



Application for a works approval amendment

Division 3, Part V *Environmental Protection Act 1986*

Works approval number	W6330/2019/1
Works approval holder	Koojan Downs Pty Ltd
ACN	628 244 628
DWER file number	DER2019/000581
Premises	'Koojan Downs' Cattle Feedlot 1131 Boundary Rd YATHROO WA 6507
Date of report	23 November 2021
Status of report	Updated final

Amendment description

This amendment is made pursuant to section 59 of the *Environmental Protection Act 1986* (EP Act) to amend the existing works approval issued for a prescribed premises as set out below. This notice of amendment is hereby given under section 59B(9) of the EP Act.

This amendment relates to infrastructure changes regarding the proposed Koojan Downs cattle feedlot, which is subject to works approval W6330/2019/1.

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>.

Purpose and scope of assessment

Koojan Downs Pty Ltd (the works approval holder), is seeking approval to include the provision for alternative lining strategies for key feedlot infrastructure and other changes as follows:

- provision to install an alternative composite lining system for the feedlot pens, catch drains and main drains, sedimentation basins and effluent holding ponds, and solid waste stockpile and carcass composting areas;
- consolidation of the two sedimentation basins proposed in stage 1 into one larger sedimentation basin;
- construction of two dedicated solid waste stockpile and carcass composting areas, instead of one large area as originally proposed;
- a change in the method for determining evapotranspiration at the premises;
- inclusion of additional areas on the premises for solid waste utilisation; and
- correcting minor clerical errors.

Background

The works approval holder proposes to develop a large outdoor (open-air) cattle feedlot in the Yathroo/Koojan area, about 22 km southwest of Moora.

The facility is proposed to be developed in two stages, each having a capacity of 20,000 head (40,000 head total design capacity), and an animal feed manufacturing mill. Once constructed, the facility will be the largest of its kind assessed under the EP Act.

Works approval W6330/2019/1 was granted to the works approval holder in August 2020, which comprised of the following infrastructure:

- two stages of feedlot rows with an overall footprint of 735,000 m², underlain by a minimum 300 mm thick compacted clay liner (CCL);
- each set of rows constructed with a catch drain system, diverting surface runoff to several 3,000 kL sedimentation basins and two holding ponds (80,000 kL and 65,000 kL), all to be constructed with CCLs; and
- a solid waste stockpile and carcass composting area (60,000 m²), with its own sedimentation basin and holding pond, all to be constructed with CCLs.

Due to the large scale of the proposal, substantial volumes of suitable quality clay material are required to construct key site infrastructure. A geotechnical investigation of the premises suggested there were natural soils at the site that could be suitable for use as a clay liner, either on their own or mixed with other material (e.g., bentonite), but did not indicate whether there would be enough site-won materials to meet all construction requirements.

The proposed development is now under construction, with bulk earthworks relating to stage 1 elements (access roads, feedlot pens, sedimentation basins, effluent holding ponds, and solid waste stockpile pad) commencing in late August 2020.

Proposed amendments

Provision for alternative lining for feedlot pens, catch drains and main drains

The initial works approval application (RDC Engineers 2019) proposes that feedlot pens, catch drains and main drains will be underlain by a minimum 300 mm thick CCL with a permeability of 1×10^{-9} m/s or less, as per the requirements of the *National Guidelines for Beef Cattle Feedlots in Australia* (MLA 2012) (National Guidelines).

The existing works approval requires pens, catch drains and main drains to be clay lined to achieve a design permeability of 1×10^{-9} m/s or less.

Recent trials conducted on-site to prepare a compacted clay liner from site-won materials using bentonite enrichment have generally not been successful in achieving the required permeability. Therefore, due to concerns around the reliability of the in-situ material in consistently achieving the required permeability, the works approval holder is now seeking to include provision of using a synthetic option to replace the 300 mm thick CCL.

The works approval holder notes the National Guidelines (MLA 2012) allow provision for synthetic liners where suitable clay materials are unavailable, noting they tend to be more expensive, require specialist installation and are harder to protect from damage by cattle and cleaning equipment.

The works approval holder has investigated various options for alternative lining systems and has engaged a specialist lining consultant (Golder Associates) to assess different configurations of geosynthetic clay liner (GCL) and high-density polyethylene (HDPE) lining systems.

The selected alternative lining system proposed comprises the following:

- installation of a GCL on a prepared and compacted subgrade;
- GCL covered by 300 mm of site-won clay material (with a natural permeability of between 10^{-7} and 10^{-8} m/s), compacted to 95% relative dry density;
- a geocomposite drainage layer installed above the GCL within the surcharge layer; and
- compacted clay material capped by 150 mm of site-won gravel material, compacted to a minimum of 98% relative dry density.

As the pen area and drains will have no effective static fluid head, the works approval holder proposes to use the 'Elcoseal X800' GCL product, which is a needle punched GCL produced in Australia in accordance with relevant ISO standards. This GCL product has a minimum average roll value (MARV) of 3,700 g/m² of bentonite at 0% moisture content, which according to the manufacturer has been shown to have a technical hydraulic equivalency of a 300 mm CCL (about 2.5×10^{-11} m/s). The works approval holder proposes to implement a quality assurance and quality control system for the installation of the GCL.

The works approval holder proposes to use an alternative equivalent product with a MARV rating of equal to or greater than 3,700 g/m², if the Elcoseal X800 cannot be supplied within construction timeframes.

Golder Associates (2021) is of the opinion that a GCL would be suitable for use as a lining system under the pen areas, providing the material achieves a MARV of 3,700 g/m² of bentonite at 0% moisture content, and written confirmation is provided by the manufacturer that the hydraulic conductivity will be equivalent to 300 mm thick CCL with a permeability of less than 1×10^{-9} m/s when tested under site conditions, i.e., a confining pressure of 450 mm compacted cover soil and a hydraulic head over the GCL of 100 mm (representing surface runoff from a storm event).

The works approval holder proposes to implement procedures during the life of the operation to ensure the surcharge and gravel capping layers are maintained throughout all phases including pen cleaning, pen maintenance and repairs, to prevent the surcharge layer being exposed and to maintain the integrity of the GCL. This will be achieved by:

- equipping various items of facility mobile plant with machine control, such as the use of positioning tools and a display to provide machinery operators with a reference between the blade/bucket and the target surface;
- only using machines with control equipment installed for critical operations within areas with GCL, such as pen cleaning and maintenance; and
- maintenance of the surcharge thickness, to be verified annually.

Provision for alternative lining of sedimentation basins

The initial works approval application (RDC Engineers 2019) proposes that sedimentation basins will be underlain by a minimum 300 mm thick CCL with a permeability of 1×10^{-9} m/s or less, as per the requirements of the National Guidelines (MLA 2012).

The existing works approval requires sedimentation basins to be clay lined to achieve a design permeability of 1×10^{-9} m/s or less.

Due to concerns around the reliability of site-won material (see above), the works approval holder is now seeking to include provision of using a synthetic option to replace the 300 mm thick CCL.

The selected alternative lining system proposed comprises the following:

- installation of a GCL on a prepared and compacted subgrade;
- GCL covered by 300 mm of site-won clay material (with a natural permeability of between 10^{-7} and 10^{-8} m/s), compacted to 95% relative dry density; and
- compacted clay material capped by 150 mm of site-won gravel material, compacted to a minimum of 98% relative dry density.

As the sedimentation basins will operate with a static fluid head, the works approval holder proposes to use the 'Elcoseal X1000' GCL product, which is a needle punched GCL produced in Australia in accordance with relevant ISO standards. This GCL product has a MARV of 4,000 g/m² of bentonite at 0% moisture content, which according to the manufacturer has been shown to have a technical hydraulic equivalency of a 350 mm compacted clay liner (about 2.8×10^{-11} m/s). The works approval holder proposes to implement a quality assurance and quality control system for the installation of the GCL.

The works approval holder proposes to use an alternative equivalent product with a MARV rating of equal to or greater than 4,000 g/m², if the Elcoseal X1000 cannot be supplied within construction timeframes.

Consolidation of sedimentation basins

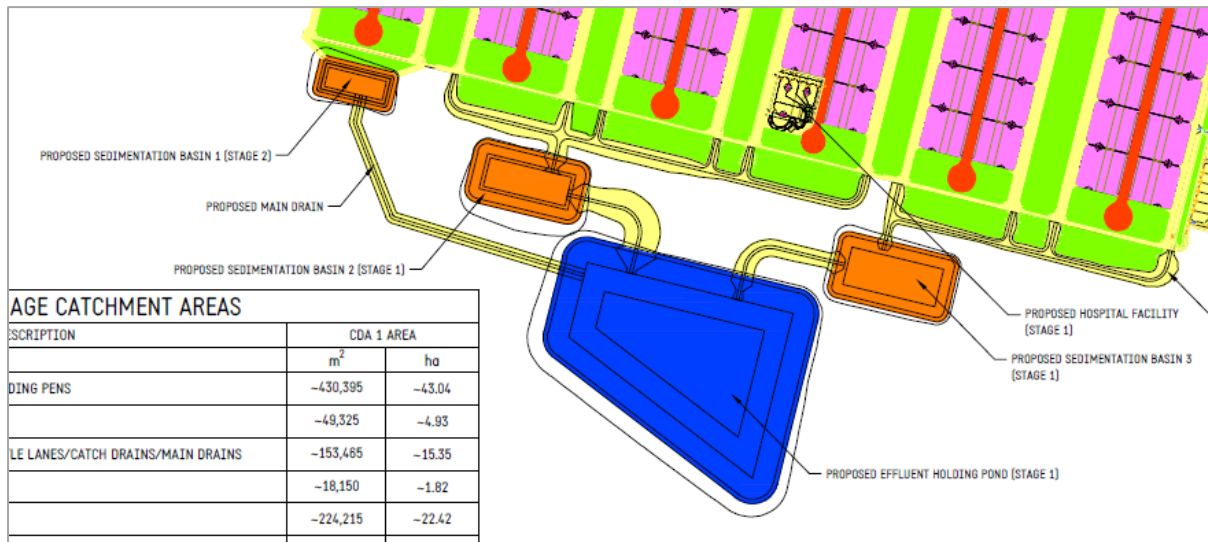
The initial works approval application (RDC Engineers 2019) proposes the construction of three dedicated sedimentation basins to service controlled drainage area 1 (CDA 1), with minimum proposed storage volumes of 2,000 m³, 3,500 m³ and 5,000 m³, respectively.

The existing works approval requires sedimentation basins to be designed with system volumes of between 1,775 m³ and 5,000 m³, with the three proposed basins for CDA 1 having volumes of 5,000 m³, 3,500 m³ (Stage 1) and 2,000 m³ (Stage 2) (Figure 1).

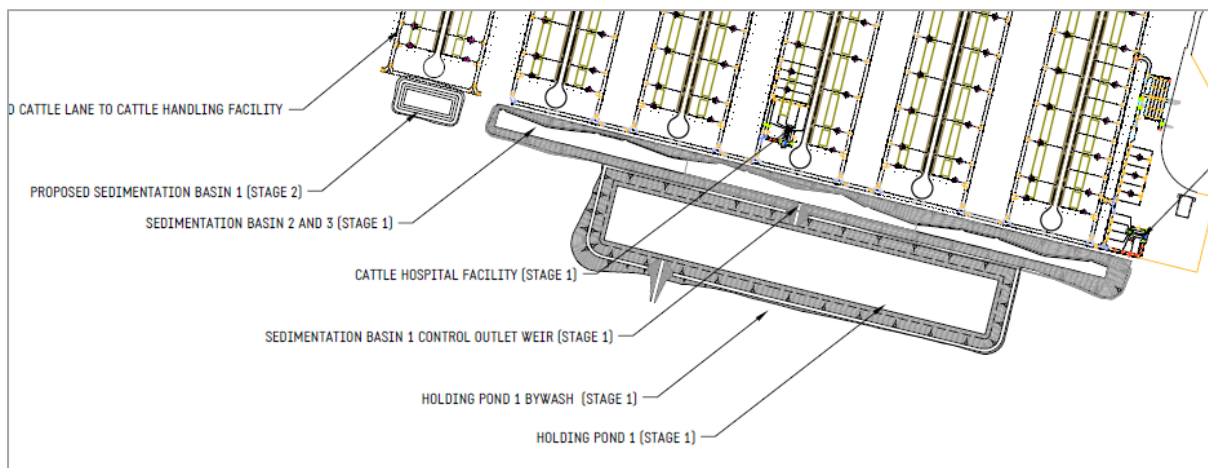
To obtain additional fill material for the earthworks design (Figure 2), the works approval holder proposes to consolidate the two separate sedimentation basins proposed in Stage 1 into one larger basin, with a capacity equal to the combined capacity of the individual basins, i.e., 8,500 m³.

Provision for alternative lining of effluent holding ponds

The initial works approval application (RDC Engineers 2019) proposes the two effluent holding ponds will be underlain by a minimum 450 mm thick CCL with a permeability of 1×10^{-9} m/s or less. The proposed thickness of the CCL exceeds the requirements of the National Guidelines (MLA 2012) to avoid the requirement to install an underdrainage and leak detection system, due to the presence of a shallow perched groundwater flow system beneath the ponds, and the long-term natural groundwater levels in the area (10 – 15 mbgl).



▲ **Figure 1: Original proposed sedimentation basins 2 & 3 for CDA 1 (orange)**



▲ **Figure 2: Proposed combined sedimentation basins 2 & 3 for Stage 1**

The existing works approval requires the two effluent holding ponds to be constructed with a CCL with a minimum thickness of 450 mm, constructed in three layers of 150 mm following compaction with an in-situ coefficient of permeability of 1×10^{-9} m/s or less.

Due to concerns around the reliability of site-won material (see above), the works approval holder is now seeking to include provision of using a synthetic option to replace the 450 mm thick CCL.

The selected alternative lining system proposed comprises the following:

- installation of a GCL on a prepared and compacted subgrade;
- GCL covered by 300 mm of site-won clay material (with a natural permeability of between 10^{-7} and 10^{-8} m/s), compacted to 95% relative dry density; and
- compacted clay material capped by 150 mm of site-won gravel material, compacted to a minimum of 98% relative dry density.

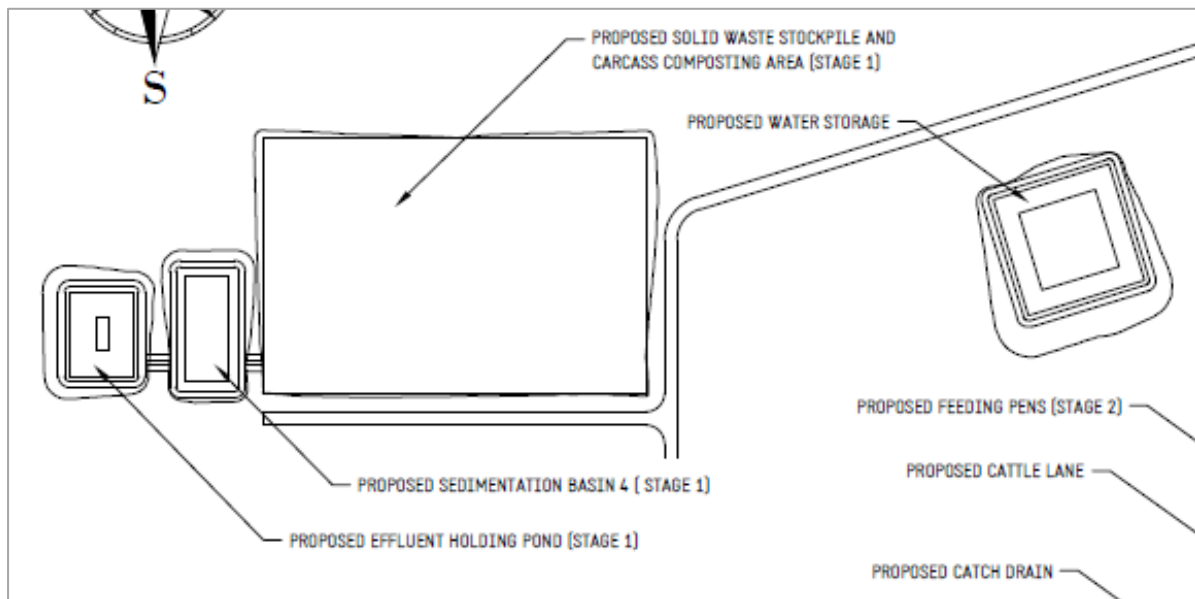
As the effluent holding ponds will operate with a static fluid head of no greater than 1.8 m, the works approval holder proposes to use the 'Elcoseal X1000' GCL product (see above). The GCL will be anchored (in accordance with manufacturer's guidelines) to cover the entire floor and all sloping sides of the ponds. The works approval holder proposes to implement a quality assurance and quality control system for the installation of the GCL.

The works approval holder proposes to use an alternative equivalent product with a MARV rating of equal to or greater than 4,000 g/m², if the Elcoseal X1000 cannot be supplied within construction timeframes.

Separation of solid waste stockpile and carcass composting area

The initial works approval application (RDC Engineers 2019) proposes the construction of a dedicated area for the temporary stockpiling of manure removed from pens and sludge from sedimentation basins and effluent holding ponds and composting of deceased animals. A total surface area of 60,000 m² had been initially proposed for solid waste stockpile and carcass composting, based on the estimated amount of wet scraped manure removed from the pens (30,010 t/yr) and mortalities from the full-scale development.

The existing works approval requires construction of a solid waste stockpile and carcass composting area with a minimum surface area of 60,000 m² (Figure 3).



▲ **Figure 3: Original proposed solid waste stockpile and carcass composting area**

The works approval holder now proposes to construct separate areas for this purpose for each of Stage 1 and Stage 2, to enable staged development and to have dedicated areas for managing the volumes of solid waste and mortalities generated from each stage (Figure 4).

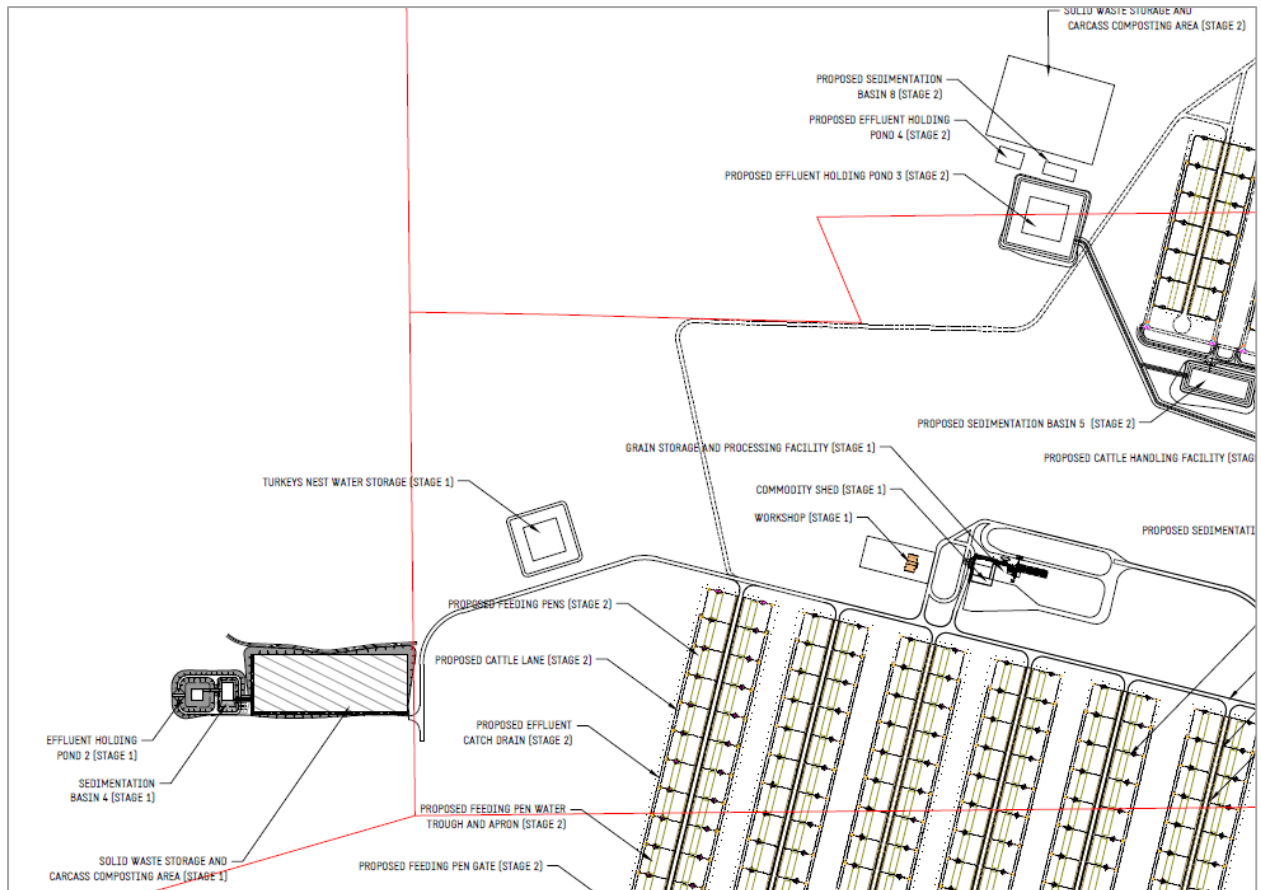
The storage, processing and/or composting of solid wastes from Stage 1, including the composting of mortalities from Stage 1, will be undertaken on a suitably designed and constructed area within CDA 2. Similarly, the storage, processing and/or composting of solid wastes for Stage 2 will be undertaken on a suitably designed and constructed area within CDA 4, in addition to the composting of mortalities.

The works approval holder has assumed windrow dimensions of about 25,000 m² of pad area is required to store and harvest manure for each stage, with an area set aside for composting mortalities adjacent to the manure stockpiles. The pads to be constructed will each comprise a total surface area of about 30,000 m².

Each solid waste stockpile and carcass composting area will constitute its own controlled drainage area, with each to be constructed with a dedicated sedimentation basin and effluent holding pond. The minimum storage capacity of each sedimentation basin is 1,000 m³ and each effluent holding pond 3,000 kL, which the works approval holder considers to be sufficient to retain runoff from a 95th percentile wet year.

Provision for alternative lining of solid waste stockpile and carcass composting areas

The initial works approval application (RDC Engineers 2019) proposes the solid waste stockpile and carcass composting area will be underlain by a minimum 300 mm thick CCL with a permeability of 1 x 10⁻⁹ m/s or less, as per the requirements of the National Guidelines (MLA 2012).



▲ **Figure 4: Proposed separate solid waste stockpile and carcass composting areas**

The existing works approval requires solid waste stockpile and carcass composting area to be constructed with a CCL with a minimum thickness of 300 mm, constructed in two layers of 150 mm following compaction with an in-situ coefficient of permeability of 1×10^{-9} m/s or less.

Due to concerns around the reliability of site-won material (see above), the works approval holder is now seeking to include provision of using a synthetic option to replace the 300 mm thick CCL.

The selected alternative lining system proposed comprises the following:

- installation of a GCL on a prepared and compacted subgrade;
- GCL covered by 300 mm of site-won clay material (with a natural permeability of between 10^{-7} and 10^{-8} m/s), compacted to 95% relative dry density;
- a geocomposite drainage layer installed above the GCL within the surcharge layer; and
- compacted clay material capped by 150 mm of site-won gravel material, compacted to a minimum of 98% relative dry density.

As the solid waste stockpile will have no effective static fluid head, the works approval holder proposes to use the 'Elcoseal X800' GCL product (see above). The works approval holder proposes to implement a quality assurance and quality control system for the installation of the GCL.

The works approval holder proposes to use an alternative equivalent product with a MARV rating of equal to or greater than $3,700 \text{ g/m}^2$, if the Elcoseal X800 cannot be supplied within construction timeframes.

The works approval holder proposes to implement procedures to ensure the GCL protective layering is repaired prior to the clay being exposed, to maintain the integrity of the GCL.

Method for estimating evapotranspiration

The existing works approval requires installation of a 'Class A' Evaporation pan (E_{pan}) capable of recording daily pan evaporation rates (daily manual readings), for the purpose of estimating evapotranspiration using site-specific data. This information would then assist in ensuring accurate water balance calculations for the effluent holding ponds and designing a suitable irrigation program for managing effluent in an acceptable and sustainable manner (future scope).

The works approval holder considers the Penman-Monteith equation, which calculates evapotranspiration using actual meteorological data (e.g., solar radiation, air temperature, humidity and wind speed), to be a more reliable method compared to E_{pan} data, and therefore requests the requirement to install a Class A pan be removed.

Updates to Schedule 1 maps

The works approval holder has provided updated maps to reflect the proposed changes to the staging of the solid waste stockpile and carcass composting areas, and reconfiguration of the sedimentation basins and effluent holding ponds.

The works approval holder has also provided an updated map that includes additional areas on the premises for solid waste utilisation.

Administrative

The works approval holder notes Table 4 includes an erroneous reference to Australian Standard "AS 6557.1" for water quality sampling requirements (should read AS/NZS 5667.1).

Update November 2021

Effluent holding pond 1

The recently amended works approval requires all infrastructure within the controlled drainage area to be constructed, certified and compliance reporting submitted, prior to the commencement of time limited operations for those feedlot pens.

After the amendment was granted, the works approval holder advised that due to construction delays there is a risk that effluent holding pond 1 may not be completed prior to its fixed date cattle entry deadline of 15 November 2021.

The works approval holder therefore seeks to include provision for commencing time limited operations prior to the completion of effluent holding 1, noting that all effluent catch drains, main catch drain and sedimentation basin 2 & 3 within the controlled drainage area for Stage 1 rows will have been constructed, certified and compliance reporting submitted by 15 November 2021. It is expected that construction of effluent holding pond 1 will be completed within 2 – 3 weeks of the cattle entry date, and that certification and compliance reporting for the pond will be submitted no later than 10 December 2021.

Until the effluent holding pond is ready, sedimentation basin 2 & 3 will be temporarily sealed to retain any effluent runoff that may be generated within the controlled drainage area. Once the effluent pond is completed, the control outlet weir will be removed.

Sedimentation basin 2 & 3 will be constructed with a minimum storage capacity of 8,500 m³, which the works approval holder considers to be more than sufficient to retain runoff that may occur during the 2 – 3 week period until the holding pond is ready.

Administrative changes

Changes have also been made to correct unintentional errors within Table 2 regarding the GCL QA requirements. Additionally, a correction has been made to the cross fall slope of the compost pad, to reflect changes made during the design phase to ensure most of the manure and compost would not scour off the pad.

Consultation

The Department of Primary Industries and Regional Development (DPIRD) advises the nature of the clay and gravel materials proposed for overlying the GCL has the potential to become saturated over time, which could have implications in terms of odour generation and reduced integrity of the surface lining. DPIRD recommends incorporation of a drainage system into the GCL design, to ensure successful operation of the GCL and associated layers.

DPIRD expects that organic material will accumulate over time within the gravel surface layer of the pens, which may impact on the effectiveness of the drainage system with drains spaced 53 m apart.

DPIRD queried the accuracy and reliability of water containment infrastructure sizing on the premises, and possible gaps in information used to achieve the proposed design. For example, when applying a cumulative winter runoff calculation to the 3.266 ha solid waste stockpile area, runoff volumes are 2-fold greater than reported.

Risk assessment

The table below describes the risk events associated with the amendments 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 (refer to conditions of the granted instrument)
Source/ Activities	Potential emissions	Potential receptors, pathway and impact	Works approval holder controls					
PROPOSED AMENDMENTS								
Provision for alternative lining of feedlot pens, catch drains and main drains, and solid waste stockpile areas	Nutrient-laden leachate from manure, urine, mobilised by surface water runoff	Seepage/infiltration, causing contamination of shallow ephemeral perched groundwater and deeper permanent watertable	Installation of GCL (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 Moderate	Not likely to occur in most circumstances Unlikely	Medium Acceptable, subject to regulatory controls	<p>The delegated officer notes the works approval holder has investigated various options for alternative lining systems, engaged a specialist lining consultant to assess different configurations of synthetic liners, and has based its proposal to use GCL on the recommendations of the specialist.</p> <p>The proposed GCL for non-water holding infrastructure has a MARV rating of 3,700 g/m² of bentonite at 0% moisture, which according to the manufacturer has a technical hydraulic equivalency of a 300 mm compacted clay liner (about 2.5 x 10⁻¹¹ m/s).</p> <p>The works approval holder will ensure the GCL is installed by specialist contractors and all works conducted in accordance with quality assurance and quality control to relevant standards.</p> <p>Although the GCL approach is technically consistent with the National Guidelines (MLA 2012), 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.</p> <p>However, the delegated officer notes the additional design controls proposed by the works approval holder, such as provision of a minimum 450 mm compacted clay and gravel surcharge (protection) layer overlying the GCL, and installation of a drainage layer between the GCL and surcharge to prevent ponding effects. In addition, the works approval holder 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.</p> <p>Based on the above, the delegated officer considers the installation of GCL will provide a similar level of protection to shallow perched groundwater at the site as a CCL, providing the GCL is installed in accordance with industry standards and an appropriate surcharge layer is maintained, in conjunction with an appropriate drainage layer, to protect the ongoing integrity of the GCL.</p> <p>As the proposed controls are critical for ensuring an acceptable level of risk is maintained should the works approval holder elect to install a GCL, they will be imposed on the amended works approval.</p> <p>A Construction and Quality Assurance Validation Report will be required to be submitted upon completion of installation, and all controlled drainage infrastructure will need to be constructed and relevant compliance reporting submitted, prior to the commencement of time limited operations for specified feedlot pens and solid waste stockpile areas.</p>	<p>Infrastructure requirements specified – option to use CCL or GCL</p> <p>GCL QA requirements specified</p> <p>Must submit QA validation report and controlled drainage infrastructure must be in place before stocking pens</p> <p>Operational requirements specified during TLO – must use machine control-equipped mobile plant for cleaning, must ensure minimum 450 thick surcharge protection layer</p>
Provision for alternative lining of sedimentation basins and effluent holding ponds			Installation of GCL (Elcoseal X1000), overlain by a drainage layer and 450 mm capping (300 mm compacted clay and 150 mm compacted gravel)	Mid-level on-site impacts Moderate	Not likely to occur in most circumstances Unlikely	Medium Acceptable, subject to regulatory controls	<p>The delegated officer is satisfied that a higher grade GCL is proposed for lining basins and ponds that will operate with a static fluid head, i.e., will contain effluent, for protection of the underlying shallow perched groundwater at the site.</p> <p>Similar to the feedlot pens, the key concerns relate to damage of the GCL by machinery during cleaning events. However, the delegated officer is satisfied this risk can be mitigated by the proposed machinery controls, which will ensure the risk of damage to the surcharge and protection layer is acceptable.</p> <p>As the proposed controls are critical for ensuring an acceptable level of risk is maintained should the works approval holder elect to install a GCL, they will be imposed on the amended works approval.</p> <p>A Construction and Quality Assurance Validation Report will also be required to be submitted upon completion of installation and submitted along with the relevant compliance reporting.</p>	As above

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

Decision

Provision for alternative lining for feedlot pens, drains and solid waste stockpile areas

The delegated officer has determined the installation of the proposed alternative lining system for feedlot pens, effluent catch drains and main drains and solid waste stockpile areas does not pose an unacceptable risk of impacts to shallow perched groundwater underlying the site. This determination is based on the following:

- the proposal being consistent with the National Guidelines, which includes provision for using synthetic lining systems where suitable clay materials are not available;
- the GCL product proposed (Elcoseal X800) having an equivalent hydraulic conductivity to a 300 mm thick CCL (2.5×10^{-11} m/s);
- there being adequate protection layers installed above the GCL, comprising 300 mm of site-won compacted clay material and 150 mm thick compacted gravel material;
- there being a sub-surface drainage layer installed between the GCL and surcharge layers, to minimise the potential for the GCL layer to cause saturation of the surcharge layer; and
- there being adequate controls proposed for protecting the integrity of the GCL by ensuring minimal damage to the surcharge layer, such as the use of machine control-equipped mobile plant for cleaning the pens, drains and stockpile areas, in addition to routine monitoring and annual verification of the surcharge thickness.

The delegated officer notes the absence of examples within Australia where GCLs have been successfully used for lining feedlot pen floors, and that it is generally a more expensive option that requires specialist installation and are harder to protect, when compared to more conventional CCL systems. However, the delegated officer is satisfied the alternative system as proposed will achieve a similar, if not greater, outcome than a 300 mm thick CCL lining system and does not significantly change the risk profile of the feedlot, providing the system is installed in accordance with industry standards and with appropriate quality assurance and quality control procedures in place, and the proposed controls for protecting the surcharge thickness during operations are appropriately implemented.

The delegated officer has therefore determined to include provision in the amended works approval for installation of the alternative lining system as proposed, with the infrastructure requirements and QA requirements clearly set out in new conditions (conditions 1 – 8).

Provision for alternative lining of sedimentation basins

The delegated officer has determined the installation of the proposed alternative lining system for sedimentation basins does not pose an unacceptable risk of impacts to shallow perched groundwater underlying the site. This determination is based on the same grounds listed above, noting a higher standard GCL product is proposed (Elcoseal X1000) having an equivalent hydraulic conductivity to a 350 mm thick CCL (2.8×10^{-11} m/s), due to the basins being operated with a static fluid head.

The delegated officer is satisfied the alternative system as proposed will achieve a similar, if not greater, outcome than the originally proposed 300 mm thick CCL lining system and does not significantly change the risk profile of the sedimentation basins, providing the system is installed in accordance with industry standards and with appropriate quality assurance and quality control procedures in place, and the proposed controls for protecting the surcharge thickness during cleaning operations are appropriately implemented.

The delegated officer has therefore determined to include provision in the amended works approval for installation of the alternative lining system as proposed, with the infrastructure requirements and QA requirements clearly set out in new conditions (conditions 1 – 8).

Consolidation of sedimentation basins

The delegated officer has considered the proposal to consolidate the two smaller

sedimentation basins for CDA 1 into one larger basin, noting the overall volumetric capacity will remain unchanged from the original design.

Analysis indicates the water containment infrastructure sizing calculations appear to be conservative based on the limited information provided with the application, however DWER is unable to verify the reliability of the results without more detailed water balance calculations. The delegated officer also notes there are inconsistencies elements with the information provided, in particular, the reports submitted by RDC Engineers (2021) and Johns Environmental (2019) use inconsistent language and terminology, make references to different controlled drainage areas that have not been clearly defined, and do not provide a year-on-year water balance. For example, it is unclear whether there will be any residual volume remaining in the ponds, and whether this has been accounted for in the water balance calculations.

The delegated officer has therefore determined to authorise the consolidation of the CDA 1 sedimentation basins into one larger basin, however, a more detailed water balance is required to determine whether the proposed containment infrastructure is appropriately sized for ongoing operations (e.g., includes cumulative winter runoff calculations and all proposed management of effluent volumes (e.g., use in composting, effluent irrigation, etc.), or whether additional management measures or controls are required. Should a more detailed water balance indicate that existing conservative predictions underestimate necessary sedimentation basin capacity, the works approval holder will need to rectify this issue, which may include a requirement to provide additional basis storage capacity.

Note: DWER has written to the works approval holder separate to this application on this aspect.

Provision for alternative lining of effluent holding ponds

The delegated officer has determined the installation of the proposed alternative lining system for the effluent holding ponds does not pose an unacceptable risk of impacts to shallow perched groundwater underlying the site. This determination is based on the same grounds listed above, noting a higher standard GCL product is proposed (Elcoseal X1000) having an equivalent hydraulic conductivity to a 350 mm thick CCL (2.8×10^{-11} m/s), due to the ponds being operated with a static fluid head.

The delegated officer is satisfied the alternative system as proposed will achieve a similar, if not greater, outcome than the originally proposed 450 mm thick CCL lining system and does not significantly change the risk profile of the holding ponds, providing the GCL system is installed in accordance with industry standards and with appropriate quality assurance and quality control procedures in place.

The delegated officer also notes that recent monitoring of groundwater levels indicates only 1 m separation between the base of holding pond 1 and the underlying perched watertable – it is therefore critical that soils beneath the GCL liner and on the batter slopes are suitably compacted to further reduce the risk of seepage taking place.

The delegated officer has therefore determined to include provision in the amended works approval for installation of the alternative lining system as proposed, with the infrastructure requirements and QA requirements clearly set out in new conditions (conditions 1 – 8).

Separation of solid waste stockpile and carcass composting area

The delegated officer has considered the proposal to stage the development of the solid waste stockpile area, by constructing separate stockpile areas for each stage of the project.

It is noted the solid waste stockpile and carcass composting area proposed in the initial works approval application was sized on the estimated volume of solid waste proposed from the full development, with the proposal now to essentially split this area in half and construct separate stockpile areas, each with their own controlled drainage area, sedimentation basin and holding pond.

Whilst the delegated officer does not object in principle to this proposed change, which will be

authorised through this amendment process, a more detailed water balance is required for these proposed changes to demonstrate the containment infrastructure is appropriately sized.

Note: DWER has written to the works approval holder separate to this amendment on this aspect.

Method for estimating evapotranspiration

The delegated officer notes that specification of the 'Class A' type evaporation pan in the works approval was based on this being the standard device used for manual measurement of evaporation by the Australian Bureau of Meteorology.

However, the Penman-Monteith equation is considered a suitable alternative to an evaporation pan, providing the meteorological data used in the equation is obtained from a site as close to the holding ponds as possible, to minimise the degree of uncertainty of evaporation estimates.

Updates to Schedule 1 maps

The delegated officer has reviewed the updated site layout map provided by the works approval holder, that reflects the proposed changes to the staging of the solid waste stockpile and carcass composting areas, and reconfiguration of the sedimentation basins and effluent holding ponds. The Schedule 1 map in the amended works approval has been updated accordingly.

The delegated officer notes the updated effluent and solid waste utilisation map provided by the works approval holder, with additional utilisation areas included, however, advises that effluent and solid waste utilisation has not been assessed or authorised as part of this original works approval application. Upon review, the delegated officer considers the existing works approval should not include any conditions or map(s) that provide any implied authorisation of this aspect of the proposal. As such, existing controls in Table 1 relating to the 'effluent utilisation area' and the 'Effluent and solid waste utilisation area map' in Schedule 1 have been removed as part of this amendment and will instead be assessed as part of the licence application.

Note: DWER has written to the works approval holder separate to this amendment on this aspect.

Administrative

The erroneous reference to Australian Standard "AS 6557.1" in Table 4 has been corrected to AS/NZS 5667.1.

Works approval update

In amending the works approval, the delegated officer has also made several changes to improve clarity and enforceability of conditions, and to ensure consistency with recent approvals issued for similar proposals. These changes include:

- restructuring the infrastructure table, by:
 - clearly delineating infrastructure authorised under each of Stage 1 and Stage 2;
 - specifying key design requirements for each type of infrastructure, such as dimensions, capacity and lining requirements; and
 - specifying the infrastructure in each controlled drainage area,
- including separate conditions for specifying minimum requirements for lining system options, including quality assurance and quality control requirements and validation reporting;
- including provision for separate compliance reporting for Stage 1 and Stage 2, and improving clarity of compliance reporting requirements;
- providing further clarity on time limited operations, where feedlot pens can only be stocked once all infrastructure within the relevant controlled drainage area has been constructed and all compliance reporting and QA validation reporting has been submitted;
- restructuring the infrastructure requirements table under time limited operations, by:
 - allocating letters to feedlot rows, for compliance reference purposes;

- specifying minimum pen cleaning requirements and authorised location of manure stockpiling;
- specifying minimum controls for protection of the surcharge layer of surfaces with GCLs installed beneath (see above);
- specifying minimum maintenance controls for effluent catch drains, controlled drainage areas and sedimentation basins;
- specifying minimum composting requirements, consistent with the National Guidelines,
- including general monitoring conditions to provide further clarity and enforceability for monitoring purposes;
- addition of newly installed groundwater monitoring bores in Table 5;
- replacing the existing requirements to prepare a soil monitoring program with standard soil monitoring requirements, consistent with recent approvals;
- inclusion of additional definitions for newly defined terms;
- revision of condition numbers, and removal of redundant conditions and realigning condition numbers for numerical consistency; and
- correction of clerical mistakes and unintentional errors.

The decision report for the original works approval will remain on the DWER website for future reference and will act as a record of DWER's decision making.

Update November 2021

The delegated officer has determined to allow the commencement of time limited operations for Stage 1 feedlot rows prior to the effluent holding pond being ready, on the provision the holding pond is completed within 2 – 3 weeks of the cattle entry date, i.e., no later than 10 December 2021.

The delegated officer notes the average monthly rainfall for November for Moora is 17 mm, therefore the sedimentation basin will have sufficient capacity to contain any effluent runoff that may occur for the 2 – 3 week period until the holding pond comes online.

The delegated officer has also determined to correct unintentional errors within Table 2 and to update the cross fall slope specified for the compost pad.

Consultation

The works approval holder was provided with drafts of the revised works approval and this report on 17 September 2021 and sought only minor corrections and clarifications that were accepted by the delegated officer.

The works approval holder sought clarification on condition 8, which is the requirement to have a geosynthetic liner installation Construction Quality Assurance Validation Report (CQAVR) written and certified by the qualified professional engineer that completed the Construction Quality Assurance (CQA). The final wording of condition 8 was revised to allow flexibility for the CQAVR to be prepared and certified by a qualified professional engineer that did not necessarily complete the CQA.

The works approval holder also sought clarification on the interpretation of condition 10 requirements for submitting an ECR for stage 1 and stage 2. The condition as drafted provisioned for two ECR's, to be submitted within 30 days of completing all infrastructure for each respective stage and facilitating transition to time limited operations (TLO) as soon as practical completion of the cattle handling facility, Row A and associated feed roads and drainage infrastructure.

Condition 10, as written in the draft amended works approval, provisioned for an ECR at the completion of stage 1 to enable transition to stage 1 TLO and a separate ECR for stage 2. The final wording was revised to provide the option for the works approval holder to submitted ECR's for individual items of infrastructure within each stage at its discretion. The delegated officer notes that the works approval holder will be unable to transition to stage 1 TLO until all stage 1 infrastructure is completed and all relevant ECR's for that stage submitted (similarly

for stage 2). This is to ensure all relevant infrastructure for that stage is complete, in particular controlled drainage components.

Conclusion

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

Summary of amendments

The below table provides a summary of the proposed amendments and will act as a record of implemented changes. All proposed changes have been incorporated into the revised works approval as part of the amendment process.

Condition no.	Proposed amendments
Cover page	Restructured table to clearly delineate Stage 1 and Stage 2 design capacity, in animal numbers and SCUs
Works approval history	Inserted, consistent with current DWER template
Interpretation	Updated dot point (d), consistent with current DWER template
Condition 1, Table 1	<p>Restructured, to clearly delineate key infrastructure in Stage 1 and Stage 2:</p> <ul style="list-style-type: none"> • Added design requirements for cattle handling facility, as per application; • Clearly describe number of feedlot rows and number of pens per row and corresponding dimensions, and identified on Schedule 1 infrastructure map; • Update to specification of floor lining requirements; • Clearly describe effluent catch drains for all rows, including dimensions, and update to specification of lining requirements; • Inserted clear description of controlled drainage areas, including minimum design requirements; • Clearly describe sedimentation basins for each stage, including minimum design requirements and update to specification of lining requirements; • Clearly describe effluent holding ponds for each stage, including minimum design requirements and update to specification of lining requirements; • Clearly describe solid waste storage and carcass composting areas, including minimum design requirements and update to specification of lining requirements – update reflects separate areas for each stage; • Deleted reference to 'effluent utilisation area', as this will be assessed under the licence application; • Updated 'grain storage and processing facility' to describe key infrastructure – Schedule 1 maps removed as considered superfluous; • Deleted requirement for 'flow meters', as this will be addressed under the licence application; • Updated requirement for 'weather station', deleted reference to installation of Class A evaporation pan; • Long fall slope updated to reflect design phase changes
Conditions 2 – 4 (new)	Inserted new conditions specifying lining options for key infrastructure, including minimum requirements for lining materials
Conditions 5 – 8 (new)	<ul style="list-style-type: none"> • Inserted new conditions specifying QA requirements for GCLs, including minimum requirements for materials testing and

	<p>construction quality assurance validation reporting;</p> <ul style="list-style-type: none"> • <u>QA requirements corrected to reflect manufacturer recommended testing frequencies</u>
Condition 9 (previously condition 2*)	Deleted requirement for installation of groundwater monitoring bores in effluent utilisation areas, as this will be assessed under the licence application
Conditions 10 & 11 (3 & 4*)	Updated compliance reporting conditions, to clearly delineate reporting for each stage (to allow TLO following completion of Stage 1). Inserted new requirements for submission of clay materials testing and QA reporting for GCLs
Condition 12 (new)	Inserted new provision to allow for re-certification of works that may initially be certified as being non-compliant
Condition 13 (5*)	Updated TLO condition, to clearly stipulate that TLO (i.e., stocking of pens) may not commence until all key infrastructure within the relevant controlled drainage area has been constructed, QA requirements have been met and compliance reporting submitted
Condition 15 (*7)	Restructured, to clearly stipulate operational requirements for key infrastructure, consistent with recent approvals: <ul style="list-style-type: none"> • Inserted maximum stocking density within pens, as per application; • Inserted minimum pen cleaning requirements, including frequency of manure removal and use of machine control-equipped machinery only within pens; • Inserted requirement to maintain 450 mm thickness of surcharge layer above GCL (± 75 mm); • Inserted requirement to maintain effluent catch drains and controlled drainage areas such that effluent can freely drain to sedimentation basin(s); • Inserted minimum operational requirements for sedimentation basins, including desludging and freeboard; • Inserted requirement for all manure removed from pens and deceased animals to be stockpiled on the designated solid waste stockpile area; • Inserted minimum operational requirements for carcass composting, consistent with the National Guidelines.
Conditions 16 – 19 (new)	Inserted standard conditions specifying general monitoring requirements, such as specifying relevant standards for each monitoring type, minimum timeframe between sampling events and equipment calibration requirements
Condition 20 (8*), Table 5	Updated, to include reference points of recently installed groundwater monitoring bore locations (KMB08 – KMB13, KMB 15 – KMB17) Change ‘three-monthly’ to ‘quarterly’
Condition 21 (11 & 12*)	Requirement to submit a soil monitoring strategy replaced by an outcomes-based soil monitoring program for the proposed effluent and solid waste utilisation areas, consistent with similar recent approvals for irrigation with nutrient-rich wastewater. Program requires gathering baseline data for each proposed paddock, that will be used for designing a suitable irrigation program for managing effluent in an acceptable and sustainable manner (assessed under the licence application)
Condition 22 (9*)	Updated, consistent with monitoring records for similar operations
Condition 25 (15*)	Updated, to include reporting of maintenance of infrastructure, soil monitoring and inputs and outputs
Definitions	Definitions removed: ‘AS 1726’, ‘wastewater – conditions which contained these references have been removed as part of this

	amendment
	Definitions added: 'ASPAC', 'ASPAC certification', 'averaging period', 'books', 'CBR', 'DPIRD guidelines for soil sampling', 'low risk feedstock', 'MARV', 'NATA', 'NATA accreditation', 'prescribed premises', 'Phosphorus retention index (PRI)', 'quarterly', 'spot sample'
Schedule 1: Maps	Premises map updated. Map of key infrastructure updated. Feedmill design and layout maps deleted. Effluent and solid waste utilisation area map deleted.

References

1. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Risk Assessments*, Perth, Western Australia.
2. Golder Associates Pty Ltd (Golder Associates) 2021, *Geosynthetic liner operations assessment for Stage 1 intensive feeding pens, Koojan Downs feedlot, near Moora, Western Australia*. Technical memorandum prepared for Koojan Downs Pty Ltd, April 2021.
3. Johns Environmental Group Pty Ltd (Johns Environmental) 2019, *Runoff determination and pond sizing for the Koojan Downs beef cattle feeding facility at Moora WA*. Report prepared for RDC Engineers Pty Ltd, October 2019.
4. Meat and Livestock Australia (MLA) 2012, *National Guidelines for Beef Cattle Feedlots in Australia, 2nd Ed*. Meat & Livestock Australia Limited.
5. RDC Engineers Pty Ltd (RDC Engineers) 2019, *Works approval application and supporting information for proposed beef cattle feeding facility on Koojan Downs*. Prepared for Koojan Downs Pty Ltd, October 2019.
6. RDC Engineers 2021, *Works Approval W6330/2019/1, Amendment application A – Supporting information*. Prepared for Koojan Downs Pty Ltd, April 2021.