Westpork also advise it is investigating other options, including off-site disposal to a licensed

composting or organics recycling facility, or establishing its own infrastructure for on-site composting.

To address the uncertainty in the interim, the delegated officer has determined to impose conditions on the licence that require the off-site removal of dried pond sludge to a licensed composting facility. It is understood Westpork will make a decision at least 12 months prior to the first desludging event being required; however, the requirement to remove off-site will remain in place until an alternate proposal is put forward, assessed, and the licence amended.

Mortalities management

It is noted the location of the current carcass burial pit differs from the site that was proposed in the original application, which was central to the site and much higher in the landscape.

The delegated officer has concerns there is insufficient separation to the shallow groundwater table at the current carcass burial pit, with recent groundwater monitoring indicating a standing water level of around 5 mbgl. Assuming the depth to the base of the pit is around 3 – 4 m, and considering the deep yellow sands in this location, there is an unacceptable risk that seepage of contaminated fluid from decomposing animals is seeping to soil and groundwater.

An improvement condition has therefore been added to the licence for Westpork to investigate more appropriate burial sites on the premises where there will be sufficient separation to groundwater (demonstrated by drilling results) or construct a new disposal pit with a low permeability liner. A timeframe of 3 months will be imposed to ensure a timely cessation of the existing pit, prior to the upcoming 2024 winter period.

Cogeneration

Whilst the use of CAPs and engineered anaerobic digesters are considered industry best practice and have been in use at piggeries around the world for some time, the delegated officer notes it is still a relatively novel concept for the WA pork industry, with only one other such example in the state that was not constructed properly and subsequently failed, resulting in significant odour complaints. Cogeneration is also a novel concept in this state and the department is yet to have assessed an application for this technology for an intensive piggery.

The cogeneration plant at this premises was not assessed by the department and it was constructed by Westpork without approval; only the flaring of collected biogas has been assessed and approved at this site. Whilst the benefits of cogeneration are acknowledged, i.e., providing a source of electricity and heat for the piggery, in addition to reducing odour emissions (in theory), no information has been provided in terms of expected air quality to inform an assessment of risk to off-site receptors.

In the absence of information, the delegated officer considers there is sufficient separation in place to the nearest dwelling (>3.5 km) and that odour from the cogeneration plant would only be a potential issue for off-site receptors under upset or abnormal operating conditions. Controls on maintaining efficient operation of the co-generation plant are therefore critical for ensuring it does not present an odour risk.

The delegated officer also reserves the right to review this situation in the event that odour complaints are received that indicate the co-generation plant is significantly contributing to the issue.

Siting, design and construction

The delegated officer notes the siting and design of the piggery is consistent with current industry best practice standards, including:

- being located on priority agricultural land and well separated from populated areas and nearby (human) sensitive receptors;
- the piggery module being designed as a conventional shed system with concrete underfloor effluent collection channels and a 'pull-plug' system, in which effluent is flushed to a pond-based treatment system for eventual evaporation (no on-site discharges);

- the pond-based treatment being designed with a covered anaerobic pond, settlement trenches and evaporation ponds, which have all been constructed with a synthetic lining system, and combined are sufficiently sized to ensure the system spills no more frequently than an average of one in 20 years;
- use of a covered digestion pond (CAP), in which the digestion process removes up to 70% of volatile solids from the effluent (negating the need for pre-screening and reducing the frequency of pond desludging), and the gases produced are being captured and fed to a co-generation plant, that generates 100% of power and heat needs at the site (also eliminating the CAP as a significant odour source and minimising GHG emissions); and
- the pig sheds comprising full automation of the ventilation systems, which remove any manual controls for regulating temperature and animal welfare, thereby assisting in minimising odour emissions.

The delegated officer is satisfied the above controls and monitoring lower the overall risk profile of the premises and are critical for maintaining an acceptable level of risk of impacts during operations; as such they will be imposed on the licence as infrastructure design and operational controls.

Draft decision and applicant comments

Licence L9364/2022/1 that accompanies this report authorises emissions and discharges from ongoing operations of the Moora 3 module (35,675 SPU capacity). The conditions in the licence, as outlined in the above risk table, have been determined in accordance with the *Guideline: Setting Conditions* (DWER 2020).

Westpork was provided with drafts of the licence and this report on 19 February 2024, and sought only minor comments or clarifications, which have been updated in the final versions.

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.

References

1. Aurora Environmental 2017, *Westpork Moora Piggeries – Nutrient Management Plan V5*, report prepared for Westpork Pty Ltd, August 2017.
2. Australian Pork Ltd 2018, *National Environmental Guidelines for Indoor Piggeries* (NEGIP).
3. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
4. DER 2016, *Guidance Statement: Licence duration*, Perth, Western Australia.
5. Griffin, EA, Stuart-Street, A, van Wyk, L & Tille, PJ 2019, 'Soil capability assessment for expanding irrigated agriculture in the Dinner Hill focus area, Midlands, Western Australia', *Resource management technical report 406*, Department of Primary Industries and Regional Development, Perth.
6. Department of Primary Industries and Regional Development (DPIRD) 2021, *Soil Landscape Mapping* (DPIRD-027). Accessed from www.data.wa.gov.au.
7. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Risk*

Assessments, Perth, Western Australia.

8. Environmental & Air Quality Consulting Pty Ltd (EAQ) 2023a, *Odour impact assessment of Westpork Piggery, Dandaragan*, report prepared for Westpork Pty Ltd, April 2023.
9. EAQ 2023b, *Odour impact assessment of Westpork Piggery, Dandaragan*, report prepared for Westpork Pty Ltd, December 2023.
10. Water Direct 2017, *H2 level hydrogeological assessment, 898 Agaton Rd, Dandaragan*, report prepared for Westpork Pty Ltd, February 2017.