PLANNING REPORT & STATEMENT OF ENVIRONMENTAL EFFECTS

Proposed intensive livestock agriculture facility (sheep feedlot)

'Culverley Rise', 198 Humphreys Road, Bungowannah

July 2020

Prepared by:

Blueprint Planning

For:

Bungowannah Pastoral Company Pty Ltd

T: 02 6023 6844
E: office@blueprintplanning.com.au
W: www.blueprintplanning.com.au

blueprint PLANNING & DEVELOPMENT

blueprint | PLANNING & DEVELOPMENT

Document Control

Ref.	Version No.	Date	Revision Details	Author
1109	1	08/07/2020	Final	JL
	2	09/07/2020	Final (typo p. 1)	JL

TABLE OF CONTENTS

Appendices

Figures

Tables

1.0 INTRODUCTION

1.1 Purpose of report

The purpose of this report is to provide information in accordance with the *Environmental Planning and Assessment Act 1979* (EP&A Act), the *Environmental Planning and Assessment Regulation 2000* (EP&A Regs), and relevant land use and development policies and guidelines to inform the statutory development application and development assessment process.

More specifically, this report has been prepared in accordance with clause 50(1)(a) of the EP&A Regs and is to be included in a development application (DA) to the Greater Hume Council (Council) seeking development consent.

Firstly, this report discusses the location of the proposed development and then an overview of surrounding land uses is provided. The statutory town planning development assessment framework applicable to the land and the development is then introduced, followed by a description of the land and the development. Then assessment responses to relevant land use and development planning polices and guidelines is provided.

1.2 The Proposal

This DA, in general terms, is for a sheep feedlot (the Proposal). The Proposal more fully described in this report and its appendices and is shown in the **attached** DA concept plans (the DA plan set).

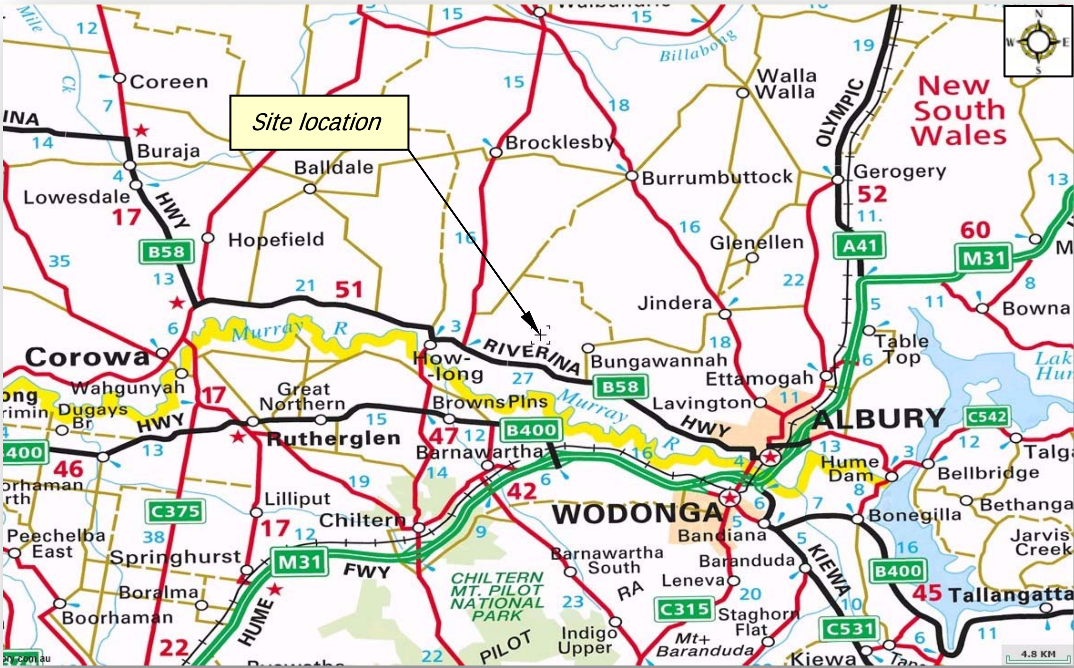
1.3 The Site

The land is located at ‘Culverley Rise’, 198 Humphreys Road, Bungowannah, and is otherwise known as Lot 7 DP665615, Lot 7 DP665616, and Lots 74, 75, 102, 276 and 300 DP753749) (the Site). The Site is located approximately 8 Kilometres to the east-northeast of Howlong and approximately 21 kilometres northwest of Albury. Vehicle access to the Site is via Humphreys Road.

A location map of the Site is shown at **Figure 1** and aerial photographs, cadastre and topographic information is shown at **Figure 2**, **Figure 3** and **Figure 4**. Title diagrams of the Site and related documentation are provided at **Appendix A**.

A description of the Site and surrounding land use and development context is provided at **Section 2.1**.

<u>Figure 1</u>: Location map



<u>Source</u>: Street Directory (2020).

1.4 Current land use

The Site is currently used for agricultural grazing and cropping purposes as generally shown in **Figure 2**, **Figure 3** and **Figure 4**.

1.5 Statutory land use and development assessment framework

1.5.1 Legislation

<u>Federal</u>

Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) applies to the Site and the Proposal in regard to whether any environmental assessment issue may warrant that an activity approval under the EPBC Act be obtained.

Figure 2: Aerial photograph of the Site and surrounding area

Source: Nearmap (27 February 2020).

<u>Figure 3</u>: Aerial photograph of the Site and surrounding area with cadastre

<u>Source</u>: SIX Maps (aerial photograph 22 February 2014).

<u>Figure 4</u>: Topographic map of the Site and surrounding area with cadastre

<u>Source</u>: SIX Maps.

State

Environmental Planning and Assessment Act 1979

Part 4 of the EP&A Act applies to the Proposal, and pursuant to sections 4.10 and 4.46 of the EP&A Act the Proposal is not respectively identified as "designated development" or "integrated development".

Environmental Planning and Assessment Regulation 2000

The reason why the Proposal is not identified as "designated development" under section 4.10 of the EP&A Act is because the Proposal is not identified as "intensive livestock agriculture" under clause 21(1) of Part 1 of Schedule 3 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Act)– namely the design capacity of the Proposal is less than 4,000 sheep –

> *21* ***Intensive livestock agriculture***
> *(1) Feedlots that accommodate in a confinement area and rear or fatten (wholly or substantially) on prepared or manufactured feed, more than 1,000 head of cattle or 4,000 sheep (excluding facilities for drought or similar emergency relief).*

For the purposes of section 50(1)(c) and Part 1 of Schedule 1 of the EP&A Regs this report including the Environmental Assessment Report at **Appendix C** comprises the required 'Statement of Environmental Effects' including identification of –

- the environmental impacts of the development,
- how the environmental impacts of the development have been identified,
- the steps to be taken to protect the environment or to lessen the expected harm to the environment, and
- any matters required to be indicated by any guidelines issued by the Planning Secretary.

Biodiversity Conservation Act 2016

A 'rapid assessment' was carried out for the Proposal to determine if a 'test of significance report' (to determine whether the Proposal is likely to significantly affect threatened species or ecological communities, or their habitats) was required under Section 7.3 of the *Biodiversity Conservation Act 2016* (BC Act) or if a 'biodiversity development assessment report' was required under Section 7.7 of the BC Act. The 'rapid assessment' revealed that a 'test of significance report' was required which is provided in the Vegetation Assessment Report at **Appendix E**.

Protection of the Environment Operations Act 1997

The Proposal does not require an Environment Protection Licence (EPL) under sections 43(b), 48 and 55 of the *Protection of the Environment Operations Act 1997* (PEO Act) because the design capacity of the Proposal is less than 4,000 sheep pursuant to clause 22 of Part 1 of Schedule 1 of the PEO Act –

> *22* ***Livestock intensive activities***
> *capacity to accommodate more than...4,000 sheep...at any time*

It is also noted that the proposed waste management procedure of composting manure and deceased sheep does not require an EPL under clause 12 of Part 1 of Schedule 1 of the PEO Act as no composting of any material sourced from outside the Site is proposed.

Water Management Act 2000

Water use approvals

The Proposal benefits from an existing 500ML groundwater bore via Water Access Licence No. 29951 and Work Approval No. 50CA507720 under section 89 of the *Water Management Act 2000* (WM Act) as shown at **Appendix A**. This groundwater bore has been pump and quality tested and found suitable for all supply needs for the Proposal.

Activity approvals

No part of the Proposal is located within "waterfront land"[1] within the meaning of the WM Act except for the proposed internal vehicle access road located along the eastern lot boundary of the Site where it crosses a minor drainage line as shown in the **attached** DA plan set and **Figure 4**, however this vehicle crossing is exempt from a 'controlled activity permit' under Section 91 of the WM Act pursuant to clause 23, Schedule 4, Part 2 of the *Water Management (General) Regulation 2018* –

> *23* ***Activities connected with construction of fencing, crossings or tracks***
> *Any activity carried out in connection with the construction or use of fencing, or of a vehicular crossing or an access track, that does not impound water, being an activity carried out in, on or under waterfront land—*
> *(a) relating to a minor stream, and*
> *(b) within a rural zone (other than a rural village) under an environmental planning instrument.*

State Environmental Planning Policy

The Proposal is affected by considerations within *State Environmental Planning Policy No. 55—Remediation of Land* (SEPP55).

State Environmental Planning Policy (Infrastructure) 2007 is not relevant to the Proposal because the Proposal is not listed in Schedule 3 of that policy.

Local Environmental Plan

The Site is affected by considerations within the *Greater Hume Local Environmental Plan 2012* (LEP).

---

[1] The nearest part of the Proposal to the subject drainage line (which is not the proposed internal vehicle access road) is the 'handling yard' shown in the **attached** DA plan set which is 90 metres from the centreline of the drainage line and is therefore 50 metres from "waterfront land" being 40 metres wide.

1.5.2 Policy

State Environmental Planning Policy

SEPP55 (and *Managing Land Contamination: Planning Guidelines* (DUAP & EPA, 1998)) generally requires that consideration be given to whether or not land proposed to be developed is contaminated and fit for use for its intended purpose. The Site is not known to be contaminated and the Proposal is considered to comply with relevant considerations.

Local Environmental Plan

The following provisions of the LEP are considered relevant to assessment of the Proposal–

- Land Use Table – Zone RU1 Primary Production: *Objectives of zone*,
- Clause 5.10: *Heritage conservation*,
- Clause 5.18: *Intensive livestock agriculture*,
- Clause 6.1: *Earthworks*, and
- Clause 6.7: *Essential services*.

An assessment table which lists the relevant content of these provisions and detailed responses are provided below at **Table 4**.

It is noted that the Proposal does not require the removal of any vegetation in any area identified as "Biodiversity" in the Terrestrial Biodiversity Map under the LEP.

LEP definitions

For the purposes of this report the following definitions listed in the Dictionary of the LEP are considered relevant[2] with yellow highlighting shown for affect –

> ***agriculture*** *means any of the following—*
> *(a) aquaculture,*
> *(b) extensive agriculture,*
> *(c) intensive livestock agriculture,*
> *(d) intensive plant agriculture.*
>
> ***intensive livestock agriculture*** *means the keeping or breeding, for commercial purposes, of cattle, poultry, pigs, goats, horses, sheep or other livestock, and includes any of the following—*
> *(a) dairies (restricted),*
> *(b) feedlots,*
> *(c) pig farms,*
> *(d) poultry farms,*
> *but does not include extensive agriculture, aquaculture or the operation of facilities for drought or similar emergency relief.*

[2] *Planning Circular: PS 13-001 – How to characterise development* (Department of Planning & Infrastructure, 2013).

> ***feedlot*** *means a confined or restricted area that is operated on a commercial basis to rear and fatten cattle, sheep or other animals, but does not include a poultry farm, dairy or pig farm.*
>
> ***extensive agriculture*** *means any of the following—*
> *(a) the production of crops or fodder (including irrigated pasture and fodder crops) for commercial purposes,*
> *(b) the grazing of livestock (other than pigs and poultry) for commercial purposes on living grasses and other plants on the land as their primary source of dietary requirements, and any supplementary or emergency feeding, or temporary agistment or housing for weaning, dipping, tagging or similar husbandry purposes, of the livestock,*
> *(c) bee keeping,*
> *(d) a dairy (pasture-based) where the animals generally feed by grazing on living grasses and other plants on the land as their primary source of dietary requirements, and any supplementary or emergency feeding, or temporary agistment or housing for weaning, dipping, tagging or similar husbandry purposes, of the animals.*

Land use zoning

The Site is zoned "RU1 Primary Production Zone" (RU1 zone) under the LEP, which is shown in the Land Zoning Map excerpt detailed below in **Figure 5**. In the Land Use Table for the RU1 zone "intensive livestock agriculture" is 'permitted with consent' and "extensive agriculture" is 'permitted without consent'. Further comment is made at **Table 4**.

Heritage conservation

"Heritage item" I17 is located within the Site and comprises the existing 'Culverley Rise' dwelling as shown in the Heritage Map excerpt detailed below in **Figure 6**, however no conservation area, or a building, work, relic or tree of historical heritage within the meanings of clause 5.10 of the LEP are located within, adjoining, or nearby the Site. Further comment is made at **Table 4**.

The Site does not contain items of Aboriginal cultural heritage arising from completed archaeological survey and consultation as documented in the Aboriginal Due Dilignce Assessment Report at **Appendix F**.

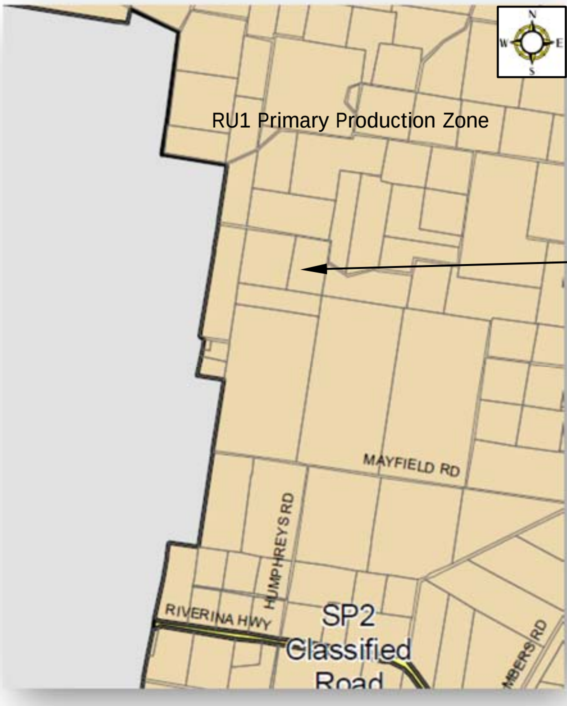
Flood prone land

The Site is not affected by a known "flood planning level" within the meaning of clause 6.1A: *Flood planning* of the LEP.

Terrestrial biodiversity

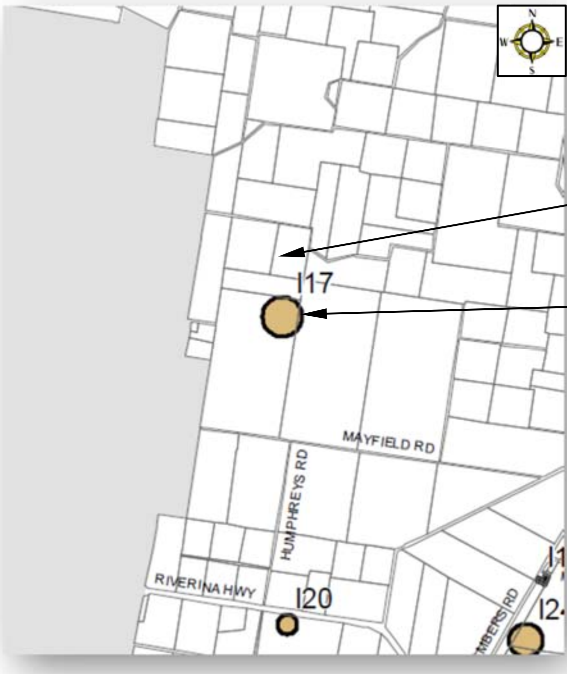
The Proposal is not affected by an area mapped as "biodiversity" within the meaning of clause 6.2: *Terrestrial biodiversity* of the LEP.

Figure 5: Excerpt of Land Use Zoning Map from the LEP



The general location of the proposed feedlot (zoned "RU1 Primary Production Zone"). Source: LEP.

Figure 6: Excerpt of Heritage Map from the LEP



The general location of the proposed feedlot.

The general location of "Heritage item" I17. Source: LEP.

Riparian land and watercourses

The Proposal is not affected by an area mapped as "waterways" within the meaning of clause 6.3 of the LEP.

Wetlands

The Site is not located within an area mapped as "wetlands" within the meaning of clause 6.3 of the LEP.

Development on river front areas

The Site is not located within a "river front area" within the meaning of clause 6.5 of the LEP.

Bush fire prone land

The Proposal is not located on "bush fire prone land" within the meaning of the EP&A Act.

Development Control Plan

The Site is affected by the *Greater Hume Development Control Plan 2013* (DCP) however upon review no guidelines are considered relevant to assessment of the Proposal.

It is noted that the DA does not include business identification signs and any such signs which require prior consent will be the subject of a separate future development application.

Other policy/guidelines

Even though not required under legislation (as the Proposal is not "designated development" under section 4.10 of the EP&A Act), the Proposal has been designed, and this report has been prepared, generally in accordance with the *Planning Guidelines - Intensive Livestock Agriculture Development* (NSW Department of Planning and Environment, 2019).[3] In particular, the following guidelines from this document have been reviewed and followed where applicable –

Initial considerations

- Section 2.1: *Project siting and land use conflict*,
- Section 2.2: *Liaison with local council and relevant agencies*,
- Section 2.3: *Consultation with community*,
- Section 2.4: *Expert advice*,

Site selection checklist

- Section 3: *Project scoping and risk identification*,
- Section 3.1 *Matching the level of assessment with the scale and risk of the proposal*,

[3] https://www.dpi.nsw.gov.au/agriculture/lup/development-assessment2/dev-app-intensive

Planning guidance – the development application process
- Section 4.1: *Is my development intensive or extensive agriculture*,
- Section 4.2: *Is an intensive livestock agriculture development permissible on my property*?
- Section 4.3: *Does my project need development consent*?
- Section 4.4: *Potential development application process scenarios*,
- Section 4.5: *How much information should I submit*?
- Section 4.6: *What other approvals may be required*?
- Section 4.7: *Who should I submit my application to*?
- Section 4.8: *What is the role of the public exhibition and submissions process*?
- Section 4.9: *Who can make submissions about my development*?
- Section 4.10: *Decision making*,
- Section 4.11: *Monitoring and compliance*,
- Section 4.12: *Where can I find more information*?

Industry guidance
- Section 5.1: *NSW Department of Primary Industries guidelines*,
- Section 5.2: *Environment Protection Authority guidance*,
- Section 5.3: *Industry developed guidelines*,
- Section 5.4: *Biosecurity*,
- Section 5.5: *Animal welfare*,
- Section 5.6: *Interstate industry and planning guidance*,

Planning documents
- Section 6.1: *Acts and Regulations*,
- Section 6.2: *Environmental Planning Instruments*,
- Section 6.3: *EPA guidance*,
- Section 6.4: *Planning and Development Assessment Processes*.

1.6 Other approvals or permits required

1.6.1 Future buildings

"Farm buildings" which are not either "exempt development" or "complying development" under *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008* [4] may be the subject of separate future development applications under Part 4 of the EP&A Act and a construction certificate application under Part 6 of the EP&A Act including –
- silos used for the purpose of the storage of grain that has not been produced on the landholding, and
- sheds greater than the area and or dimensions specified.

[4] Part 2 *Exempt Development Codes* and Part 3D *Inland Code* under *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008.*

The shed and silo slab parts of the Proposal would require separate Construction Certificates under Part 6 of the EP&A Act.

1.6.2 Future onsite sewerage management system

If a future staff office and amenities building is required then the process described in **Section 1.6.1** would also be relevant, as well as the need for an onsite sewerage management system via a permit under section 68 of the *Local Government Act 1993*.

2.0 SITE CONTEXT

2.1 Site location, surrounding development, and existing character

The location of the Site was briefly described in **Section 1.3** and is graphically shown in **Figure 1**, **Figure 2**, **Figure 3** and **Figure 4** and in the photographs of the Site and surrounding area at **Appendix B**. The location of the Site is also described and shown in the Environmental Assessment Report at **Appendix C**.

The Site is located in a rural area with predominantly agricultural land uses consisting of livestock grazing and crop production supported by pivot irrigation. The site is currently used for agricultural livestock grazing for sheep and cattle and cereal and fodder crop production supported by pivot and linear above-ground spray and drip irrigation.

The Site is occupied by an existing dwelling (a manager's residence), multiple farm buildings consisting of machinery, hay and water bore/pump sheds, and silos, dams, yards and vegetation plantation belts.

Adjoining and nearby land is similarly occupied by agricultural infrastructure and related dwellings.

The Site and all adjoining and nearby land has rural landscape character.

2.2 Future character

Given the location of the Site and adjoining land and their uses and development, it is not expected that the future character of the area will significantly change in the foreseeable future.

2.3 Site description

2.3.1 Cadastre and topography

The cadastral makeup of the Site and its topography was briefly described in **Section 1.3** and is graphically shown in **Figure 2**, **Figure 3** and **Figure 4** and is also described and shown in the Environmental Assessment Report at **Appendix C**.

The Site comprises a part of the 'Culverley Rise' landholding with address described as 198 Humphreys Road, Bungowannah but abuts and will be operated in conjunction with the 'Weebo Park' landholding to the northeast with address described as 89 Hovell Road, Bungowannah. The combined landholding has an area of approximately 3,880 hectares.

The feedlot complex itself has dimensions of approximately 550 metres by 770 metres with an area of approximately 4.6 hectares. The feedlot is located on an even slope of approximately 4% or 2.3° with a southwest aspect. Feedlot layout, orientation and alignment has been designed to facilitate stormwater drainage control and management, biosecurity cross-contamination imperatives, cleaning, solar access, shade and air circulation.

2.3.2 Vehicle access

Vehicle access to the Site is available via Humphreys Road via the Riverina Highway as described in the Traffic Assessment Report at **Appendix D**.

2.3.3 Surrounding road network

The road network and traffic conditions surrounding the Site are described in the Traffic Assessment Report at **Appendix D**.

2.3.4 Easements, covenants, and restrictions

The Title survey plans at **Appendix A** show that the Site has no existing infrastructure easements, covenants, restrictions, or rights-of-way within the meaning of the *Conveyancing Act 1919*. However, the Site contains existing overhead reticulated electricity lines which would otherwise be affected by easements.

2.3.5 Reticulated services and public road access

Reticulated electricity and telecommunications services are connected to the Site. The Site has public road access via Humphreys Road via the Riverina Highway.

2.3.6 Vegetation

The Site has existing remnant and planted native and exotic vegetation as described in the Vegetation Assessment Report at **Appendix E**.

2.3.7 Site analysis and pre-DA lodgement consultation

Site analysis plans are provided in the **attached** DA plan set based on feature and level survey information and in the Environmental Assessment Report at **Appendix C**.

Pre-DA lodgement consultation with Council officers took place during March 2020.

2.4 The design response and concept

The design response and concept for the Proposal has generated following a thorough site analysis and investigation process: A process which has assisted design principals to comprehensively understand the nature of the Site and the area, and to provide a design response which responds to the land use and development policies and guidelines detailed in this report and its appendices. The Proposal specifically responds to the agricultural sheep feedlot industry policies and guidelines detailed in the Environmental Assessment Report at **Appendix C**, including the –

- *Planning Guidelines - Intensive Livestock Agriculture Development* (DPE, 2019)[5] and
- *National procedures and guidelines for intensive sheep and lamb feeding systems* (MLA, 2011).[6]

[5] https://www.dpi.nsw.gov.au/agriculture/lup/development-assessment2/dev-app-intensive

[6] https://www.mla.com.au/globalassets/mla-corporate/extensions-training-and-tools/documents/nationalproceduresandguidelineslambfinishing.pdf

3.0 THE PROPOSAL

3.1 Development description

The DA is for development comprising the construction and use of an intensive livestock agriculture facility comprising a 3,750-capacity sheep feedlot as described in summary below and in detail in the Environmental Assessment Repot at **Appendix C**.

3.1.1 Site layout and design, earthworks and building works

The Proposal has been sited and designed by a professional sheep feedlot design engineer as shown in the **attached** DA plan set using latest industry-specific policies, guideless, practices tempered by extensive practical operational and management consultation experience.

The feedlot consists of 15 pens each 25 metres wide by 50 metres long, a compost manure pad, handling/loading yards, feeding alleys, a feed mill building, silos, wastewater holding pond and contaminated agricultural runoff dams.

The feedlot is approximately north/south facing to maximise solar access and evaporation rates.

The pen surfaces will be evenly graded with slopes of 2-4%. Concrete aprons or compacted crushed rock will be installed around high traffic areas, such as feeding and watering points, and will be a minimum width of 2 metres. The pens will be constructed of crushed and compacted ferricrete, which will have permeability less than 1 x 10^{-9} m/s when compacted to >98% density. This engineered surface is regarding as being impermeable and resistant to traffic by sheep and machinery.

Shelter will be provided at 0.4 m^2 per lamb and the design will ensure that both ventilation beneath the structure and afternoon shade area are maximised. The shaded areas are oriented to allow the shade to move across the pen during the day and to encourage drying of the pen floor.

Feedlot production parameters are summarised in **Table 1**.

Table 1: Production parameters summary

Parameter	Value
Sheep feedlot maximum capacity	3,750
Average days on feed	50
Average number of drafts per year	4
Maximum number of drafts per year	7
Mean occupancy	57%
Mortality rate	<1%
Stocking density	5 m^2/sheep
Average throughput	15,000 sheep/year
Maximum throughput	26,250 sheep/year
Feed consumption	1.7 kg dry matter/sheep/day[7]

A summary of feedlot land areas is provided in **Table 2**.

Table 2: Area summary

Land Use	Area (ha)
Open pens	1.87
Handling yards	0.37
Combined livestock lanes and roads and open storage	0.32
Manure stockpile pad	0.45
Feedmill and storage sheds	0.69
Holding pond & Sediment Basin – internal area only	1.25
Grassed areas	15.9
Total Controlled Drainage area	**20.85**
Irrigation Area	60.9
Waste Utilisation Area (manure application)	318.8
Total Uncontrolled Drainage Area	**379.7**

3.1.2 Stocking density

Stocking densities will average 5 m^2/sheep. Each 25m x 50m pen can accommodate up to 250 sheep. As documented in the Environmental Assessment Report at **Appendix C**, the *Australian Animal Welfare Standards and Guidelines for the Welfare of Sheep* (DAAHA,

[7] Comprising grain feed (1.5 kg/head/day) and roughage (0.2 kg/head/day).

2016) specify that the minimum area per sheep for outdoor feedlots for lambs is 1.0 m^2 up to 41 kg and 1.3 m^2 for adult sheep.

3.1.3 Water Supply

An adequate supply of clean, good quality water will be available to sheep and lambs at all times. Water troughs and float valves will be maintained to minimise overflows and spillage. Troughs will be cleaned as frequently as necessary to optimise water and dry matter intake.

A minimum of 4 litres of water per head per day and up to 6.5 litres during sustained hot and/or humid weather will be available on demand. At least 3 day's water supply will be available in case of breakdown or emergency, requiring a minimum sheep drinking water supply of 8.9ML per year which will be supplied from rainwater tanks from building roof supply and 4 existing groundwater bores within the Site from 500ML groundwater licence capacity.

3.1.4 Stormwater drainage and management

Controlled Drainage Area

The Proposal includes a defined Controlled Drainage Area (CDA) which comprises containment of solid and liquid wastes from storm and steady rainfall events including –

- clean water diversion banks up-slope of the feedlot,
- catch drains, and
- wastewater holding ponds downslope of the feedlot.

The hydrology of the CDA (drains, pipes and ponds) will be engineered for the appropriate storm interval event during detailed design which will be based on an average recurrence interval (ARI) of 20 years and a runoff coefficient of 0.8. The CDA comprises a catchment of approximately 20.85 hectares.

Clean water diversion bund

The Proposal is designed with a clean water diversion bund around the north eastern edge of the facility.

Catch drains

Stormwater from all pen areas will be collected in catch drains situated directly downslope of each pen which will discharge to the holding dam. Catch drains will be designed to carry peak flow rates resulting from the design storm interval. Drains will be constructed at a 0.3% slope, and will perform two tasks –

- capture and divert runoff to the holding dam, and
- capture sediment.

Detailed design of the CDA drains will be conducted once approval for the feedlot has been obtained.

Wastewater holding dam

Because the frequency, intensity and duration of individual rainfall events are a function of probability, it is not possible to design a drainage system that will contain the feedlot runoff during every potential rainfall event. Accordingly, embankments might overtop or spillways might overflow during extreme rainfall events. The design frequency of holding pond overtopping and overflow events is an average of less than 1-in-10 years.

The principal design function of a holding pond is to store feedlot runoff until such time as the pond effluent can be safely used for irrigating the wastewater utilisation area. Depending on the time for which the runoff is stored in the holding pond, microbial degradation (principally anaerobic) of the entrained organic matter may occur, a portion of any mineralised nitrogen may be lost to volatilisation and denitrification processes and a proportion of the water will be lost to evaporation. Some sludge build-up may also occur through settlement of the entrained solids.

A single large primary wastewater pond is proposed and will be designed so that it –
- can be rapidly dewatered,
- has a dead storage volume for accumulation of sludge,
- self-drains for ready drying and cleaning (through the dry season), and
- has an emergency overflow to a wet weather storage pond (WUA tailwater dam).

In addition, the wastewater pond will be constructed so that it is cut below the natural surface and will have an embankment of approximately 2-3m above the surface. The pond lining will be further 'reinforced' to prevent lining 'push out' by the subsurface flow. Further, to reduce the risk of structural failure of the inner embankment and floor, rock armouring will be implemented to improve stability during periods of heightened transient groundwater flow. Compacted material under the clay liner will undergo stability treatment. A piezometer will be placed above and below the pond to monitor shallow groundwater depth and quality and to function as an early warning leak detection system.

Holding pond spillways are to be designed to discharge a 1-in-50 year storm event at non scouring velocity. The minimum freeboard is to be 0.9m.

Preliminary modelling has indicated that a minimum holding pond size of 22.5ML will be required to minimise overtopping and overflow events to less than 1-in-10 years.

3.1.5 Road works

The Site is proposed to have vehicle access via Mayfield Road and Humphreys Road via the Riverina Highway. The intersections of Humphreys Road/Riverina Highway and Humphreys Road/Mayfield Road are proposed to be upgraded as a part of the Proposal in accordance with the Traffic Assessment Report at **Appendix D** as follows –

- Humphreys Road/Riverina Highway intersection: Upgrade to a BAR/BAL type intersection consistent with Austroads design guidelines i.e. vehicle passing lanes around turning vehicles to facilitate through-traffic as shown in the **attached** DA plan set, and
- Mayfield Road/Humphreys Road: Upgrade by removing three existing trees to facilitate adequate B-double truck turning movements as shown in the **attached** DA plan set. The removal of this vegetation has been included in the Vegetation Assessment Report at **Appendix E**.

A new vehicle accessway to the Site is also included as a part of the Proposal which is proposed at the southeast corner of the Site and then along the eastern lot boundaries of the Site to the feedlot area as shown in the **attached** DA plan set. The existing vehicle accessway to the 'Culverley Rise' dwelling will remain (so that residential traffic is separated). The proposed access road will be constructed and maintained to accommodate B-double trucks with suitable material and drainage for all-weather operations.

3.1.6 Vegetation removal works

Vegetation removal works include the removal of trees and grasses as documented and shown in the Vegetation Assessment Report at **Appendix E**, which includes the removal of native and exotic trees and grasses and the three trees required to be removed at the intersection of Humphreys Road/Mayfield Road (no trees require removal at the intersection of Humphreys Road/Riverina Highway). The Proposal has been sited and designed to avoid the removal of native vegetation as far as practical.

3.1.7 Vegetation plantation works

The Proposal includes the plantation of 'Vegetative Environmental Buffer' plantation belts at the locations shown in the Environmental Assessment Report at **Appendix C** (Figure 13). These VEB areas are required for amenity reasons – not to offset the removal of native vegetation (which is not required).

3.1.8 Days and hours of operation

The Proposal is proposed to normally operate between 6:00am and 8:00pm, 7 days per week. While most operations will cease from 6:00pm each day, there will be times where truck loads of sheep will not arrive until later and operations will need to continue until 8:00pm to ensure the animals are managed appropriately. Of course, sheep will be at the facility 24/7 except during any drafting layover period where the facility may undergo extensive periodic maintenance cleaning, including servicing all stormwater drainage systems and ponds to ensure effective and efficient operating capacity is maintained.

3.1.9 Staff

The Proposal will employ 3 full-time staff and up to 4 part-time staff, depending on seasonal variations and market conditions.

3.2 Operational parameters

Table 3 provides a summary of the operational parameters of the Proposal during construction.

Table 3: Operational parameters of the Proposal during construction

Parameter	***Response***
• Days and hours of demolition/ construction:	in accordance with *AS 2436:1981–Guide to noise control on construction, maintenance and demolition sites*, namely 7:00am to 7:00pm, Monday to Saturday (excluding public holidays)
• Traffic management:	in accordance with a Traffic Management Plan (TMP) for each stage of construction as relevant
• Car parking:	some onsite car parking provided in the 'construction zone'
• Loading/ unloading:	onsite loading/unloading provided in the 'construction zone' in accordance with the relevant TMP
• Waste management:	waste is stored in dedicated containers within the 'construction zone' and collected by licensed contractors for offsite disposal
• Safety and security:	relevant WH&S and WorkCover standards and guidelines
• Lighting:	standard security lighting
• Plant and machinery:	standard building industry construction equipment
• Noise, dust, and vibration:	standard building industry construction equipment; construction carried out in accordance with *AS2436:1981–Guide to noise control on construction, maintenance and demolition sites*
• Stormwater:	construction carried out in accordance with *Managing Urban Stormwater, Soils & Construction, Volume 1* (Landcom, 2004) and

Parameter	***Response***
	Managing Urban Stormwater, Soils & Construction, Volume 2 (DECC, 2008)
• Visual:	hoardings and security fencing erected along all construction area boundaries where appropriate

4.0 PLANNING ASSESSMENT MATTERS

4.1 Local Environmental Plan

Table 4: Assessment Matters – Greater Hume Local Environmental Plan 2012

	Response
LEP Land Use Table - Zone RU1 Primary Production: Objectives of zone	
• *To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.*	Complies – The Proposal encourages sustainable primary industry production by maintaining and enhancing the natural resource base because the Proposal has demonstrated, through this report (specifically the Environmental Assessment Report at **Appendix C**), that all works to establish and operate the Proposal comply with all relevant agricultural land use and development policies and guidelines in relation to natural resource matters, including surface and ground water, soil characteristics and biodiversity.
• *To encourage diversity in primary industry enterprises and systems appropriate for the area.*	Complies – The Proposal encourages diversity in primary industry enterprises and systems appropriate for the Bungowannah area because no commercial sheep feedlot currently exists in the area and because the Proposal has been specifically sited and designed within the Site and in relation to adjoining land by a professional sheep feedlot design engineer using latest industry-specific best-practice policies and guideless based on industry practical operational experience.

• *To minimise the fragmentation and alienation of resource lands.*	Complies – No subdivision of the Site is proposed as a part of the Proposal and the environmental buffers required for the Proposal do not prevent or limit the use of the Site or adjoining land for existing and continued agricultural resource purposes (livestock grazing and fodder and crop production).
• *To minimise conflict between land uses within this zone and land uses within adjoining zones.*	Complies – The Site and all adjoining and nearby land is zoned RU1 zone. The nearest non-RU1 zone to the Site is in Howlong located approximately 8 Kilometres to the west-southwest. (To avoid confusion, it is noted that this objective is <u>not</u> saying – *To minimise conflict between land uses within this land and land uses within adjoining land.*)
• *To maintain the rural landscape character of the land.*	Complies – The Proposal is for an agricultural land use including agricultural-type built works and facilities. All works have been appropriately sited in the rural landscape of Bungowannah such that the existing rural landscape character of the land and the area will be maintained.
LEP Clause 5.10: Heritage conservation	
(4) Effect of proposed development on heritage significance – The consent authority must, before granting consent under this clause in respect of a heritage item or heritage conservation area, consider the effect of the proposed development on the heritage significance of the item or area concerned. This subclause applies regardless of whether a heritage management document is prepared under subclause (5) or a heritage conservation management plan is submitted under subclause (6).	The subject heritage item is the 'Culverley Rise' dwelling shown in **Figure 6** and listed as Item I17 in Schedule 5 of the LEP as an item of 'local' heritage significance (not State or Federal). No part of the Proposal impacts upon the heritage significance of this heritage item or its relevant curtilage area.
LEP Clause 5.18: Intensive livestock agriculture	

(1) The objectives of this clause are—	
(a) to ensure appropriate environmental assessment of development for the purpose of intensive livestock agriculture that is permitted with consent under this Plan, and	Complies – The Proposal has been sited, designed and environmentally assessed in accordance with the intensive livestock agriculture policies and guidelines for sheep feedlots as detailed in Section 1.5.2 and in the Environmental Assessment Report at **Appendix C**.
(b) to provide for certain capacity thresholds below which development consent is not required for that development subject to certain restrictions as to location.	Not relevant to the Proposal.
(2) This clause applies if development for the purpose of intensive livestock agriculture is permitted with consent under this Plan.	Relevant to the Proposal.
(3) In determining whether or not to grant development consent under this Plan to development for the purpose of intensive livestock agriculture, the consent authority must take the following into consideration—	
(a) the adequacy of the information provided in the statement of environmental effects or (if the development is designated development) the environmental impact statement accompanying the development application,	Complies – The information provided in this report as a whole is considered to be adequate.
(b) the potential for odours to adversely impact on the amenity of residences or other land uses within the vicinity of the site,	Complies – The potential for odours to adversely impact on the amenity of residences or other land uses within the vicinity of the Site has been researched and assessed in the Environmental Assessment Report at **Appendix C**. Consultation with all adjoining landowners has been carried out and odour mitigation measures have been documented in accordance with best-practice policies and guidelines and will be implemented.

(c) the potential for the pollution of surface water and ground water,	Complies – The potential for the pollution of surface water and ground water has been researched and assessed in the Environmental Assessment Report at **Appendix C**. Surface water and ground water pollution impact mitigation measures have been documented in accordance with best-practice policies and guidelines and will be implemented.
(d) the potential for the degradation of soils,	Complies – The potential for the degradation of soils has been researched and assessed in the Environmental Assessment Report at **Appendix C**. Soil degradation mitigation measures have been documented in accordance with best-practice policies and guidelines and will be implemented.
(e) the measures proposed to mitigate any potential adverse impacts,	Complies – In addition to the potential for odour, surface water and ground water, and soil impacts, the following additional potential impacts have also been researched and assessed in the Environmental Assessment Report at **Appendix C** and mitigation measures have been documented in accordance with best-practice policies and guidelines and will be implemented – • dust (particulates and deposition), • noise, • land, • solid waste, • animal welfare, and • biosecurity. In addition – • traffic impacts have been researched and assessed in the Traffic Assessment Report at **Appendix D**, • vegetation removal and biodiversity impacts have been researched and assessed in the Vegetation Assessment Report at **Appendix E**, and • Aboriginal cultural heritage impacts have been researched and assessed in the Aboriginal Due Diligence Assessment Report at **Appendix F**,

	and mitigation measures have been documented in accordance with best-practice policies and guidelines and will be implemented
(f) the suitability of the site in the circumstances,	Complies – Refer to **Section 4.2** below.
(g) whether the applicant has indicated an intention to comply with relevant industry codes of practice for the health and welfare of animals,	Complies – The Proposal will be operated in accordance with industry codes of practice for the health and welfare of animals as documented in the Environmental Assessment Report at **Appendix C**.
(h) the consistency of the proposal with, and any reasons for departing from, the environmental planning and assessment aspects of any guidelines for the establishment and operation of relevant types of intensive livestock agriculture published, and made available to the consent authority, by the Department of Primary Industries (within the Department of Industry) and approved by the Planning Secretary.	Complies – The Proposal is consistent with and does not depart from the *Planning Guidelines - Intensive Livestock Agriculture Development* (NSW Department of Planning and Environment, 2019) where relevant to the Proposal (noting that the Proposal is not classified as "designated development").
LEP Clause 6.1: Earthworks	
(1) The objective of this clause is to ensure that earthworks for which development consent is required will not have a detrimental impact on environmental functions and processes, neighbouring uses, cultural or heritage items or features of the surrounding land.	Earthworks which alter the ground level (existing) by more than 600 millimetres[8] will not have a detrimental impact on environmental functions and processes, neighbouring uses, items or features. Impacts to Aboriginal cultural heritage have been documented at **Appendix F**. Earthworks have been minimised through preliminary civil engineering design investigations supported by geotechnical and feature and level survey.
(3) Before granting development consent for earthworks (or for development involving ancillary earthworks), the consent authority must consider the following matters—	

[8] With reference to clause 2.30 *Exempt Development Codes* of *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008*.

(a) the likely disruption of, or any detrimental effect on, drainage patterns and soil stability in the locality of the development, *(b) the effect of the development on the likely future use or redevelopment of the land,*	The concept civil and traffic engineering plans in the **attached** DA plan set and the Environmental Assessment Report at **Appendix C** and the Traffic Assessment at **Appendix D** show and describe the proposed extent of earthworks including stormwater drainage, stormwater detention, cut/fill, drainage catchment, and sediment and erosion control measures during construction works and operations.
(c) the quality of the fill or the soil to be excavated, or both, *(d) the effect of the development on the existing and likely amenity of adjoining properties,* *(e) the source of any fill material and the destination of any excavated material,*	Any material required to be imported to the Site will be from approved sources (i.e. licenced quarries) and will comply with "virgin excavated natural material" (VENM) requirements under the *Protection of the Environment Operations Act 1997*. It is not anticipated that any excavated material will leave the Site. The proposed earthworks will have sediment and erosion control measures during construction works and will implement dust control measures in accordance with standard construction industry guidelines and practices.
(f) the likelihood of disturbing relics,	The Proposal is not located within a heritage conservation area or known to be affected by a heritage item, an Aboriginal object, or a building, work, relic or tree within the meaning of clause 5.10 of the LEP. No part of the Proposal impacts upon the heritage significance of the 'Culverley Rise' dwelling shown in **Figure 6** and listed as Item I17 in Schedule 5 of the LEP as an item of 'local' heritage significance (not State or Federal) or its relevant curtilage area. Impacts to Aboriginal cultural heritage (none found) have been documented at **Appendix F**.
(g) the proximity to, and potential for adverse impacts on, any waterway, drinking water catchment or environmentally sensitive area,	The proposed earthworks will have sediment and erosion control measures during construction works. The proposed stormwater detention and quality control system will ensure that stormwater discharged from the Site will be

(h) any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development.	to pre-development levels and meet water quality guidelines. Refer to the Environmental Assessment Report at **Appendix C**.
LEP Clause 6.7: Essential services	
(2) Development consent must not be granted to development unless the consent authority is satisfied that any of the following services that are essential for the development are available or that adequate arrangements have been made to make them available when required— *(a) the supply of water,* *(b) the supply of electricity,* *(c) the disposal and management of sewage,* *(d) stormwater drainage or on-site conservation,* *(e) suitable vehicular access.*	Complies – The Proposal requires reticulated electricity, water, stormwater drainage detention and management and access to the public road network to operate – • reticulated electricity is connected to the Site, • the Site has four groundwater bores with adequate quantity and quality of water to support the Proposal, • stormwater drainage detention and management works and measures are proposed, and • the Site has access to the public road network via Humphreys Road via the Riverina Highway.

4.2 Suitability of the Site for the Proposal

The Site is suitable for the Proposal as Site attributes are conducive for development and the Proposal would fit into the area in accordance with the 'objectives' for the RU1 zone under the LEP and the policies and guidelines for sheep feedlot development under the *Planning Guidelines - Intensive Livestock Agriculture Development* (NSW Department of Planning and Environment, 2019), specifically –

- There are no constraints posed by adjacent developments which are unresolvable, including the locations of sensitive receivers.
- There is adequate transport infrastructure and facilities in the area.
- Utilities and services are available to the Site and are adequate for the Proposal.
- There are no hazardous land uses or activities within or nearby the Site which would prevent or limit the Proposal.
- The Site is not subject to natural hazards or land contamination, including subsidence, slip, mass movement, or bushfire constraints.
- Soil characteristics on the Site are appropriate for development.
- The Site is not subject to biodiversity or cultural heritage constraints.

The Site is also suitable for the Proposal due to the Site being located in an established rural area with rural character with no relevant environmental buffers from adjoining or nearby environmental features which would prevent or limit the Proposal. The Site also has adequate setbacks to sensitive land uses.

Visual impacts from proposed road works, earthworks, building bulk, scale and design, vegetation removal, and new vegetation plantation to adjoining or nearby land (and the public domain to the extent to which the Site may be able to be seen) are also acceptable in the circumstances assessed.

4.3 Public interest

The Proposal is considered to be in the public interest as the Proposal will not compromise the effective and ongoing operation and function of the rural/agricultural area of Bungowannah or adjoining or nearby agricultural grazing or cropping areas or detrimentally impact traffic safety or road congestion.

The Proposal also complies with ecological sustainable development (ESD) principles relating to environmental impacts and mitigation measures relating to sheep feedlot intensive livestock agriculture facilities.

The Proposal will generate up to 20 temporary employment opportunities during the estimated 3-month construction period, with site, road, building and infrastructure construction works estimated at approximately $1.57M.

The Proposal will also generate 3 full-time staff and up to 4 part-time staff employment opportunities, depending on seasonal variations and market conditions.

All impacts to the natural and physical environment can be avoided and where they cannot be avoided, they can be mitigated to acceptable impact levels, i.e. traffic safety, vegetation removal, Aboriginal cultural heritage, noise, odour, water quality, biosecurity etc.

5.0 CONCLUSIONS

This report concludes that the environmental impacts generated by the Proposal, whether considered individually or cumulatively in the context of the Site and the broader area, are not significant and therefore the Proposal warrants the support of the RMS and Council and the issue of development consent.

Having regard to all land use, development, and intensive livestock agriculture facility environmental assessment material presented in this report including its appendices, approval of the Proposal is therefore considered justified and warranted.

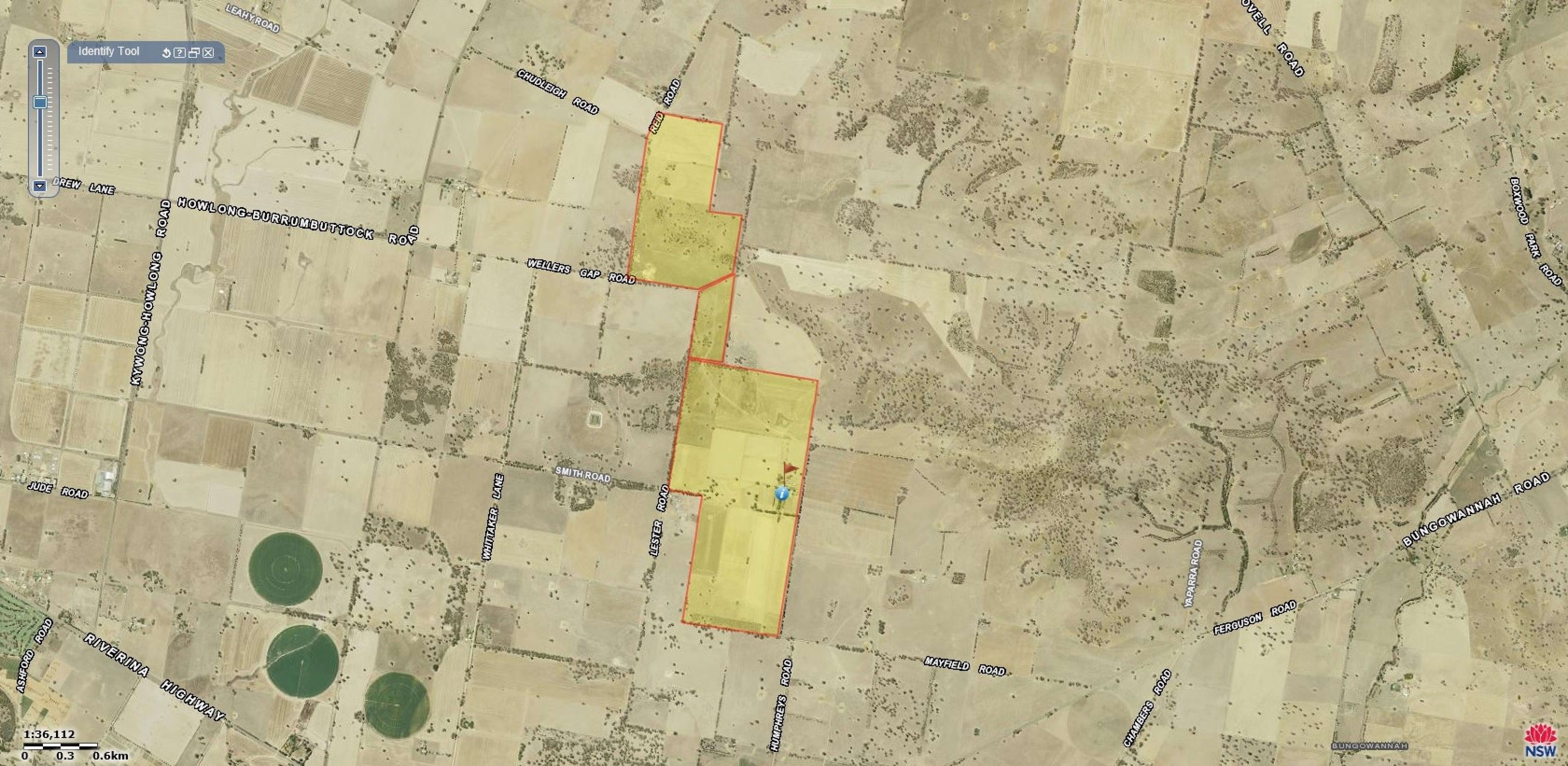
*****

APPENDIX A:

Title diagrams

'CULVERLEY RISE' 198 HUMPHREYS ROAD, BUNGOWANNAH				
Lot or Portion Number	**Deposited Plan or Crown Plan Number**	**Title Reference**	**Parcel Area (Hectares)**	**Parcel Area (Acres)**
7	DP665615	Volume 2563 Folio 236	113.3	279.97
7	DP665616	Volume 2563 Folio 243	16.19	40.006
74	CP 188.1668	Auto Consol 4728-166	24.281	60
75	CP 192.1668		16.187	40
300	CP 3055.1668	300/753749	64.75	160
301	CP 963.1668	301/753744	16.187	40
302	CP 964.1668	302/753744	32.375	80
94	CP 219.1668	94/753749	32.375	80
Total Area			**315.645**	**779.976**

'CULVERLEY RISE' WATER				
WAL	**Share**	**Tenure**	**Category**	**Approval/Licence No.**
WAL29951	500 Units	Continuing	Aquifer	50CA507720



Identify Tool
LEAHY ROAD
CHUDLEIGH ROAD
REID ROAD
DREW LANE
HOWLONG-BURRUMBUTTOCK ROAD
KYWONG-HOWLONG ROAD
WELLERS GAP ROAD
SMITH ROAD
JUDE ROAD
WHITAKER LANE
LESTER ROAD
ASHFORD ROAD
RIVERINA HIGHWAY
HUMPHREYS ROAD
MAYFIELD ROAD
FERGUSON ROAD
YAPARRA ROAD
BUNGOWANNAH ROAD
CHAMBERS ROAD
BOXWOOD PARK ROAD
OVELL ROAD
BUNGOWANNAH
1:36,112
0 0.3 0.6km
NSW

DP 665615

Registered: GP 28-8-1997

Title System: TORRENS

Purpose: DEPARTMENTAL

Ref. Map: PH#

Last Plan: 14.1668

THIS PLAN HAS BEEN CREATED TO PROVIDE A UNIQUE IDENTIFIER TO ENABLE THE ISSUE OF AN AUTOMATED TORRENS TITLE FOR THE LAND COMPRISED IN FOLIO OF THE REGISTER VOLUME 2563 FOLIO 236 FORMERLY KNOWN AS PART PORTION 7

Lengths are in metres.

Reduction Ratio : NOT TO SCALE

L.G.A.: HUME

LOCALITY: .

PARISH: MOORWATHA

COUNTY: HUME (32)

NOO1D1B

G.D.B. 8226-S

DP 665616

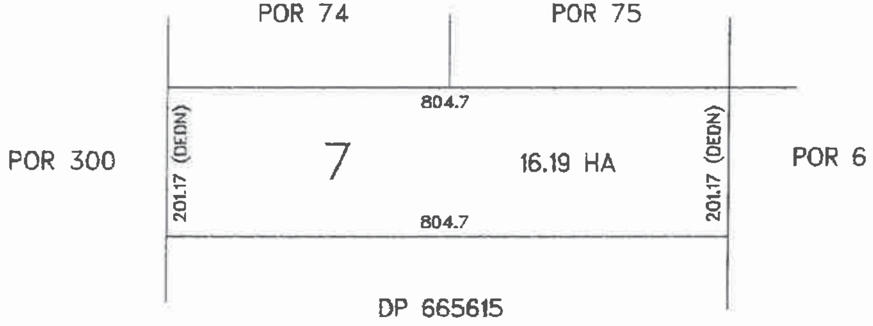
Registered: GP 28-8-1997

Title System: TORRENS

Purpose: DEPARTMENTAL

Ref. Map: PH#

Last Plan: 14.1668



THIS PLAN HAS BEEN CREATED TO PROVIDE A UNIQUE IDENTIFIER TO ENABLE THE ISSUE OF AN AUTOMATED TORRENS TITLE FOR THE LAND COMPRISED IN FOLIO OF THE REGISTER VOLUME 2563 FOLIO 243 FORMERLY KNOWN AS PART PORTION 7

Lengths are in metres.

Reduction Ratio : NOT TO SCALE

L.G.A.: HUME

LOCALITY: .

PARISH: MOORWATHA

COUNTY: HUME (32)

NOO1D1B

G.D.B. 8226-S

281

Albury

PLAN OF A PORTION OF LAND

No. 74 Parish of Moorwatha

COUNTY OF HUME.

Applied for as Conditional Purchase by Thomas Dalton *No.* 67. 1787

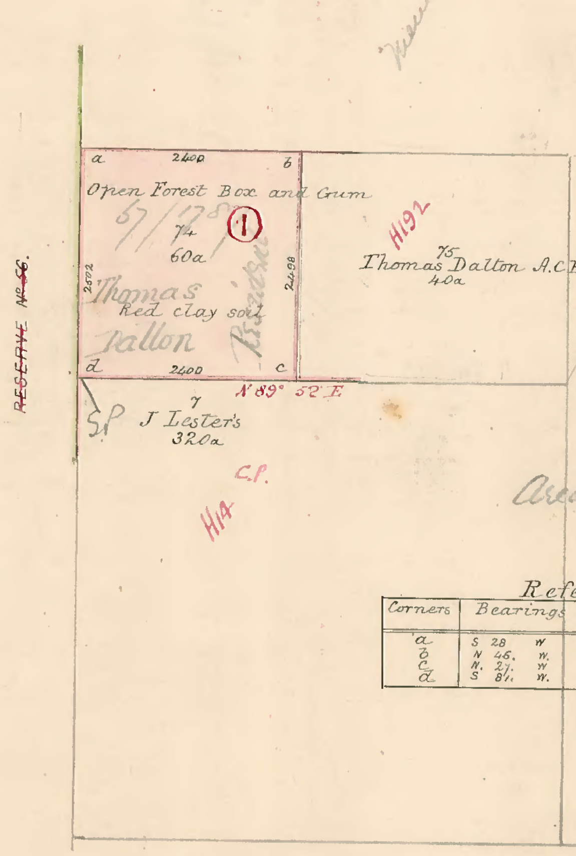
under Section 13. *Crown Lands Alienation Act,* 1861.

Surveyed by Circumferentor 16th September 1867 *Marked according to Regulations.*

Scale 20 *Chains to an Inch.*

Transmitted to the Surveyor-General
with letter 67-430-21st October 1867
John Bury
Licensed Surveyor.

① C.P 67. 1787 pt Consd. Area 100ac See also H192. 1668 Edward Collins Sale compd. Sales 35.24630



Area Exd & Charted
8 June 1868

J.H.C
11 June 1868

Reference

Corners	Bearings	From	Links	Nos. on trees
a	S 28 W	Gum	77	74.
b	N 46. W.	Box.	44	74 – 75.
c	N. 27. W		61.	
d	S 81. W.	Gum.	34	" R " 74.

188 – 1668

67. 88 S.P.

301

PLAN OF A PORTION OF LAND

No. 75. Parish of Moorwatha

COUNTY OF HUME.

Applied for as Conditional Purchase by Thomas Dalton № 67. 2234

under Section 21 *Crown Lands Alienation Act,* 1861.

Surveyed by Circumferentor 16th September 1867 *Marked according to Regulations.*

Scale 20 *Chains to an Inch.*

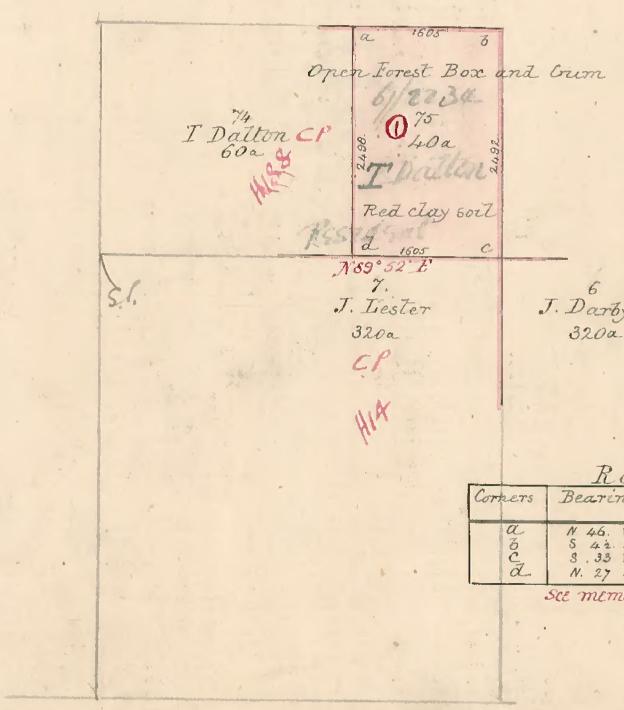
Transmitted to the Surveyor-General

with letter 67-468. 31st Octr 1867

John Berry

Licensed Surveyor.

① C.P. 67. 2234 pt Consd Area 100 ac See also H188.1668 Edward Collins Sale compd Sales 35. 24630



Area ✓

✓ Checked

Reference

Corners	Bearings	From	Links	Nos on trees
a	N 46. W.	Box.	44	74 - 75
b	S 4½. E.	"	52.	75.
c	S. 33 W.	"	60.	6 - 7 - 75
d	N. 27 W.	"	61.	74 - 75

See memo on 67/6964 for bearing d-c

11 June 68

192 - 1668

67/102 con

68/11882.

376 Albury

PLAN OF A PORTION OF LAND

No. 102 Parish of Moorwatha

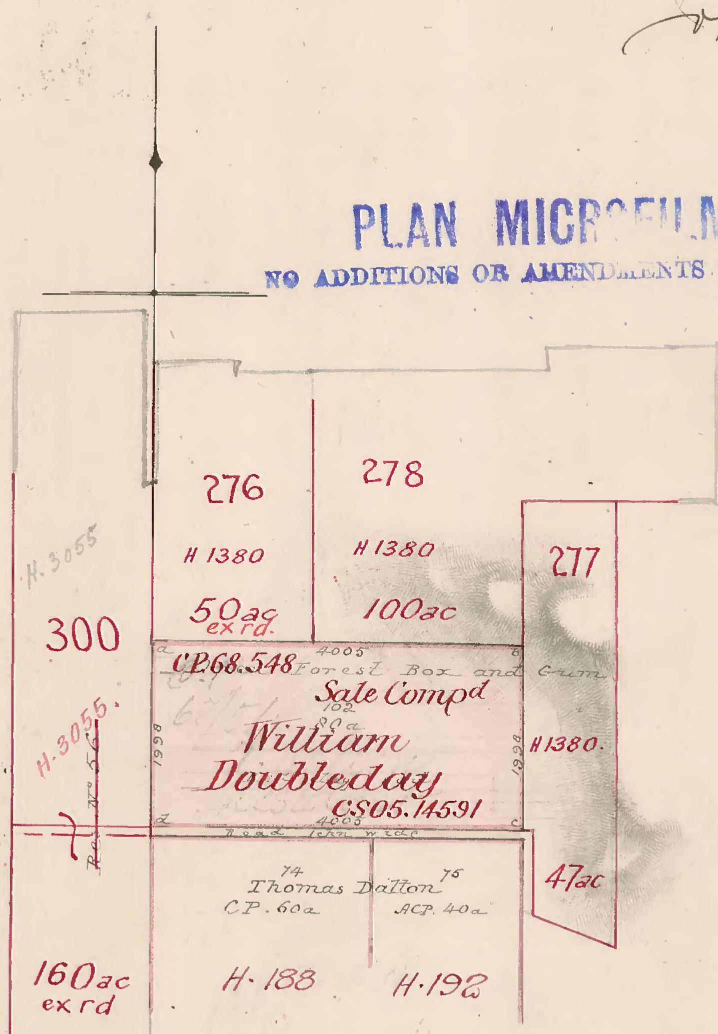
COUNTY OF HUME.

Applied for as Conditional Purchase by Thomas Kelton 68.548
under Section 13 Crown Lands Alienation Act, 1861.

Surveyed by Theodolite 19th September 1868 Marked according to Regulations.

Scale 20 Chains to an Inch.

Transmitted to the Surveyor-General.
with letter 68.263. 30th Nov 1868
John Berry
Licensed Surveyor.



REFERENCE

Corners	Bearings	From	Links	Nos on trees
a	S 38 W	Box	35	102
b	S 42 E	"	20	102
c	S 84 W	"	12	102
d	S 16 W	Gum	64	102

Charted May 25/69 JJ

WHL 26 May 69

Exmd. for Deed JCG. 15.6.'05

252 - 1668

JH 68/98

15
P 19438

Albury

PLAN

of portion 276, 277, 278, 279, 280

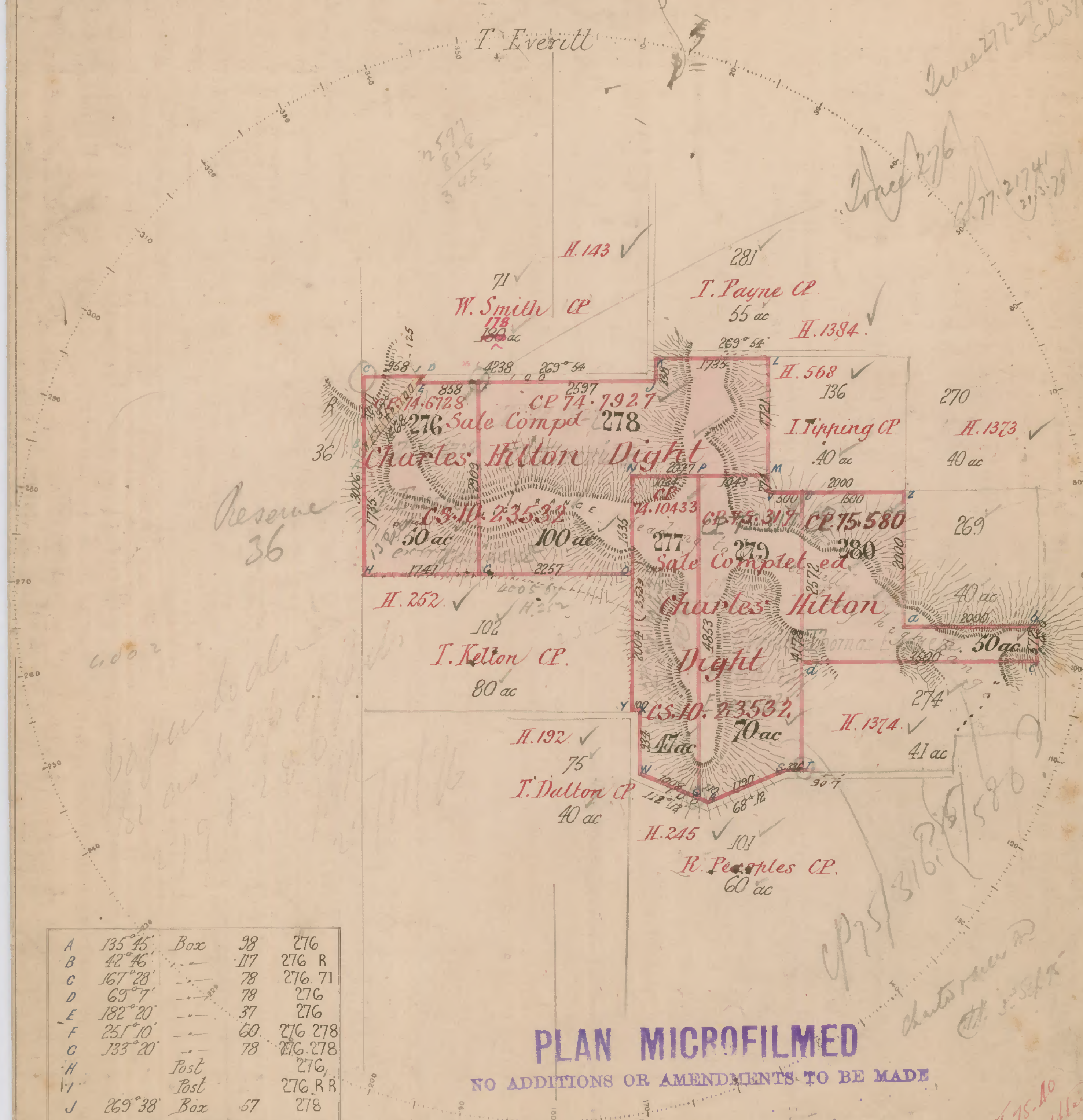
Parish of Morewatha

COUNTY HUME

(Corowa + Howlong)

Applied for under the 13 & 21 clause of the Crown Lands Alienation Act of 1861 by

T. Everitt



Reference to Corners

Corner	Bearing	From	Links	No. on Tree
A	135°45'	Box	98	276
B	42°46'	—	117	276 R
C	167°28'	—	78	276. 71
D	69°7'	—	78	276
E	182°20'	—	37	276
F	251°10'	—	60	276. 278
G	133°20'	—	78	276. 278
H		Post		276
I		Post		276. R R
J	269°38'	Box	57	278
K	285°10'	Box	22	278
L		Post		278. 136
M	110°10'	Box	98	278
N	351°10'	—	101	279. 278
O	132°	—	21	102. 278
P	260°20'	—	56	277. 279
Q	116°8	—	66	277. 279
R		Post		279
S	161°53'	Box	42	279
T	278°3'	—	37	274. 279
U	337°17'	—	93	279. 280
V		Post		136. 279
W	27°	Box	50	277
X	326°30'	—	96	277
Y		Post		277. 102
Z	77°55'	Box	6	280. 269
a	126°55'	—	72	280. 269
b	184°24'	—	21	280. 269
c	86°8'	—	68	280. 274
d	46°44'	—	49	274. 280

Reference to Traverse

Line	Bearing	Distance

Plan accepted JAL 20th Sep 75

Scale 20 Chains to an Inch.

Marked in accordance with regulations
Instrument used in Survey Theodolite
Date of Survey 18 & 19 June 1875
Value of Improvements fencing £36. Hut £14
Situated in the

1380 – 1668

Transmitted to the Surveyor General with my letter of the July 10th No. 75/105

Geo. Blunt

Licensed Surveyor

1381

1668

4.9.64

PLAN OF PORTION No. 300

County of Hume — *Parish of Moorwatha*

LAND DISTRICT OF ALBURY — LAND BOARD DISTRICT OF WAGGA WAGGA

Resumed Area No. not divided — Pastoral Holding, Eastern Division.

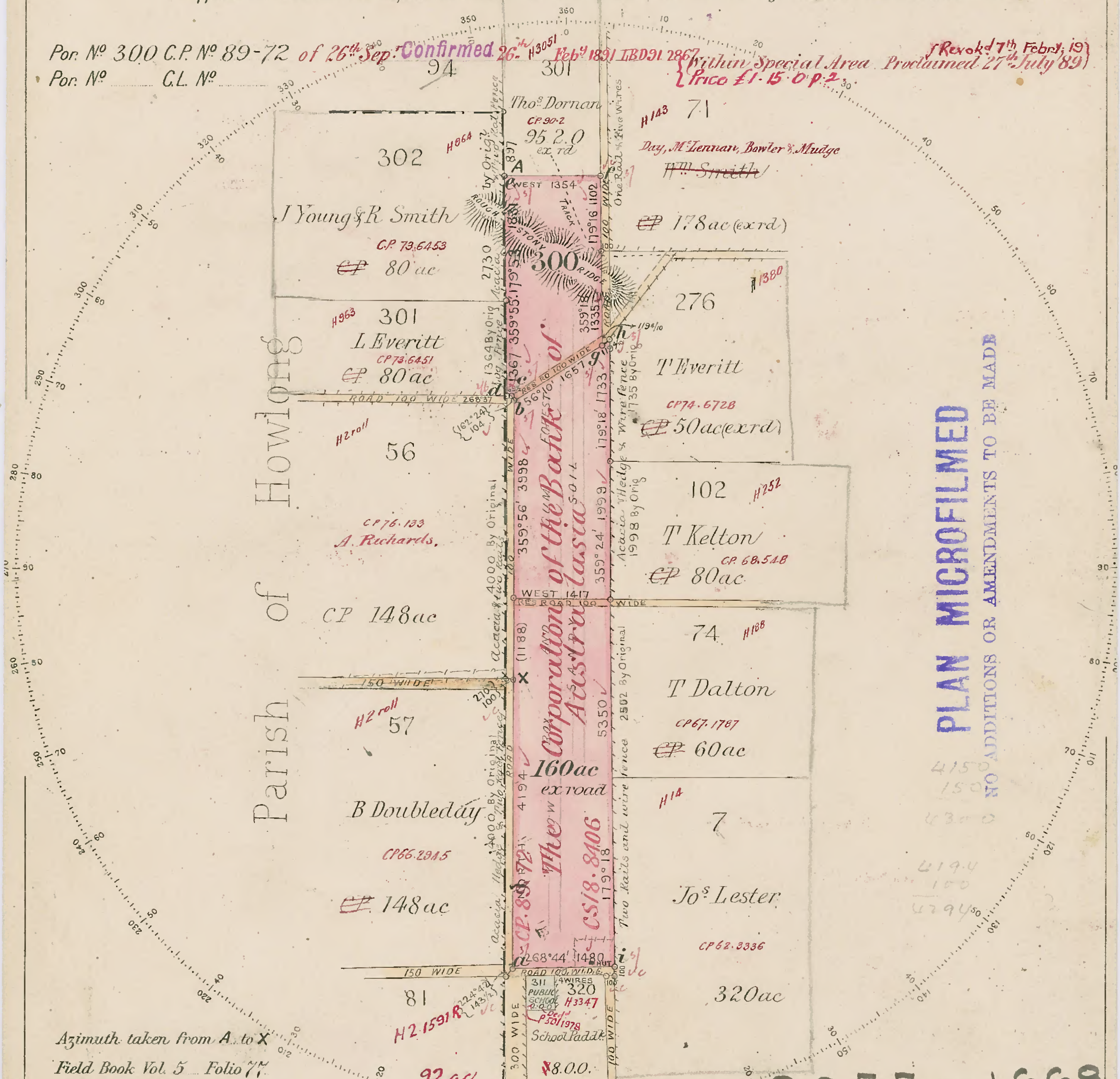
Applied for under the 24th & 26th Sections of the Crown Lands Act of 1884 by Stanislaus H De Mamiel

Por. No. 300 C.P. No. 89-72 of 26th Sep. Confirmed 26th Feby 1891 LBD 91 2867 H3051

Por. No. .... C.L. No. ....

Within Special Area Proclaimed 27th July 89 (Revoked 7th Feby, 19)

Price £1-15-0 p.a.



Azimuth taken from A to X

Field Book Vol. 5 Folio 77

3055 – 1668

Reference to Corners

Corner	Bearing	From	Links	No. on Tree
a	313°44'	Y Box	108	300
b	194°45'	Gum	8½	300
c	69°49'	Box	94½	300
d	32°20'	Box	37	300, 301
e	221°0'	Box	50	300. 301
f		POST		300 · 301
g	24°20	Box	68½	300
h	FENCE	POST		300
i	323°0	Dd Box	15½	300

Reference to Traverse

Line	Bearing	Distance
a/c 90/19		
	80.00 Chains @ 9d	
	166.82 "	" 6d
	29.54 "	" 9d rds.
	5.43 "	" 4½d con
	8 Corners @ 5/-	
	1 "	" 2/6
	35% increase.	

A.R. Hall

Value of Improvements

Wire Fence £4. Hut erecting

Charted on Head Office Maps already 13-10-91

I hereby certify that I in person made and on the 9th September 1890 completed the survey represented on this plan on which are written the bearings and lengths of the lines measured by me and I declare that the survey has been executed in accordance with the regulations published for the guidance of Licensed Surveyors and the practice of the Department of Lands.

Wm Cowley — Licensed Surveyor

Transmitted to the District Surveyor with my letter of 30th Sep 1890 — No. 24

Voucher No. 90.19 Passed 9th Decr 1890

Calculation Book No. 592 Folio 48

Checked and Charted V.G. Lynch 9.12.90

Examined A.R. Hall 9th Decr 1890

Plan approved 16 December 1890

Scale 20 Chains to an Inch.

William Orr DS

H3055

LAND REGISTRY SERVICES **Title Search** InfoTrack

NEW SOUTH WALES LAND REGISTRY SERVICES - TITLE SEARCH

FOLIO: WAL29951

SEARCH DATE	TIME	EDITION NO	DATE
10/1/2020	2:39 PM	1	11/9/2012

WARNING NOTE: INFORMATION ON THIS REGISTER IS NOT GUARANTEED

TENURE TYPE: CONTINUING

HOLDER(S)

PETER BURNETT WALLACE
PAMELA RAY WALLACE
AS TENANTS IN COMMON IN EQUAL SHARES (DW AG775474)

ENCUMBRANCES (1 ENCUMBRANCE)

1 TERM TRANSFER: NIL

NOTATIONS

UNREGISTERED DEALINGS: NIL

ACCESS LICENCE DETAILS

CATEGORY: AQUIFER

SHARE COMPONENT:
SHARE - 500 UNITS
WATER SOURCE - UPPER MURRAY GROUNDWATER SOURCE
WATER SHARING PLAN - MURRAY UNREGULATED AND ALLUVIAL WATER SOURCES 2011

EXTRACTION COMPONENT:
TIMES/RATES/CIRCUMSTANCES - SUBJECT TO THE CONDITIONS OF THE WATER ACCESS LICENCE
EXTRACTION FROM - AQUIFER
EXTRACTION ZONE - WHOLE WATER SOURCE

NOMINATED WORKS:
WORK APPROVAL NUMBER(S) - 50CA507720
INTERSTATE TAGGING ZONE - NIL

CONDITIONS

LICENCE CONDITIONS FORM A PART OF THIS LICENCE AND AFFECT THE SHARE AND EXTRACTION COMPONENTS. CONDITION STATEMENTS ARE AVAILABLE FROM

END OF PAGE 1 - CONTINUED OVER

CONDITIONS (CONTINUED)

WATERNSW

NOTES

A WATER LICENCE INFORMATION SHEET IS AVAILABLE FROM THE WATERNSW WEBSITE WWW.WATERNSW.COM.AU AND SHOULD BE REFERRED TO IN INTERPRETING THIS LICENCE.
WATERNSW PHONE 1300 662 077, EMAIL CUSTOMER.HELPDESK@WATERNSW.COM.AU
LICENCE REFERENCE NUMBER: 50AL507719
PREVIOUS WATER ACT LICENCE NUMBER(S): 50PT940472, 50BL196660.

*** END OF SEARCH ***

 Received: 10/01/2020 14:39:11

SEARCH REPLY

InfoTrack

G P O Box 4029

SYDNEY NSW-2001

Department of Primary Industries Office of Water

APPROVALS UNDER WATER MANAGEMENT ACT 2000
LICENCES UNDER WATER ACT 1912 (Part 2, Part 5, Part 8)

Solicitor Enquiry Number: SE024944 **Date closed:** 23/01/2020

Your reference: 557484

Vendor's name(s)
Wallace,P B & P R
Purchaser's name(s)
Muntz ,Fleming

A search of the Office's databases in relation to the lots or licence/approval numbers supplied in your request has disclosed the following:

Land Reference	Approval / Licence no.	WAL	Material attached
300//753749	50CA507720	29951	Statement of Approval (WMA 2000)
301//753744	50CA507720	29951	Statement of Approval (WMA 2000)
302//753744	50CA507720	29951	Statement of Approval (WMA 2000)
7//665615	50CA507720	29951	Statement of Approval (WMA 2000)
7//665616	50CA507720	29951	Statement of Approval (WMA 2000)
74//753749	50CA507720	29951	Statement of Approval (WMA 2000)
75//753749	50CA507720	29951	Statement of Approval (WMA 2000)
94//753749	50CA507720	29951	Statement of Approval (WMA 2000)

NOTE:

* Water Access Licences (WALs) are separate from land and must be searched separately.

Contact

Should you wish to obtain further information on Water Licensing issues or seek advice relating to the licenses/approvals on the search reply please contact the Water Regulation Officer at:

MURRAY REGION

NSW Office of Water
PO BOX 205
449 CHARLOTTE STREET
DENILIQUIN NSW 2710
Phone: 03 58983900
Fax: 03 58813465

For financial statements for each chargeable licence, you will need to make a request directly with State Water Corporation (SWC).
A request form is attached if the licence is chargeable.

This water interest search was conducted by Cathy Ahmed who is contactable on 02 9865 2325

For this search, the following licences incur annual water charges:

* WAL29951

Please note: the NSW Office of Water aims to maintain the accuracy and completeness of its records but does not warrant the information supplied.

PLEASE SEE GENERAL WARNINGS ON NEXT PAGE

WARNINGS:

Where the search reports licences under the Water Act 1912, these licences continue to be attached to land and are transferred with land sales. A licence statement is provided.

Where the search reports approvals under the Water Management Act (WMA 2000), then the rights to take water have been separated from the approvals for works and use of water on land. These rights to take water are defined in Water Access Licences (WALs) which do not automatically transfer with the land, and must be searched separately.

Detailed information on Water Access Licences can be obtained from the Water Access Licence Register held at the Department of Land and Property Information (LPI) using the WAL number. Water Access Licences without a WAL number are not yet on the register. (The website address is: https://six.nsw.gov.au/wps/portal/).

Water Access Licence conditions and general information can be found on the NOW website using either the WAL number or NOW reference number.
(The website address is: http://www.water.nsw.gov.au).

Works Not on Land Being Sold - If the Water Supply Works Approval statement shows works (pumps etc) to be on land which is not included in the proposed sale then the approval does not guarantee access to that land unless specified in the conditions.

Search Reports Expired Licence or Approval - Contact Regional Office to determine the status of any application that may have been lodged to renew the licence or approval in question.

Stock and domestic bores - this search may not report all stock and domestic bore licences/approvals on the properties. Such licences/approvals however do not attract any fees. If the landholder believes there is a licenced bore on the property which has not been reported and further information is desired please contact the regional office address shown.

Statement of Approval
Water Management Act 2000

Approval details

Approval number	50CA507720
Status	CURRENT*
Approval kind	Water Supply Works Water Use
Water sharing plan	MURRAY UNREGULATED AND ALLUVIAL WATER SOURCES 2011
Date of effect	30/Jan/2012
Expiry date	29/Jan/2025
Approval holder(s)	Schedule 1
Water supply works	Schedule 2
Water use	Schedule 3
Conditions	Schedule 4

Contact for service of documents

Name	Wallace, Peter Burnett
Address	Culverley Rise RMB 351 ALBURY NSW 2640

*** Note: An approval has effect for such period as is specified in the approval, or if the period is extended under section 105, that extended period. If an application for extension of an approval is lodged before the approval expires, the term of the expiring approval is extended until either the date of the final decision on the application, or a date fixed by the Minister for the approval, whichever is the later date. An approval which has expired can be the subject of an application to extend it but it needs to be accompanied by a statutory declaration of the reasons for the delay in making the application. If the Minister accepts these reasons the term of the approval is taken to have been extended, and the application may be dealt with, as if the application had been made before the approval expired.**

It is an offence under the Water Management Act 2000 to breach a term or condition of the approval or to construct and use works to which the approval does not relate. It is also an offence to use works the subject of an approval if the approval has expired, been surrendered or cancelled.

Schedule 1 - Approval holders

The holders of this approval are:

Approval holder(s)	ACN (if applicable)
Peter Burnett Wallace	
Pamela Ray Wallace	

Important notice - change of landholder or contact

Please advise the Office in the event of any of the following, as soon as practicable:

- If there is a change in the ownership or occupation of the land benefited by this approval (see Schedule 2). Under the Water Management Act 2000, an approval is typically held by the owner or lawful occupier of the benefited land. Consequently, a change in occupation may cause a change in your legal obligations as an approval holder.*
- If there is a change to the contact person. You will be required to lodge a written statement signed by all the holders.*
- If there is a change to the mailing address for the nominated contact person. This should be done by the contact person in writing.

** An updated Statement of Approval will be issued free of charge*

Schedule 2 - Water supply works

Part A: Authorised water supply works

Subject to the conditions of this approval, in relation to each numbered work in the table, the holders of this approval are authorised to construct and use a water supply work of the type shown at the location specified:

Work 1

Work identifier	GW503143	
Specified work	BORE	
Diameter (constructed) in millimeters	225	
Specified location	7//665615	Whole Lot
Management zone (if applicable)		
Water source	UPPER MURRAY GROUNDWATER SOURCE	
Water sharing plan	MURRAY UNREGULATED AND ALLUVIAL WATER SOURCES 2011	

Schedule 3 - Water Use

Subject to the conditions of this approval, the holder(s) of this approval is authorised to use water for the following purpose(s) and location(s):

Purpose 1

Specified purpose	IRRIGATION
Specified location	7//665615 74//753749 75//753749 301//753744 302//753744 94//753749 7//665616 300//753749

Schedule 4 - Conditions

The approval is subject to the following conditions:

Plan conditions

Water sharing plan — ***Murray Unregulated and Alluvial Water Sources***

Water management works

MW0097-00001

If contaminated water is found above the production aquifer during the construction of the water supply work authorised by this approval, the licensed driller must:
A. notify the relevant licensor in writing within 48 hours of becoming aware of the contaminated water, and
B. adhere to the Minimum Construction Requirements for Water Bores in Australia (2012), as amended or replaced from time to time.

MW0487-00001

The water supply work authorised by this approval must be constructed within three (3) years from the date this approval is granted.

MW0044-00001

A. When a water supply work authorised by this approval is to be abandoned or replaced, the approval holder must contact the relevant licensor in writing to verify whether the work must be decommissioned.

B. The work is to be decommissioned, unless the approval holder receives notice from the Minister not to do so.

C. When decommissioning the work the approval holder must:
i. comply with the minimum requirements for decommissioning bores prescribed in the Minimum Construction Requirements for Water Bores in Australia (2012), as amended or replaced from time to time, and
ii. notify the relevant licensor in writing within sixty (60) days of decommissioning that the work has been decommissioned.

Monitoring and recording

MW2338-00001

The completed logbook must be retained for five (5) years from the last date recorded in the logbook.

MW0484-00001

Before water is taken through the water supply work authorised by this approval, confirmation must be recorded in the logbook that cease to take conditions do not apply and water may be taken.

The method of confirming that water may be taken, such as visual inspection, internet search, must also be recorded in the logbook.

If water may be taken, the:
A. date, and
B. time of the confirmation, and
C. flow rate or water level at the reference point in the water source
must be recorded in the logbook.

MW2336-00001

The purpose or purposes for which water is taken, as well as details of the type of crop, area cropped, and dates of planting and harvesting, must be recorded in the logbook each time water is taken.

MW2337-00001

The following information must be recorded in the logbook for each period of time that water is taken:
A. date, volume of water, start and end time when water was taken as well as the pump capacity per unit of time, and
B. the access licence number under which the water is taken, and
C. the approval number under which the water is taken, and
D. the volume of water taken for domestic consumption and/or stock watering.

MW2339-00001

A logbook must be kept, unless the work is metered and fitted with a data logger. The logbook must be produced for inspection when requested by the relevant licensor.

MW0482-00001

Where a water meter is installed on a water supply work authorised by this approval, the meter reading must be recorded in the logbook before taking water. This reading must be recorded every time water is to be taken.

Reporting

MK0485-00001

Within sixty (60) days of completing construction of the water supply work authorised by this approval, the approval holder must provide a completed Form A for that work to the relevant licensor.

Other conditions

No other conditions applicable

Glossary

cease to take - Cease to take conditions means any condition on this approval, or on the access licence under which water is proposed to be taken, that prohibits the taking of water in a particular circumstance.

domestic consumption - Domestic consumption is the use of water for normal household purposes in domestic premises situated on the land.

form A - Form A is the form supplied to the approval holder by the driller at completion of the work. It includes details of location and construction of the bore, and quality of the bore water. All sections must be completed before the approval holder signs the form.

licensor - WaterNSW or DPI Water, depending on which organisation administers your licences and/or approvals

logbook - A logbook is a document, electronic or hard copy, that records specific required information.

metered water supply work - A metered water supply work is a water supply work fitted with a data logger and a water meter that complies with Australian Standard AS 4747: Meters for non-urban water supply.

stock watering - Stock watering is the use of water for stock animals being raised on the land. It does not include the use of water for the raising of stock animals on an intensive commercial basis (kept in feedlots or buildings for all, or a substantial part, of the period during which the stock animals are being raised).

water meter - A water meter is a device that measures the volume of water extracted over a known period of time. Examples of a water meter include a mechanical meter, electromagnetic meter, channel meter with mobile phone, or an authorised meter equivalent.

General Notes

All conditions on an approval require compliance. An appeal to the Land and Environment Court against a decision to impose certain conditions on an approval can be made within 28 days after the date the decision is made. Conditions identified with the first letter "D" are those that can be appealed during the appeal period.

The words in this approval have the same meaning as in the *Water Management Act 2000*

Note: The words in this approval have the same meaning as in the WMA

END OF STATEMENT

APPENDIX B:

Photographs of the Site and surrounding area

Photograph 1:

The location of the proposed vehicle crossover to the Site (looking north from Mayfield Road adjacent the Site).

Photograph 2:

Mayfield Road to the east of the location of the proposed vehicle crossover to the Site (looking east from Mayfield Road adjacent the Site).

Photograph 3:

Mayfield Road to the west of the location of the proposed vehicle crossover to the Site (looking west from Mayfield Road adjacent the Site).

Photograph 4:

The location of the proposed internal access road to the feedlot area and the location of the proposed truck turning area adjacent to the proposed feed mill building (looking south from the north-eastern corner of the feedlot area within the Site).

Photograph 5:

The location of the proposed truck turning area adjacent to the proposed feed mill building (looking south-southwest from the north-eastern corner of the feedlot area within the Site).

Photograph 6:

The location of the proposed feed mill building and silos (looking southwest from the north-eastern corner of the feedlot area within the Site).

	Photograph 7: The location of the proposed feed mill building and silos (looking west-southwest from the north-eastern corner of the feedlot area within the Site).
	Photograph 8: The location of the proposed internal access road to the proposed truck turning area, feed mill building and silos (looking north from adjacent the proposed feedlot handling yard within the Site).
	Photograph 9: The location of the proposed feedlot handling yard (looking north-northwest from adjacent the proposed feedlot handling yard within the Site).

Photograph 10:

The location of the proposed feedlot handling yard and alignment of the pens with the existing dam shown in the distance proposed to be removed (looking northwest from adjacent the proposed feedlot handling yard within the Site).

Photograph 11:

The location of the proposed feedlot handling yard with the existing dam shown in the distance proposed to be removed (looking west from adjacent the proposed feedlot handling yard within the Site).

Photograph 12:

The location of the proposed internal access road to the proposed feedlot area (looking south from adjacent the proposed feedlot handling yard within the Site).

Photograph 13:

The location of the proposed silos, feed mill building and truck turning area in the distance (looking east from the proposed feed road vehicle turning area adjacent proposed 'Pen O').

Photograph 14:

The location and alignment of the proposed feed road and pens (looking southeast from the proposed feed road vehicle turning area adjacent proposed 'Pen O').

Photograph 15:

The locations of the proposed pens (left) and manure pad area (right) (looking south-southeast from the proposed feed road vehicle turning area adjacent proposed 'Pen O').

Photograph 16:

The locations of the proposed manure pad area and sediment and holding ponds (looking south from the proposed feed road vehicle turning area adjacent proposed 'Pen O').

Photograph 17:

The locations of the proposed sediment and holding ponds (looking southwest from the proposed feed road vehicle turning area adjacent proposed 'Pen O').

Photograph 18:

The locations of the proposed sediment and holding ponds (looking northeast from the southwestern corner of the proposed holding pond).

Photograph 19:

The locations of the proposed sediment and holding ponds (looking east from the southwestern corner of the proposed holding pond).

Photograph 20:

The locations of the proposed sediment and holding ponds (looking southeast from the southwestern corner of the proposed holding pond).

*****

APPENDIX C:

Environmental Assessment

Environmental Assessment Report

Culverly Rise Sheep Feedlot

Report Number 24439.102586

Prepared for

Prepared by

Bungowannah Pastoral Co. Pty Ltd

EnviroAg Australia

'Weebo Park', 89 Hovell Road
BUNGOWANNAH NSW 2640
Telephone: 0419 688 215
ABN: 91 638 341 303

PO Box 1775
ARMIDALE NSW 2350
Telephone: (02) 6772 9010
ABN: 56 135 005 999

Document Status Record

Report Type:	Environmental Assessment Report
Project Title:	Culverly Rise Sheep Feedlot
Client:	Bungowannah Pastoral Co. Pty Ltd
Project.Document Number:	24439.102586
File Name:	24439.102586_200610_Culverly_Rise_SheepFLOT_EAR_Rev2

Revision	Date of Issue	Author	Reviewed	Quality Assurance	Approved
A	19/05/2020	Lauren Buchanan Hanlu Zhang	Peter Pearson	Steve Webster	Simon Lott
0	25/05/2020	Lauren Buchanan	Peter Pearson	Steve Webster	Simon Lott
1	01/06/2020	Lauren Buchanan	Peter Pearson	Steve Webster	Simon Lott
2	17/06/2020	Lauren Buchanan	Peter Pearson	Sarah Gasparre	Simon Lott

Signatures

Notes:	**Distribution:**	
Rev 2: Final Report	**Recipient**	**No. Copies**
Client	Bungowannah Pastoral Co. Pty Ltd	1
Company	EnviroAg Australia	1

This document provides information to address the intent of Project Number 24439 as agreed to by Bungowannah Pastoral Co. Pty Ltd.

Executive Summary

Bungowannah Pastoral Co. Pty Ltd is seeking to establish a 3,750 head sheep feedlot at the ‘Culverly Rise’ property located at 198 Humphreys Road, Bungowannah, NSW.

This Environmental Assessment Report (EAR) has been prepared by EnviroAg Australia Pty Limited (EnviroAg) for the Culverly Rise Feedlot Statement of Environmental Effects (SEE) for the development consent application to Greater Hume Council.

This EAR outlines the proposed sheep feedlot layout which allows pen size of 5 m²/sheep, construction of 22.5ML holding pond and 5.5ML sediment basin and a 26.5ML tailwater dam or contaminated agricultural runoff dam.

Hydraulic modelling has been completed to determine suitable location, sizing and design of effluent storage and application to land. With appropriate management measures implemented, it is anticipated that environmental impacts from these activities will be mitigated.

Cumulative odour impacts have been considered from several nearby small-scale feedlot facilities. With appropriate management measures implemented it is anticipated that environmental impacts from odour generation will be managed to acceptable levels.

Noise is not an issue for this site as the nearest receptor that is not an active feedlot is over 2.5km away from the proposed feedlot site.

The design and operation of the facility will be in accordance with the *Model code of practice for the welfare of animals: the sheep* (Primary Industries Ministerial Council 2006), thus animal welfare issues will be appropriately managed on site.

The project has been designed to avoid and mitigate impacts to the environmental values of the site and adjoining land where practicable and minimise any remaining potential impacts through appropriate design and management measures. A thorough and comprehensive assessment of existing environmental values and potential environmental impacts has been undertaken.

The project will avoid, mitigate and minimise potential impacts to a degree that will enable significant economic and operational benefits to be sustainably achieved.

This report has been prepared in accordance with the planning guidelines *Intensive Livestock Agriculture Development* (DoPE 2019).

Table of Contents

List of Tables

List of Figures

List of Appendices

1. Introduction

Bungowannah Pastoral Co. Pty Ltd is seeking to establish a 3,750 head sheep feedlot on the 'Culverly Rise' property located at 198 Humphreys Road, Bungowannah, NSW.

The proposed feedlot will include the following development:

- 15 pens located on the north eastern boundary of the Culverly Rise property;
- Internal roads;
- Manure and carcass composting area;
- Controlled drainage system;
- Holding pond and sediment basin;
- Feed mill and storage; and
- Contaminated agricultural runoff (CAR) dam.

Substantial market opportunities exist for feedlot lamb, both domestically and internationally. By controlling the animal's environment and nutrition during fattening, a higher quality and more consistent product can be produced. Feedlots also allow significant value to be added to grains and agricultural by-products that are otherwise unsuitable or are low value products (nutritionally and monetarily) when directly utilised for human consumption.

Bungowannah Pastoral Co. Pty Ltd believes the production derived from the proposed development will complement their existing agricultural activities.

This Environmental Assessment Report (EAR) is a comprehensive assessment of the proposed feedlot infrastructure and its' potential impacts on the surrounding environment. It will accompany the Statement of Environmental Effects (SEE) for the development consent application to Greater Hume Council.

2. Site

2.1 Site Identification

Relevant site details are presented in Table 1.

Table 1 Site details

Site Address	'Culverly Rise' - 198 Humphreys Road, Bungowannah 2640
Site Name	Culverly Rise Feedlot
Property Area	Culverly Rise – 318 ha Weebo Park – 1125 ha
Feedlot Area	21 ha
Land owner	Mr Michael Dunn
Applicant	Bungowannah Pastoral Company
ABN	91 638 341 303
Contact details	Mr Michael Dunn 'Weebo Park' 89 Hovell Road BUNGOWANNAH NSW 2640

Lot on plan	Culverly Rise' - 198 Humphreys Road, Bungowannah 2640 • 300/-/DP753749 • 7/-/DP665615 • 75/-/DP753749 • 301/-/DP753744 • 7/-/DP665616 • 94/-/DP753749 • 302/-/DP753744 • 74/-/DP753749 'Weebo Park' - 89 Hovell Road, Bungowannah 2640 (Weebo Park Pty Ltd and C.P.D. Dunn Pty Ltd) • 2/-/DP1192682 • 268/-/DP753749 • 47/-/DP753749 • 65/-/DP753749 • 2/-/DP1250551 • 271/-/DP753749 • 48/-/DP753749 • 80/-/DP753749 • 245/-/DP753749 • 3/-/DP1192682 • 49/-/DP753749 • 303/DP753749 • 247/ DP753749 • 4/DP1192682 • 1/DP1194393 • 269/DP753749 • 101/DP753749 • 270/DP753749 • 272/DP753749 • 102/DP753749 • 274/DP753749 • 136/DP753749 • 279/DP753749 • 278/ DP753749 • 277/DP753749 • 273/DP753749 • 280/DP753749 • 276/DP753749 • 2/DP1226147 • 3/DP1231094 • 1/DP1250551 • 2/DP1192682 • 3/DP1250551
Tenure	Freehold
Land Use Zoning	RU1 Primary Production Zone
Local Government	Greater Hume Council

2.2 Property Description

The 'Culverly Rise' property is located approximately 25km northwest of Albury, NSW. It is in a rural locality and is predominantly surrounded by agricultural activities.

The proposed site is zoned RU1 Primary Production Zone under the *Greater Hume Local Environmental Plan* (2012).

The site is currently operated for grazing and cultivation purposes and the proposed use will maintain the agricultural business nature and character of the region.

There are other small-scale feedlots nearby, the closest being the neighbor directly to the west of the Culverly Rise property. A complete assessment of nearby receptors and cumulative impacts is discussed in section 4.1 of this report.

Access to the proposed development will be from Humphreys Road which is directly connected to the Riverina Highway. Humphreys Road is currently unsealed.

There is State Vegetation Mapping across the property (refer to Figure 2); however, the feedlot infrastructure and activities will not impact any of this designated area.

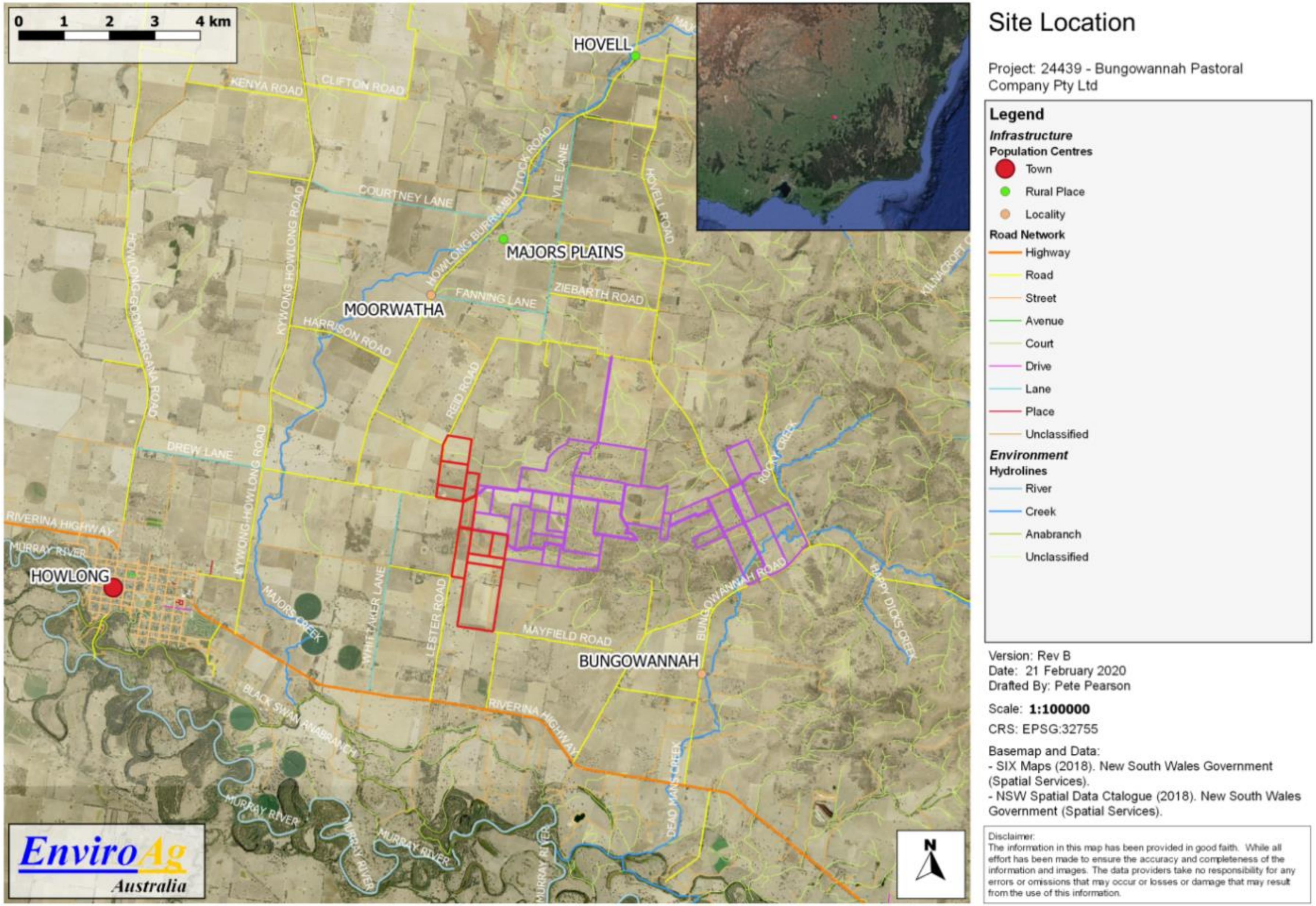


Figure 1 Site Location

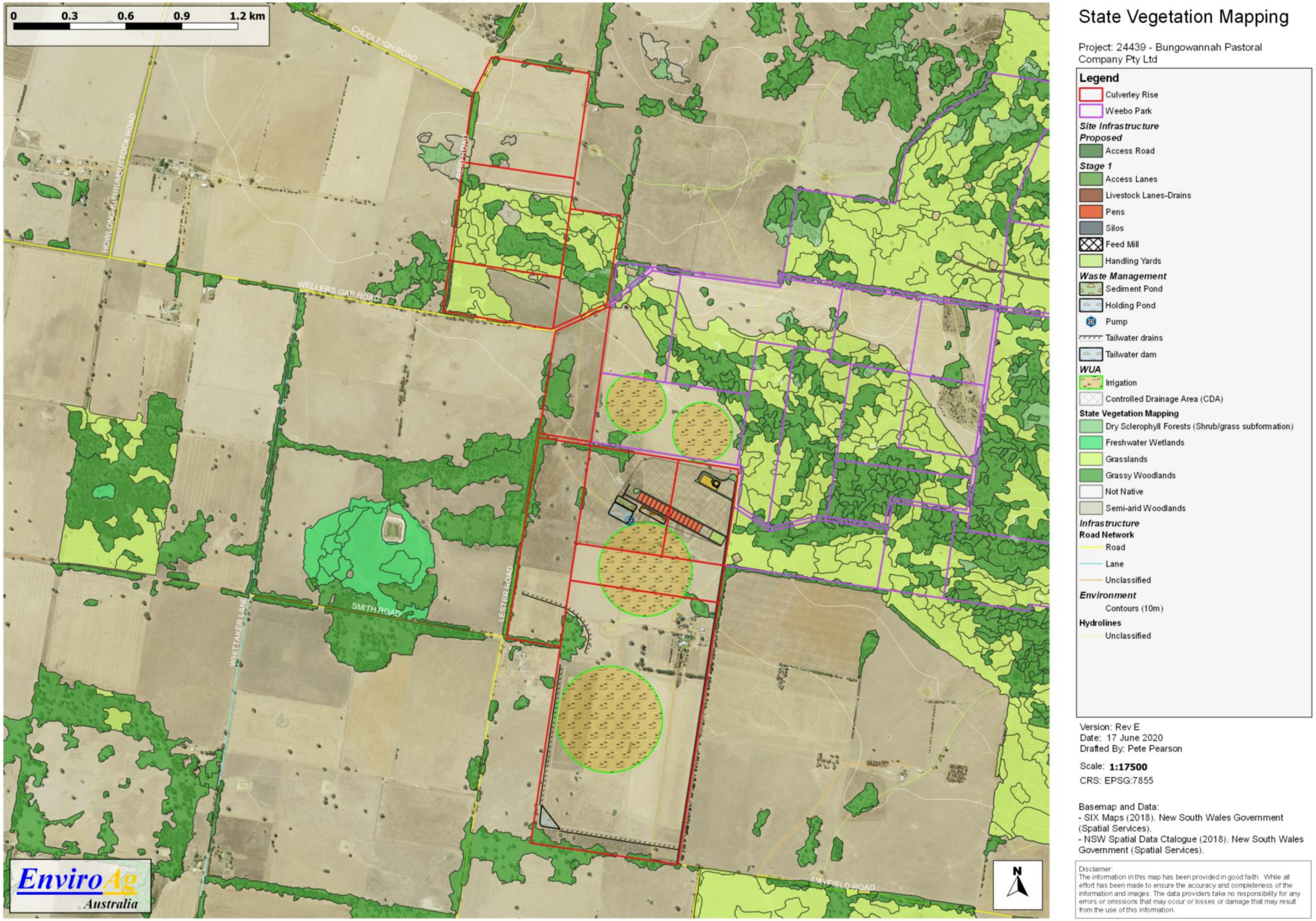


Figure 2 State Vegetation Mapping

3. Proposed Development

3.1 Site Operations

The site will operate at a maximum capacity of 3,750 sheep. Approximately 800 sheep (lambs) can be transported on a standard 25m B double truck and the maximum accommodation period on site is anticipated to be 50 days. It is possible to have a maximum of 7 drafts per year; however, it is likely that an average year will only see 4 drafts occur. This equates to approximately 65 truck movements for sheep each year.

Sheep will consume grain feed (1.5kg/head/day) and roughage (0.2kg/head/day), this will result in approximately 50 trucks for feed each year.

The site will contain 15 pens to house the 3,750 head of sheep.

The concept site layout is show in Figure 3.

Table 2 Production parameters of the proposed feedlot.

Parameter	Value
Maximum capacity	3,750 head sheep
Average Days on feed	50 days
Average number of drafts per year	4
Maximum number of drafts per year	7
Mean occupancy	57%
Mortality rate	<1%
Stocking density	5 m^2/sheep
Average throughput	15,000 head/year
Maximum throughput	26,250 head/year
Feed consumption	1.7 kg dry matter/sheep/day

3.2 Operational Hours

The site is proposed to operate between 6am and 8pm, 7 days per week. As discussed further in this report, due to animal welfare reasons, if trucks arrive at the site between 8pm and 6am they will require to be unloaded to ensure the animals do not come under stress.

While most operations will cease from 6pm each day, there will be times where loads will not arrive until later and operations will need to continue until 8pm to ensure the animals are managed appropriately.

3.3 Staffing

The proposed feedlot will employ 3 full-time staff and up to 4 part time staff, depending on seasonal variations and market fluctuations.

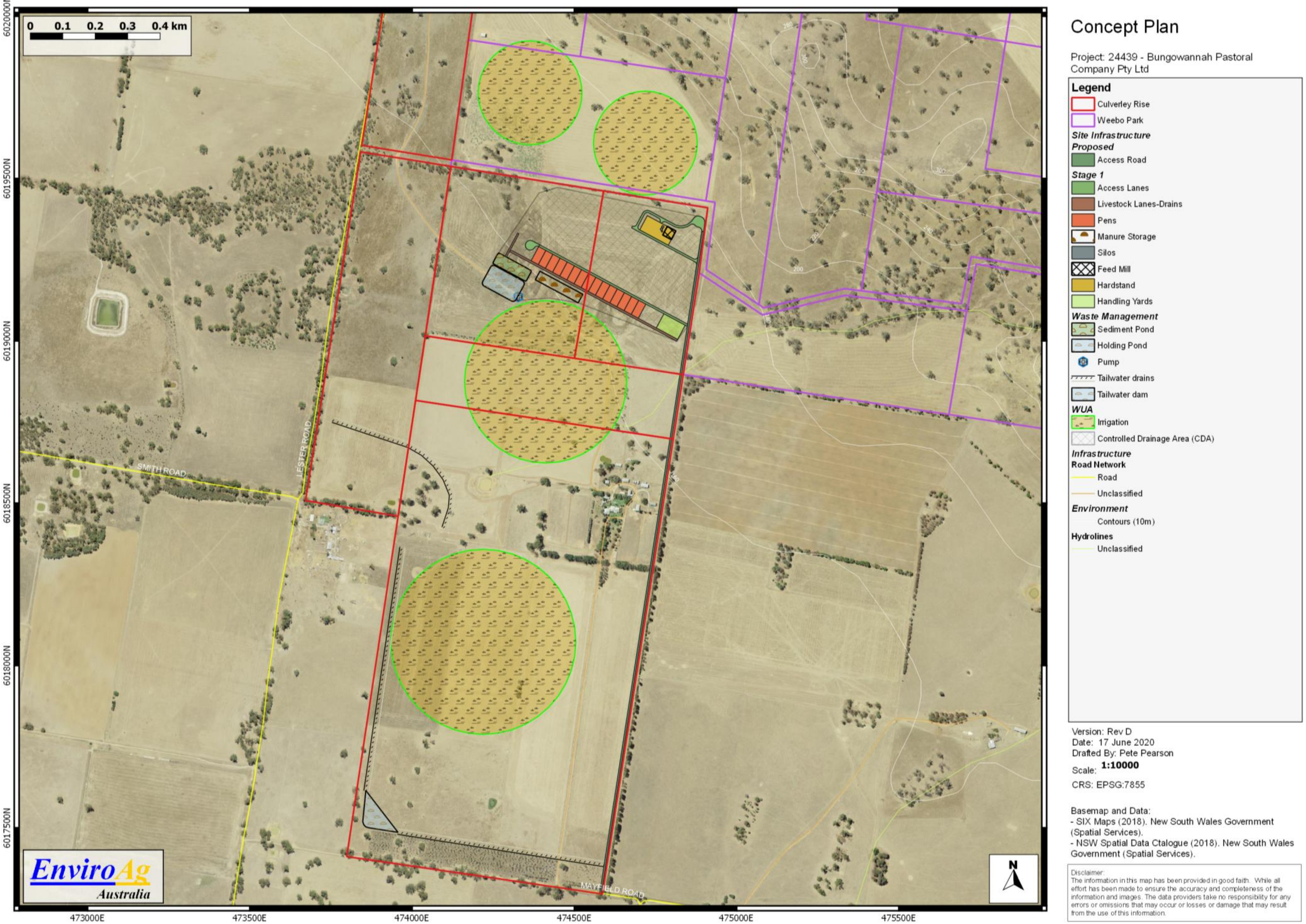


Figure 3 Concept Site Layout

3.4 Stocking Density

Stocking densities will average $5m^2$/sheep. Each 25m x 50m pen can accommodate up to 250 sheep.

The Australian Animal Welfare Standards and Guidelines for the Welfare of Sheep (DAAHA 2016) outlines that the minimum area per sheep for outdoor feedlots for lambs up to 41kg is $1.0m^2$ and $1.3m^2$ for adult sheep.

3.5 Pen Design

In accordance with the MLA National Guidelines (2011) the feedlot will be north/south facing to maximise solar radiation and evaporation rates. Pen design is shown in Appendix A.

The pen surfaces will be evenly graded and with a slope between 2% and 4%. Concrete aprons or compacted crushed rock will be installed around high traffic areas, such as feeding and watering points, and will be a minimum width of 2m. The pens will be constructed of crushed and compacted ferricrete. The material has been shown to have permeability less than 1×10^{-9} m/s when compacted to > 98% density. This engineered surface will be essentially impermeable and resistant to traffic by animals and machinery.

Shelter will be provided at $0.4m^2$ per lamb (MLA 2011), the shelter design will ensure that both ventilation beneath the structure and afternoon shade area are maximised. The shaded areas are oriented to allow the shade to move across the pen during the day and to encourage drying of the pen floor.

3.6 Feedlot Design

The feedlot consists of 15 pens, a compost manure pad, handling/loading yards, feeding alleys, a feed mill, wastewater holding pond and contaminated agricultural runoff dams.

A summary of the areas of land use applicable to the proposed feedlot development is provided in Table 3 below.

Table 3 Areas of land use

Land Use	Area (ha)
Open pen area	1.87
Handling yards	0.37
Combined livestock lanes and roads and open area storage	0.32
Manure stockpile pad	0.45
Feedmill and storage sheds	0.69
Holding pond & Sediment Basin – internal area only	1.25
Grassed areas	15.9
Total Controlled Drainage area	**20.85**
Irrigation Area	60.9
Waste Utilisation Area (manure application)	318.8
Total Uncontrolled Drainage Area	**379.7**

3.7 Water Supply

An adequate supply of clean, good quality water will be available to sheep and lambs at all times. Water troughs and float valves will be maintained to minimise overflows and spillage. Troughs will be cleaned as frequently as necessary to optimise water and dry matter intake.

A minimum of 4 litres of water per head per day and up to 6.5 litres during sustained hot and/or humid weather will be available on demand. At least 3 days water supply should be available in case of breakdown or emergency (MLA 2011). Therefore; the site will require a minimum water supply of 8.9ML per year for stock.

Water resources should be fresh, palatable and cool with less than 4,000ppm soluble salts for lambs and 7,000ppm for mature sheep.

There is a minor dam pre-existing on site that may be used for stock watering purposes; however, there are 5 pre-existing bores on the 'Culverly Rise' property, 4 of which are directly utilised for water supply purposes. The site is considered to have sufficient pre-existing water infrastructure to support the proposed sheep feedlot.

3.8 Drainage Systems

3.8.1 Controlled Drainage Areas

In general, uncontrolled runoff from a feedlot and its associated facilities may pose as a risk to water quality in the external environment. The environmentally "safe" management of wastes within a feedlot is founded upon the general containment of solid and liquid wastes within a controlled drainage area (CDA) where runoff, particularly from rainfall events, can be captured and, within the system's design capacity, safely contained. In practical terms, a controlled drainage area can be delineated as the land area between:

- Any clean water diversion banks above the feedlot;
- Catch-drains, and,
- Wastewater holding ponds downslope from the feedlot.

The entire hydrology of the CDA is required to be engineered for extreme wet season events due to the location of the facility in relation to normal climatic processes for the areas.

The relevant land use areas within the CDA of the proposed development are shown in Table 3. The CDA of the proposed feedlot compromises a catchment with a total area of approximately 20.85ha.

3.8.2 Clean Water Diversion Banks

Many feedlots employ diversion banks to prevent clean water entering the CDA from up slope and adding to feedlot runoff. The feedlot is designed with a clean water diversion bund around the north eastern edge of the facility that will divert clean waters around the site and prevent excess contaminated waters being generated.

3.8.3 Catch Drains

Runoff from the pen areas will be collected in catch drains situated directly behind each pen. The controlled drains attached to the pens are located down slope of the pens ensuring all runoff from the pens enters this drainage system appropriately. These drains will discharge into the holding pond. Critical management practices, such as cleaning the entire site prior to the onset of wet season, will be implemented on site.

Catch drains will be designed to carry peak flow rates resulting from a design storm with an average recurrence interval (ARI) of 20 years and a runoff coefficient of 0.8. The maximum allowable flow velocity in channels is dependent on the characteristics of the material lining of the channel. High design velocities (>3 m/s) generally necessitate a concrete or masonry liner being applied. Where it is desirable to minimise any sedimentation of the entrained solids in the drains, minimum flow velocities (>0.3 – 0.5 m/s) may apply.

Drains will be constructed at a 0.3% slope, and will perform two tasks:

- Apprehend and divert runoff to the holding dam, and,
- Capture sediment.

The channels formed by the catch drains and main drains will be trapezoidal in cross-section. The bed width of the channel is usually determined by factors such as the operating width of the machinery cleaning and maintaining the drain. The drains will be lined with compacted gravel to provide a suitably durable surface for the dual purposes of being trafficable and moving drainage waters. For channels lined with compacted gravel and having a bed slope gradient of 1-2%, a suitable maximum design velocity is 0.6m/s.

A suitable freeboard for the feedlot drains is 0.5 metres (ICIAI, 1997). Side batter grades should less than 1:3 (ICIAI, 1997). Energy dissipaters may need to be placed where a catch drain terminates in a holding pond, so reducing the exit velocity from the channel (Lott, 1994). Detailed design of the CDA drains will be conducted once approval for the feedlot has been obtained.

3.8.4 Wastewater Holding Pond

Because the frequency, intensity and duration of individual rainfall events are a function of probability, it is not possible to design a drainage system that will contain the feedlot runoff during every potential rainfall event. Accordingly, embankments might overtop or spillways might overflow during extreme rainfall events. Other than in very sensitive environments the allowable design frequency of holding pond overtopping and overflow events is an average of less than 1 in 10 years (Skerman 2000).

The principal design function of a holding pond is to store feedlot runoff until such time as the pond effluent can be safely used for irrigating the wastewater utilisation area. Depending on the time for which the runoff is stored in the holding pond, microbial degradation (principally anaerobic) of the entrained organic matter may occur, a portion of any mineralised nitrogen may be lost to volatilisation and denitrification processes and a proportion of the water will be lost to evaporation (Lott 1994 and ICIAI 1997). Some sludge build-up may also occur through settlement of the entrained solids (Lott 1994).

A single large primary wastewater pond is proposed. It will be designed so that:

- It can be rapidly dewatered;
- It has a dead storage volume for accumulation of sludge;
- It self-drains for ready drying and cleaning (through the dry season); and,
- It has an emergency over flow to a wet weather storage pond (WUA tailwater dam).

In addition, the wastewater pond will be constructed so that it is cut below the natural surface and will have an embankment of approximately 2-3m above the surface. The pond lining will be further "reinforced" to prevent lining 'push out' by the subsurface flow. Further, to reduce the risk of structural failure of the inner embankment and floor, rock armouring will be implemented to improve stability during periods of heightened transient groundwater flow. Compacted material under the clay liner will undergo stability treatment. A piezometer will be placed above and below the pond to monitor shallow groundwater depth and quality and to function as an early warning leak detection system.

Holding pond spillways are to be designed to discharge a 1 in 50 year storm event at non scouring velocity. The minimum freeboard is to be 0.9m.

Modelling with FSIM (Lott 1995 and Lott 1998) has indicated that a minimum holding pond size of 22.5ML will be required to minimise overtopping and overflow events to less than 1 in 10 years.

3.8.5 Sediment Basin

The purpose of the sediment basin is to catch the solids from wastewater and allow the liquids to continue on to the primary wastewater pond for treatment. To achieve this, the sediment basin typically needs to slow water flow to less than 0.005m/s (Lott & Skerman, 1995). Sediment basin cleaning will be undertaken via a front-end loader or excavator. Solids recovered from the basins will be placed on the compost manure pad for composting. The liquids from the sedimentation basins will discharge to the primary wastewater pond.

Sedimentation basins and ponds typically have aspect ratios (*L*/*W*) of between 2:1 and 3:1 but basins shallower (<1.5m in depth) than ponds (>1.5m in depth).

Sediment basins are designed to drain freely after each runoff event so allowing the collected solids to be dried and removed at frequent intervals, and to allow solids from a series of runoff events to accumulate with decanting of the captured solids typically occurring at intervals of one to five years.

The final design of the sediment basin will be confirmed on completion of the detailed design for the site. Modelling for the site requires a minimum sediment basin capacity of 5.5ML.

3.8.6 WUA Tailwater Dams

The waste utilisation areas have tailwater dams. These are designed as a "terminal system" to capture runoff from the areas where effluent and composted manure have been deposited as part of the site operations. These waste utilisation areas (WUA) tailwater dams will accommodate the effluent tailwater volume plus stormwater runoff from the WUAs.

The WUA tailwater dam will overflow with excess clean water inflows. Accordingly, the pond spillway should be designed to accommodate the runoff from at least a 1 in 20 year design storm for the WUA catchments (ICIAI, 1997 and SCARM, 1997).

Capturing the first flush (25mm) allows the property to capture the primary contaminants that would be generated by the site runoff at the commencement of a rain event.

The WUA capacity for the catchment area has been calculated as follows:

Total Area of WUA (ha) x 0.25 = Maximum Capacity in megalitres (ML).

The WUA tailwater dam is proposed to be approximately 26.5ML; however, the actual capacity will be finalised during the detailed design phase.

The WUA tailwater dam will be largely cut below the natural surface. This will eliminate any prospect of catastrophic embankment failure. The by-wash and weir must be capable of handling a 1 in 50 year design storm. The by-wash is to be cut on the lowest point on the tailwater pond and WUA tailwater dam so water discharge to the natural flow line.

3.9 Waste Water Irrigation Area

The runoff from the feedlots controlled drainage area captured in the holding pond is to be irrigated on land within the property adjacent to the feedlot (refer to Figure 3) where the nutrients and water can be utilised in plant production. The soil in this wastewater utilisation area provides a "sink" for the assimilation of applied nutrients.

An irrigation area cropped to improved pasture would need to be 20ha in size to enable wastewater applications to be sustainable from a nutrient balance viewpoint. The proposed irrigation area is 60.9ha and more than sufficient to spread the collected effluent waters.

The irrigation areas of 60.9ha will be sown to an improved pasture and will be cut for silage production. It is estimated that irrigated improved pasture will have a gross water requirement of 9.58ML/ha/year respectively (refer to section 4.5.4 of this report for assessment of this aspect).

The annual average waste water production is estimated to be approximately 111ML per year, applied to 60.9ha this equates to approximately 1.8ML/ha/year. This is less than the expected crop water requirement of 9.58ML/ha/year. A crop water deficit is expect in summer and clean water will be held where ever possible to irrigate at this time to allow crop dry matter yields to be maximised.

3.10 Crop Production

It is critical that a crop is grown that grows through winter and summer and provides year round water demand and maximum dry matter production so that it can be harvested in dry breaks in the wet season (silage), as early as possible after the wet season for silage and hay, and then through the dry season as hay so it provides a dry fodder supply for the operations.

To achieve this, it is proposed to use a brassica/canola mix. This provides an improved pasture that is extremely competitive and takes up appreciable amounts of Nitrogen, Phosphorus, Potassium and Sulphur.

Maintenance of the improved pastures by separating out undesirable grass species and re-sowing or over-sowing of land areas with improved pasture seed will be required.

Where appropriate the additional introduction of hybrid forage species will be added to the pasture mix to increase dry matter production.

3.11 Liquid Waste Management

The wastewater facilities have been designed to retain all wastewater onsite. This is achieved through sloping of contaminated areas (pens, manure pad, drains) to ensure that wastewater enters the wastewater holding pond. All ponds and dams onsite will be lined with compacted clay lining to eliminate potential seepage.

Irrigation will be undertaken when a soil moisture deficit occurs. The water deficit will be established by direct measurements by the farm manager.

Irrigation will only be undertaken when rainfall is not imminent. Irrigation will not occur in the 4 days prior to crop harvest (hay cutting and bailing).

Tailwater will generally only be generated by rainfall runoff.

3.12 Solid Waste Management

Solid wastes generated on site may include:

- General waste;
- Metal waste;
- Regulated wastes (e.g. oil, fuel, batteries, tyres);
- Paints and resins;
- Construction waste (e.g. timber, concrete, spoil, poly pipe);
- Feed waste;
- Manure;
- Dead sheep; and,
- Biohazard waste (e.g. veterinary products).

The impacts from the waste generated on site can be managed appropriately to ensure that they are reduced as much as practical.

Table 4 Waste Management Summary

Waste Type	Source(s)
Cleared Vegetation	Site construction.
Excavated Waste (Soil)	Earthworks for site construction.
Timber and Steel	Site construction.
Plastics and poly pipe	Site construction.
Concrete	Site construction.
Regulated waste (oil, fuels, batteries and tyres)	Site operations
Paints and resins	Site operations
General Wastes including putrescibles & organic (food waste), some plastics, cardboard and paper	Construction and site operations.
Sewage Effluent	Construction and site operations.
Feed spoilage	Site operations
Liquid effluent from pens	Site operations
Manure	Site operations
Biohazard waste	Site operations
Dead carcases	Site operations

3.12.1 Manure Storage and Composting Area

Manure harvested from the pens and sedimentation basin will be stockpiled and composted on-site prior to it either being sold for off-site use as a soil ameliorant or utilised on site in manure spreading practices. A 45kg sheep produces approximately 1.8kg of manure per day (Schoenian 2018); therefore, approximately 1,687.5 tonnes of manure is anticipated to be generated on site each year.

Composting of the manure will stabilise a large proportion of the organic matter constituents, reducing the odour and pollution hazards associated with any subsequent handling and use of the manure. Manure will be regularly cleaned from pens. Sludge will be recovered from sedimentation basins. These wastes and spoilt feed from the feed mill will be combined at the manure storage area and windrowed so as to compost.

Individual carcases of any stock dying while at the feedlot will be placed in separate larger windrows for decomposition and vector management. This removes the need for a “carcass pit” which presents (unnecessarily) disease, vector management and environmental risks. Composting carcases is a recognised approved process under the MLA Guidelines (2011). The composting process is completed as follows:

1) Place a layer of dry organic matter 30 centimetres deep on the ground over an area slightly larger than the carcass. Straw, sawdust or hay are all suitable.

2) Place the dead animal on the bed and cover with another layer of the dry organic material to a depth of 30 centimetres.

3) Cover all of this with semi-dry organic material such as feedlot pen manure, stockpiled manure, or silage. This layer needs to be at least 60 centimetres deep to contain odours and exclude scavengers.

4) Allow the pile to "work" for 20 days undisturbed. Internal temperatures should reach between 65 - 75°C.

5) After 20 days, or when the internal temperature falls below 60°C, turn the pile and expose the carcass. Cover the carcass again with 30 centimetres of dry organic material and 60 centimetres of semi-dry material.

6) Allow the pile to "work" for another 20 days undisturbed. Internal temperatures should reach 70°C and then slowly decrease. After 40 days only large bones and some wool will remain. The composted carcass can then be incorporated with manure or solid wastes for spreading on land.

Where carcass disposal through composting cannot be conducted, burial is a suitable method.

The following dimensions are recommended for disposal of stock through burial:

- depth: approximately 4 metres;
- width: no greater than 3 metres;
- length: will be dependent on number and size of carcasses for burial;
- backfill: 1.5 – 2 metres of backfill should be placed over carcasses;
  - as carcasses decompose additional soil should be added to accommodate subsidence
  - the pit should be monitored over the following months and when subsidence has stopped the surface of the pit should be sealed with clay and levelled then covered with topsoil.

3.12.2 Mass Disposal

Mass death may be as a result of various scenarios, including but not limited, to disease / quarantine outbreak or severe weather event (heat or severe storms).

In an event a mass death occurs at the site then the National AUSVET management plan for the same will be invoked.

For mass mortalities or disposal of infected stock burial is the preferred method of disposal. In this method carcasses should be deeply buried in a completely sealed pit to prevent the escape of fluids and/or infectious agents. If sufficient good quality clay is not available the pits may need to be lined with high density polyethylene (HDPE) or other such material to prevent leakage (MLA 2011).

3.13 Traffic & Access

Access to the site will be from a new access way constructed to the east of the existing established access for 198 Humphreys Road. Humphreys road is unsealed from the Riverina Highway right to the property access point.

It is anticipated that the feedlot site will generate approximately 50 feed trucks annually and 65 stock trucks annually.

A traffic impact assessment has been completed as part of the Statement of Environmental Effects and provides complete detail on the impacts to local road infrastructure.

3.14 Future Expansion

It is possible that the feedlot will undergo expansion in the event that the development proves to be economically beneficial. The proposed feedlot could be considered to expand up to 15,000 head. A preliminary design concept of the potential layout of this expanded feedlot is shown in Figure 4 and Appendix B. Approval for such expansion is not sought at this time.

If expansion is considered feasible a new assessment of potential impacts and necessary changes to infrastructure will need to be undertaken. Any expansion above 4,000 head will require an Environmental Protection Licence from the EPA in order to operate.

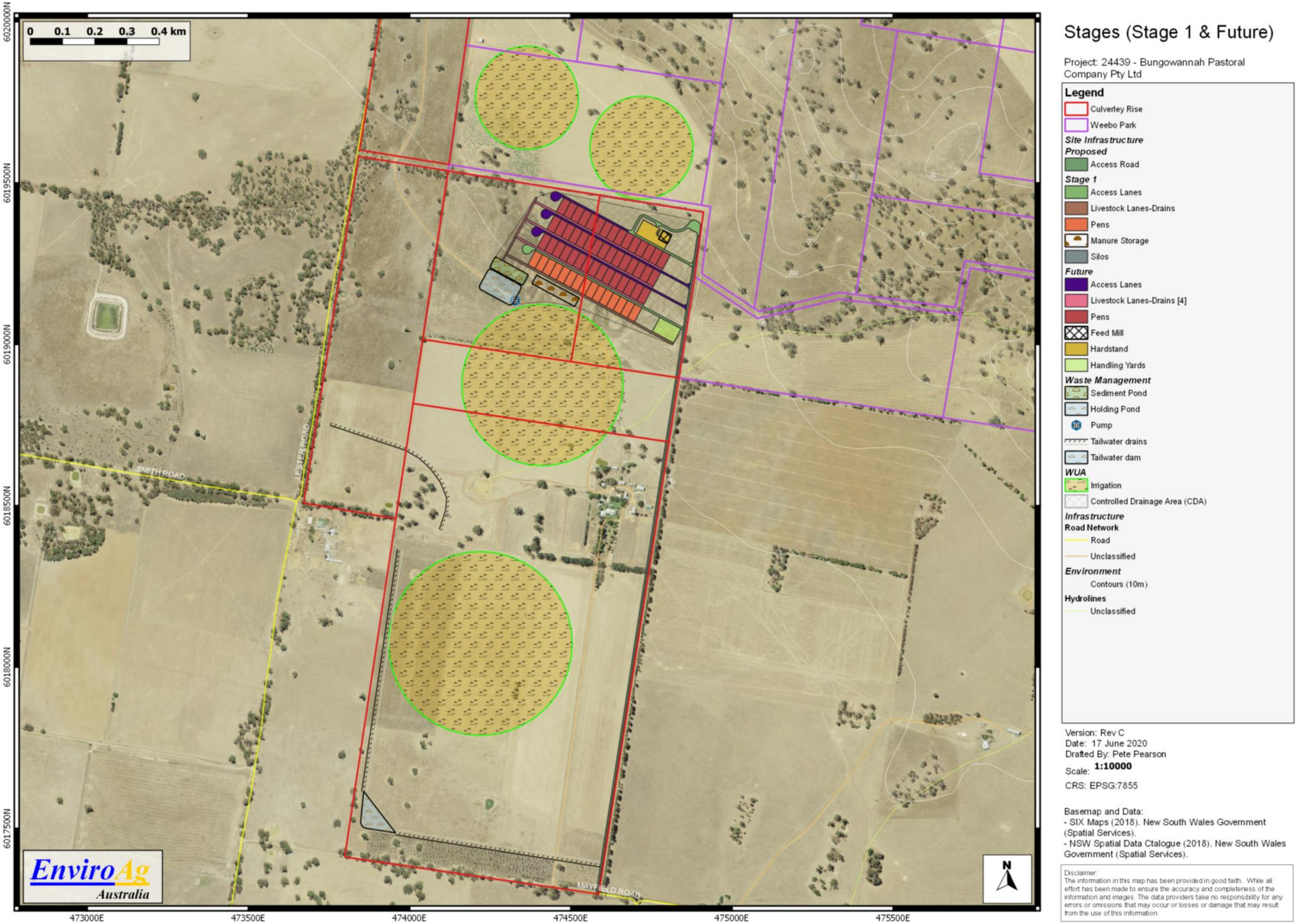


Figure 4 **Potential Future Expansion Layout**

4. Environmental Assessment

4.1 Air Quality

Odour and dust emissions from an intensive livestock development can potentially be a contentious issue. Guidelines regarding odour management and separation distances have been developed. The most applicable current guideline is the *National Procedures and Guidelines for Intensive Sheep and Lamb Feeding Systems* (MLA 2011). While promoting management practices known to minimise odour emissions, they seek to ensure that feedlots are displaced from receptors by distances that minimise the risk of odour and dust nuisance at these locations.

4.1.1 Existing Environment

4.1.1.1. Climate

The climate at the site is classified as Cfa (warm and temperate), according to the Köppen-Geiger climate classification. The evapotranspiration rates are generally higher than the average precipitation levels received in the area making it a semi-arid environment. The nearest long-term weather station is at Bungowannah (Roseleigh 74236), approximately 5.4km away. Climate statistics from SILO (Scientific Information for Land Owners) data (2020) are shown in Table 5, while Figure 5 and Figure 6 present the average monthly rainfall, evaporation and temperatures.

Climate data is obtained as Patched Point Data from the Queensland Government SILO database. SILO is a database of historical climate records for Australia. Patched Point Data is a daily time series of data at a point location consisting of station records which have been supplemented by interpolated estimates, including Computerising the Australian Climate Archives (CLIMARC) data, when observed data are missing. This allows for a full data set from the 1st January 1889 through to the current date.

Table 5 Climate Statistics for Bungowannah 1889-2020 (Roseleigh 74236)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave	Total Annual
Average maximum temp (°C)	31.9	31.4	27.9	22.5	17.5	13.8	12.8	14.7	18.0	21.8	26.1	29.7	22.3	N/A
Average minimum temp (°C)	15.5	15.4	12.5	8.4	5.3	3.5	2.7	3.7	5.4	7.8	10.7	13.4	8.7	N/A
Average rainfall (mm)	39.23	34.39	39.83	41.25	50.18	58.45	59.29	58.57	51.04	54.79	43.91	40.10	47.6	571.04
Average evaporation (mm)	256.76	208.35	167.53	93.64	50.24	32.22	34.52	51.49	78.18	125.85	176.20	234.60	125.8	1509.58

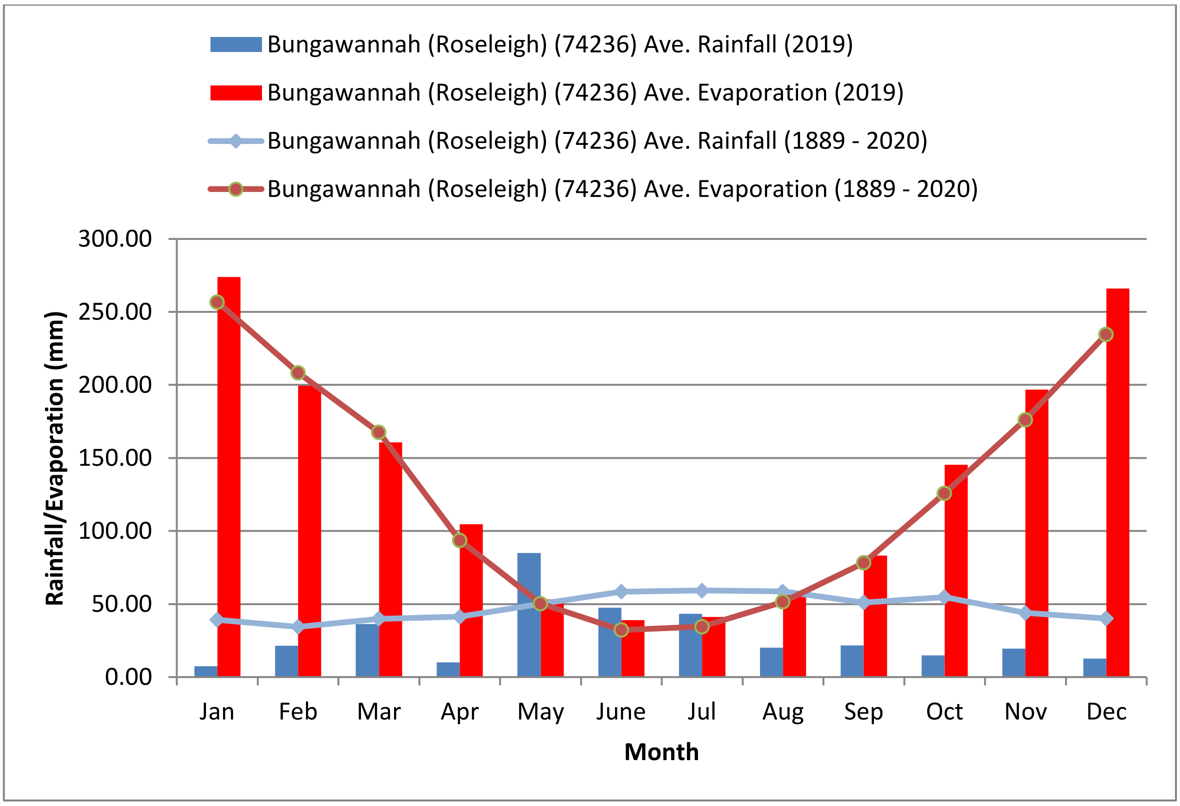


Figure 5 **Average monthly rainfall and evaporation (SILO data, 2020)**

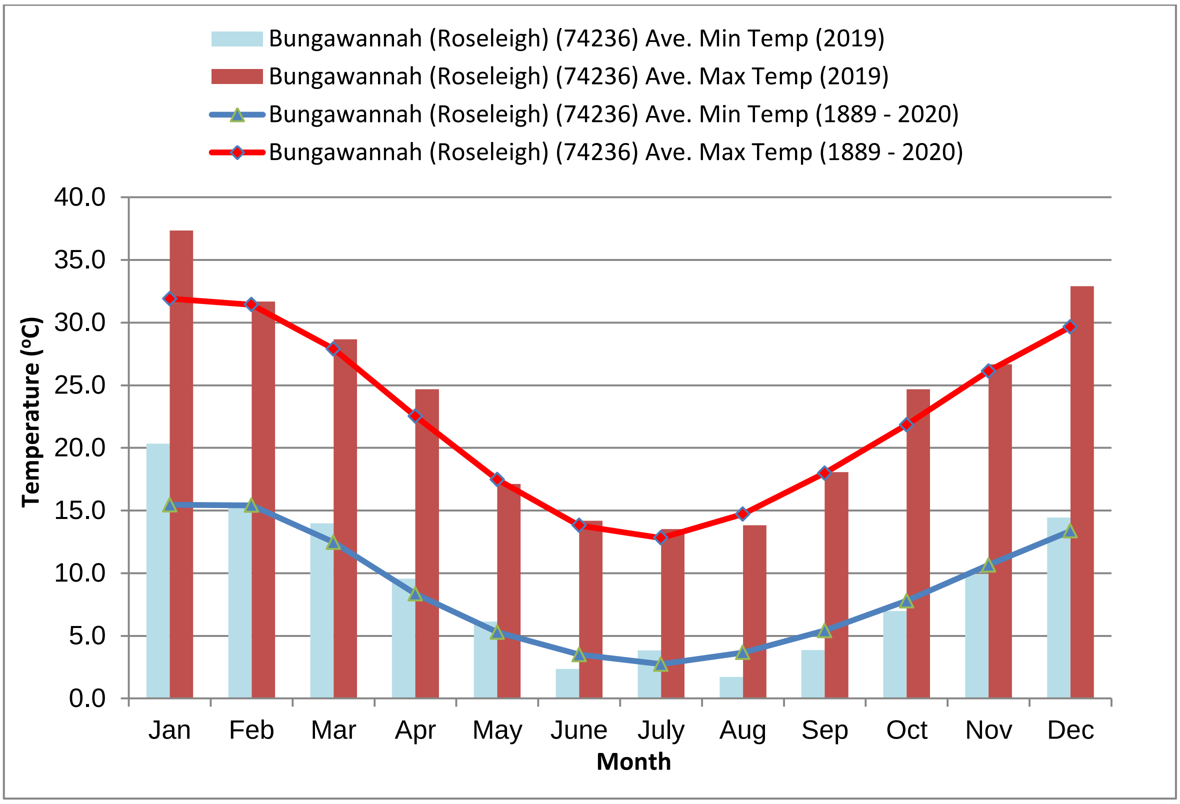


Figure 6 **Average monthly temperatures (SILO data, 2020)**

Wind direction data for the proposed site has been obtained from the BOM Albury Airport (station no. 72146) data as it is the closest available location that contained this data.

General wind direction for the proposed feedlot site has been recorded as follows:

- Morning (9am) – predominantly from south east between 0 and 10 km/h for the majority of the annual recording periods (refer to Figure 7).
- Afternoon (3pm) – winds predominantly blowing from the west between 20 and 30 km/h for the majority of the annual recording periods (refer to Figure 8).

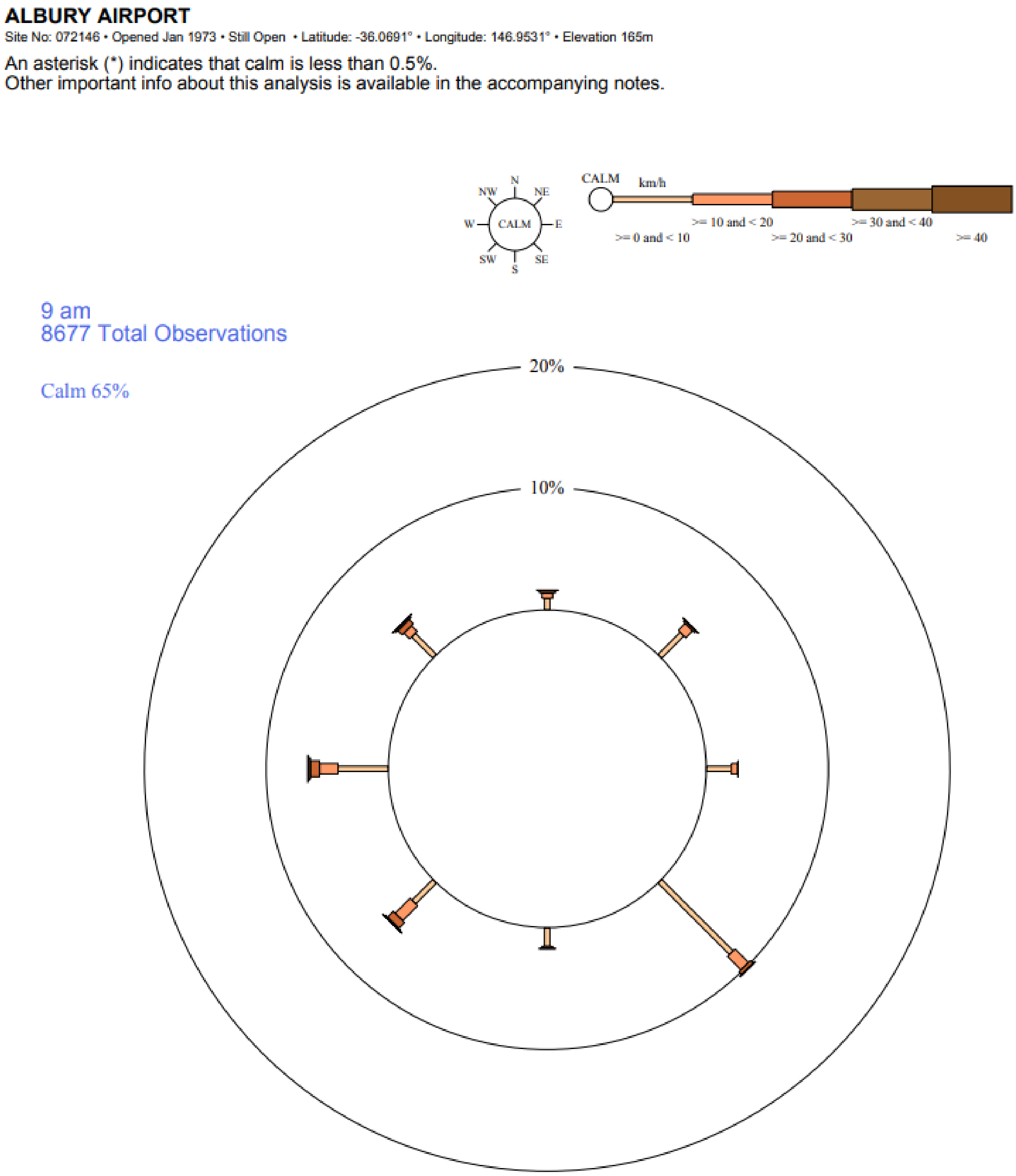


Figure 7 Albury Wind Rose 9am

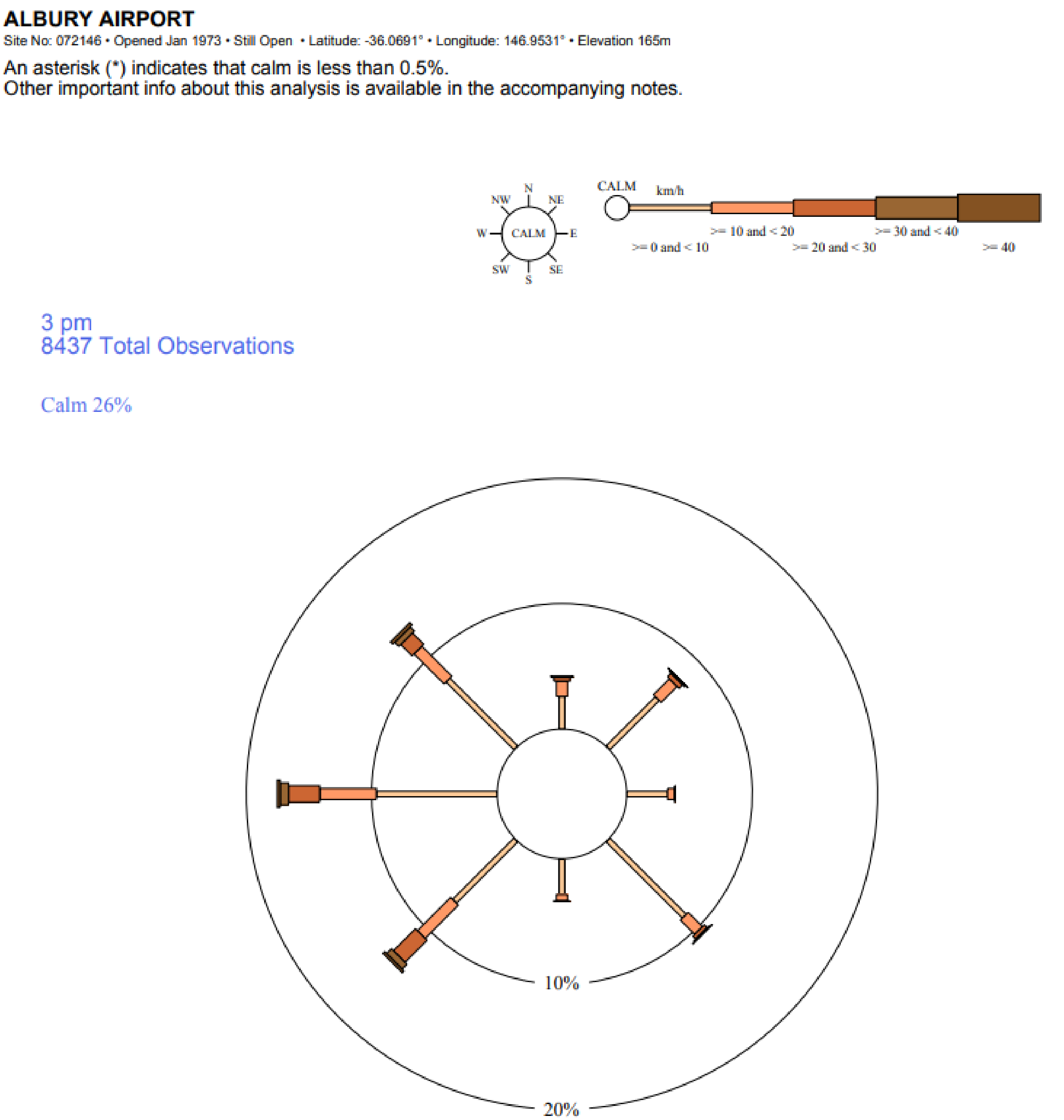


Figure 8 Albury Wind Rose 3pm

Temperature inversions may occur during the cooler periods of the year; however, given that temperature inversions are generally likely to occur between sunset and two hours after sunrise, it is unlikely that the feedlot operations in their limited operating hours would cause dust nuisance or amenity impacts to nearby receptors.

Table 6 indicates that the average sunrise and sunset times for the Albury area (BOM 2019).

Table 6 Average Sunrise and Sunset Times – Albury, NSW

Season	Average Sunrise Time	Average Sunset Time
Summer*	6:00am	8:30pm
Autumn	6:30am	6:00pm
Winter	7:20am	5:15pm
Spring*	6:15am	7:40pm

* Daylight savings has been accounted for during these seasons.

4.1.1.2. Receptors

Nearby receptors have been mapped within a 2km radius of the proposed feedlot site and are identified in Figure 9 and Table 7.

The closest receptor is the neighbour to the southwest of the proposed feedlot which is approximately 921m from the nearest pivot irrigator that is to be constructed for waste utilisation areas.

Table 7 Nearby Receptors

Receptor Number	Location (X, Y) 55S	Direction From Feedlot	Distance From Feedlot (m)
1	473719.663, 6018443.134	SW	921
2	471990.603, 6017853.919	SW	2,625
3	472153.313, 6017345.767	SW	2,795
4	472026.475, 6017298.024	SW	2,922
5	473785.305, 6016829.026	S	2,298
6	473639.921, 6016242.632	S	2,894
7	474148.009, 6015422.375	S	3,548
8	474354.298, 6015413.443	S	3,463
9	474695.537, 6015448.675	S	3,526
10	472089.460, 6020379.268	NW	2,428

The existing dwelling located at "Culverly Rise" will be occupied by the manager of the feedlot and this dwelling is not regarded as a "receptor" as it is in the same ownership as the feedlot.

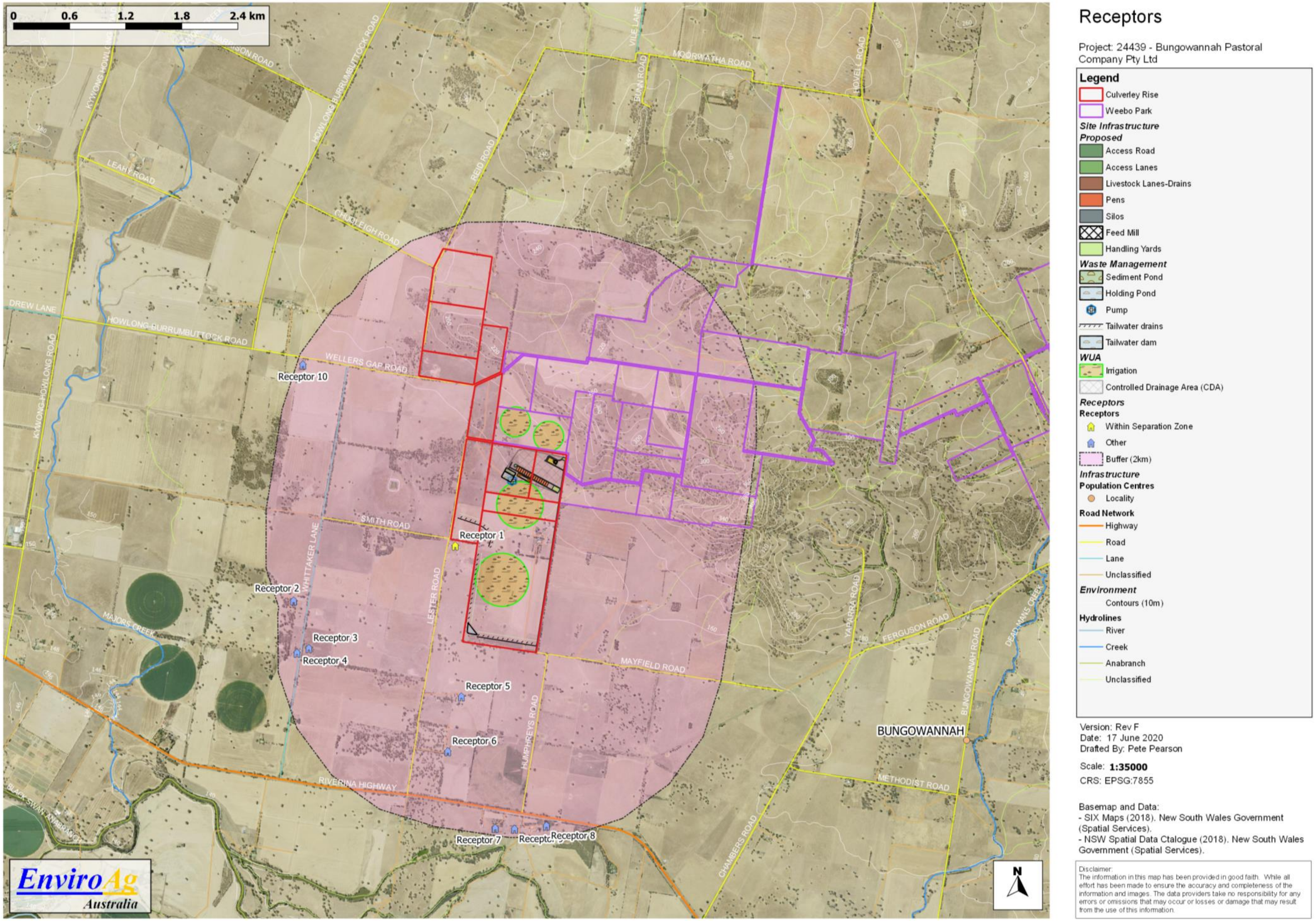


Figure 9 Nearby Receptors

4.1.2 Assessment

Malodours are generated when organic matter is decomposed in a manner that results in the formation of gaseous compounds in sufficient concentration to be not only detected but cause offense to a person. Emissions from an intensive livestock facility, are highly dependent upon factors such as animal stocking density, animal size and age, the diet fed, manure production, manure harvesting techniques, pen surface and soil characteristics, and ambient environmental conditions (i.e. temperature, wind, humidity, precipitation) (Cole et al., 2012).

Alternately, when dry conditions occur and dust is generated and becomes air borne, the organic dusts received can create a chemical reaction in the receptor's olfactory system and a sense of odour can result.

The sources of odours from the feedlot include:

- Pen surfaces (odour and dust);
- Livestock handling facilities (odour and dust);
- Waste water holding ponds (odour);
- Manure storage and composting areas (odour and dust); and,
- Irrigation of waste waters (odour).

Odour emissions from a feedlot manure pad do not occur at the same uniform rate. Ormerod and Zeise (1995) and Lunney & Smith (1995) document that in feedlot pens the odour emission rates are dependent upon:

- The depth of the manure pad;
- The moisture content of the manure pad;
- The temperature of the manure pad; and
- The elapsed time since rainfall.

The depth of the manure pad can be shown to be a function of:

- The stocking density of the stock;
- The live mass of the stock and subsequent feed intake, gut fill and excreta; and,
- The pen cleaning interval.

Further, the moisture content of manure pad can be shown to be a function of:

- The live mass of the stock per unit area;
- Rainfall;
- Evaporation; and
- Rainfall runoff.

4.1.2.1. Odour from Manure Pads

Watts and Tucker (1994) describe odour generation for pen manure covered surfaces. They note that odour concentrations from dry feedlot pads are low and result from low bacterial activity due to a lack of moisture. Upon wetting, bacterial metabolism and growth accelerates. Initially, aerobic bacteria proliferate and rapidly utilise the oxygen in the pad leading to anaerobic conditions.

The anaerobic bacteria that survive the dry periods in a moist, anaerobic layer at the base of the pad can now proliferate causing the level of odours to rise. The anaerobic organisms ferment substrates such as undigested plant material and dead microbes to form Volatile Fatty Acid (VFA) and sulphurous compounds, some of which are regarded as unpleasant odours. After a couple of days, the pad may have dried out and overall bacterial activity declines. Also, as the pad dries, a crust forms over the surface limiting emissions of odours from layers deeper in the pad. After significant wetting of the pad, there can be strong odours emitted because of anaerobic fermentation of waste. Odour generation and emission decline as the pad dries.

The level of VFA is directly linked to excess nutrients that bypass the digestive system of stock. Given that sheep consume substantially lower levels of nutrients than cattle the sheep feedlot will typically produce significantly lower levels of VFA and thus generate and emit less odour with a less offensive odour profile. This is well supported by industry experience and current research (MLA 2011 & MLA 2018).

The response of odour over time and the magnitude of the odour concentrations measured using simulated feedlot pads were similar to those described by Watts et al. (1994) for a commercial feedlot. Odour concentration peaked approximately 48 hours after significant wetting of the pads. The peak odour concentration was approximately 68 times higher than the odours from dry pads.

It is important that pens are kept as dry as possible. Open pens should be sloped to drain rainfall runoff as quickly as possible. The sheep feedlot will cover some pen areas so that they do not get wet by rain. This directly alters the pen water balance.

4.1.2.2. Odour Emissions from the Wastewater Holding Ponds

Waste water ponds that hold contaminated water can create odour. Typically this occurs when runoff enters ponds suddenly loading the pond water with organic material. This destabilises the pond environment and causes odours to be generated (Lott 1994).

Little runoff is expected at the proposed sheep feedlot site through the dry season. If and when dry season runoff occurs, the collected water will be rapidly pumped to the irrigable area. The pivot irrigators will be able to apply 12.5mm across the irrigable area in a 24 hour period.

Continued cleaning of the open pens, use of sedimentation systems and recovery of solids will provide the runoff with the least load of organic matter and nutrient.

The open pens will be cleaned prior to the wet season to remove the manure load. This will ensure that the holding ponds will capture, essentially, clean water that is unlikely to cause odour. Should odour occur, the pump will be used to recirculate water with an input of lime that will both adjust the pH and remove odours. Water will then be pumped to the irrigable area as soon as a water deficit occurs in the soils.

Odour from waste water ponds are considered to be part of the feedlot complex that is assessed in any separation distance calculation.

4.1.2.3. Odour Emissions from Waste Water Irrigation

Odour from irrigation of waste waters occurs most when waste waters are sprayed and aerosols are generated. The irrigation design for the feedlot uses poly lined pivot irrigators with drop hoses that place the waste water directly on the ground. The low-pressure irrigation that will be used generates little aerosol.

4.1.2.4. Manure Composting

When properly managed, composting windrows produce little odour (Cole et al., 2012).

Aerobic decomposition occurs under conditions where oxygen is available in the system. Under aerobic conditions, the main decomposition by-products are carbon dioxide, water and other compounds (e.g. water soluble, inorganic nitrogen and sulphur-based compounds), which tend to produce little odour (Elliot et al 1978).

Anaerobic decomposition occurs where there is little or no oxygen available to the system. Anaerobic decomposition is a slower and less complete process than aerobic decomposition. Because anaerobic digestion is less complete, the by-products yielded are more complex and subsequently tend to be more odorous (Elliot et al 1978). Some of the by-products of anaerobic digestion, such as volatile fatty acids, phenols and hydrogen sulphide, produce strong odours that may be detected a significant distance from the source (Elliot et al 1978). Other compounds released are odourless (e.g. methane).

Composted manure will be used as a soil conditioner / fertiliser on the irrigable area to bolster soil organic matter contents and retention of moisture and nutrients.

Compost windrows will be placed up and down the slope of the composting area so they shed any rainfall and do not trap any runoff. Compost turning will be undertaken with a tractor and mechanical windrower. The turning will be done in the middle of the day when maximum air/odour dispersion occurs.

4.1.2.5. Odour Dispersion

When air transports an odour from the source, dispersion or dilution of the odour occurs. This results in a declining odour concentration with increasing distance downwind of the source. This reduction in odour concentration depends on the atmospheric stability at the time.

Generally, odour does not disperse and mix as readily at night as it does during the day. Atmospheric stability refers to the potential of air to disperse and is defined using the Pasquill Gifford scheme (1983) where the atmosphere is categorised from unstable (category A) to stable (category F). Optimum dispersion occurs under unstable conditions. In simple terms, the lower the stability class (closer to A), the greater the odour dispersion and, hence, the lower the potential for odour nuisance (refer to Table 8).

Separation distance plays an important role in the dispersion of odours from feedlots. Feedlots should be established a sufficient distance from sensitive receptors, such as adjoining or nearby farm residences and towns, to ensure that dispersion effectively limits odours to acceptable levels and frequencies under the expected range of atmospheric conditions.

Table 8 Pasquill's Stability Categories

Wind Speed (height of 10m)	Day time (incoming solar radiation)			Night time (cloud cover)	
m/s	Strong	Medium	Slight	Mostly Overcast	Mostly Clear
<2	A	A - B	B	-	-
2 – 3	A - B	B	C	E	F
3 – 5	B	B - C	C	D	E
5 – 6	C	C - D	D	D	D
>6	C	D	D	D	D

4.1.2.6. Odour Assessment

The NSW Odour technical framework (2006) on odour assessment generally provides three different approaches to establishing the appropriate displacement of a feedlot development from likely receptors:

- Level 1 – A largely generic, variable separation distance ("S" factor) approach that is based on dispersion theory supplemented by experiential or empirically derived variables to account for site specific topographic of management factors;
- Level 2 – A site specific, odour dispersion modelling approach using a synthetic "worst case" meteorological dataset; and,
- Level 3 – A site specific, odour dispersion modelling approach using a year-long, on-site or site representative, metrological dataset.

Given the size of the feedlot component of the facility, a Level 1 odour assessment is suitable to determine the odour emissions associated with the proposed sheep feedlot site.

The Level 1 odour assessment takes into account the following factors:

- Type of odour;
- Quantity of odour emissions;
- Proposed management practices;
- Proposed level of emissions;
- Proposed level of emission control;
- Local topography;
- The presence of buildings;
- Worst case meteorology; and,
- And possibility of cumulative impacts.

The NSW odour technical framework does not account for sheep feedlot developments and is limited to cattle only; therefore, the odour assessment framework outlined in the MLA *National Procedures and Guidelines for Intensive Sheep and Lamb Feeding Systems* (2011) has been utilised for this report. The separation distance determination framework is essentially the same as the NSW odour technical framework; however, the stocking density factor (S1) is specifically developed for standard sheep units (SSU) as opposed to the standard cattle units (SCU) and the Wind Factor (S5) is not included as part of the assessment.

The separation distances necessary to mitigate odour impacts are based on the capacity of a feedlot, receptor sensitivity, feedlot design, feedlot management and site specific variables. For feedlots, the applicable separation distances are determined using the following equation (MLA 2011):

Equation 1. Separation Distance Equation

$$D = N^{0.5} x\ S$$

Where:

N = Maximum number of standard sheep units at any one time. A standard sheep unit is defined as a sheep of 60 kilograms live weight.

D = Separation distance in metres between the closest points of the feedlot, including the pens, manure storage areas, loading or unloading facilities and the most sensitive receptor or impact location

S = Composite Site Factor (= S1 x S2 x S3 x S4). The factors S1, S2, S3, and S4 relate to stocking density, receptor type, terrain and vegetation.

Table 9 Odour Assessment Components

Parameter	Factor Determination	Comments
SSU	3,750	A conservative figure given that it is not anticipated that sheep will reach 60kg at this facility.
Feedlot Class	1	Maximum stocking density of $5m^2$/SSU. High design, construction and operation standard, and is therefore conservative.
Stocking Density	5 m^2/SSU	
Average Annual Rainfall	570mm	Based on information acquired between 1889 and 2020 from Roseleigh BOM station (ID 74236), which is located nearby.
S1 Factor – Stocking Density	26.6	Table 6-3 of the MLA Guidelines (2011)
S2 Factor - Receptor	0.7	Value is for extensive rural residential developments, this is considered a conservative figure for this RU1 zone agricultural area.
S3 Factor - Terrain	1.2	The terrain of the site and surrounding area is considered relatively flat; however, the feedlot is upslope from the nearest receptor and as such the conservative value of low relief topography has been applied.
S4 Factor - Vegetation	1.0	The value is applicable to "few trees, long grass", while there is intention to establish a vegetation buffer between the feedlot site and the nearest receptor, this has not been accounted for in this odour determination assessment and is therefore conservative.

This assessment generates a buffer separation distance of **1,368.28m** (refer to Figure 11).

As per section 4.1.1.2 the nearest receptor, Receptor 1, is located 921m to the southwest of the proposed feedlot andalso operates a feedlot operation. The exact size and intensity of this feedlot is unknown; however, it has been assumed by Bungowannah Pastoral Co. Pty Ltd that it may hold up to 400 head of cattle. It was also assumed (based on aerial photography) that there may be two other feedlots (exact size and intensity unknown) within a 3km radius of the proposed feedlot. Which may be established under clause 18 of the State Environmental Planning Policy (Primary Production and Rural Development) 2019. Regardless, a cumulative impact assessment has been completed as required by the DoPE *Planning Guidelines for Intensive Livestock Agriculture Development* (2019).

Under the NSW *Odour technical framework* (2006) the cumulative assessment requires addition of 20% to the separation distance calculated (1,368m) and to all the other potential odour generators nearby to determine the potential odour buffer overlap. This buffer zone has been calculated to be 1,642m. As shown in Figure 12 there is overlap between the buffer zones; however, the only consequently affected receptor is Receptor 1.

Given the nature of Receptor 1 (being the owner/manager's residence for a feedlot) the implementation of vegetative environmental buffers (VEBs) should be considered a reasonable mitigation measure for reducing odour impacts from the proposed sheep feedlot at their establishment.

VEBs are purposefully planted trees and shrubs usually arranged in linear patterns near and around animal production sites.

VEBs have been documented to mitigate odours by:

- enhancement of vertical atmospheric mixing through forced mechanical turbulence which enhances dilution/dispersion of odour;
- odour filtration through particulate interception and retention; odour largely travels by way of particulates, therefore, managing particulates aides in the management of odours;
- enhanced odour/particulate fallout due to reduced wind speeds near and downwind of the VEB, and
- adsorption and absorption of ammonia onto and into the plant – this is largely due to a chemical affinity that ammonia has to the waxy coating on tree leaves

The effectiveness of VEBs in odour mitigation is a function of:

- VEB design;
- ambient weather conditions;
- landscape topography;
- direction and distance to receptors (e.g. neighbours, communities); and
- scale of emissions and the manure management protocols followed and other odour mitigation management utilised.

Field studies have recorded incremental mitigation benefits in the form of reduced particulate and odour movement downwind due to the presence of VEBs/ windbreaks. A study of two separate eight-barn swine finisher sites in Missouri found that in comparison to a control site, a simple VEB reduced odour concentrations by almost 50 percent in the VEB and by two-thirds at a distance of 15 m downwind of the VEB (Parker et al. 2012).

VEBs are not a substitute for comprehensive odour management strategies - rather they are a complimentary measure within a "suite" of odour management strategies. A complete list of mitigation and management strategies is discussed in section 4.1.3.

Figure 10 shows a typical VEB arrangement that should effectively reduce odour emission levels from the feedlot area (RIRDC 2015). The location of the proposed VEB is shown in Figure 13. VEB species suitability is outlined in Table 10.

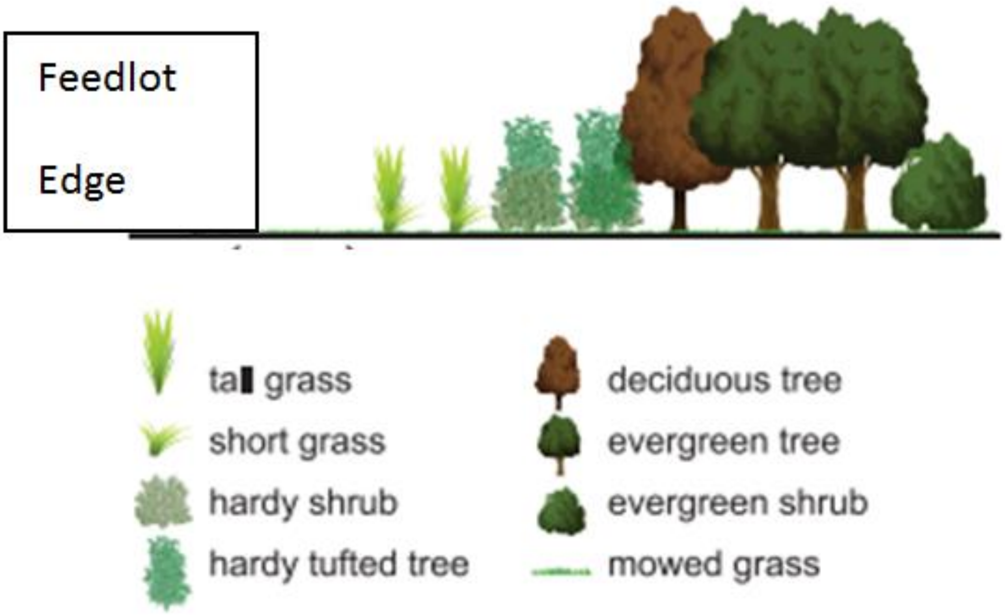


Figure 10 Typical VEB arrangement

Table 10 Proposed VEB Species Suitability

Vegetation Type	Requirement	Spacing (m) between trees/ shrubs	Spacing between Rows (m)	Examples of Species
Hardy Shrubs	• Maximum vegetative density. The density of the leaf canopy governs the filtering ability of a tree or shrub. • Complex leaf shapes and waxy or hairy leaves for efficient particulate filtering ability. Complex leaf structures provide a greater surface area to collect and filter particulates. Waxy leaves reduce the burden of dust building up on the leaves by allowing rain to wash dust off. • Wind tolerance. The shrub species selected need to be able to withstand wind and endure the drying effects of forced air from the exhaust fans. • Stable root system. Tap roots or deep roots are required to withstand prevailing winds and drought stress.	0.9 – 1.5	3.0 – 4.6	• Old Man Salt Bush (*Atriplex nummularia*) • Cabbage Tree (*Cordyline australis)* • N.Z. Flax (*Phormium tenax*)
Deciduous Trees	• Maximum vegetative density. • Complex leaf shapes and waxy or hairy leaves. • Wind tolerance. • Stable root system. • Require low care and maintenance. • Fast to medium growth rates. • Minimise trash accumulation.	2.4 – 3.0	3.0 – 6.1	• White Cedar (*Melia azedarach var.australasica*) • Silky Oak (*Grevillea robusta*) • Liquidambar (*Liquidambar styraciflua*)
Evergreen Trees	• Maximum vegetative density. • Complex leaf shapes and waxy or hairy leaves. • Wind tolerance. • Stable root system. • Require low care and maintenance. • Fast to medium growth rates. • Minimise trash accumulation.	Columnar Form 2.4 – 3.0 Conical & Broad Forms 3.0 – 4.3	Columnar Form 3.0 – 6.1 Conical & Broad Forms 4.6 – 6.1	• Lilly Pilly (*Syzygium a. Resilience*) • Kurrajong (*Brachychiton populneum)* • Plane Tree (*Platinus acerifolia*) • Sally Wattle (*Acacia salicina*) • Leyland Cypress (*Cupressocyparis leylandii*)

Vegetation Type	Requirement	Spacing (m) between trees/ shrubs	Spacing between Rows (m)	Examples of Species
Evergreen Shrubs	• Maximum vegetative density. • Complex leaf shapes and waxy or hairy leaves. • Wind tolerance. • Stable root system. • Require low care and maintenance. • Fast to medium growth rates. • Minimise trash accumulation.	2.4 – 3.0	3.0 – 6.1	• Lemon Scented Bottlebrush (*Callistemon citrinus forms*) • Coastal Rosemary (*Westringea fruticosa*) • *Teucrium fruticans*

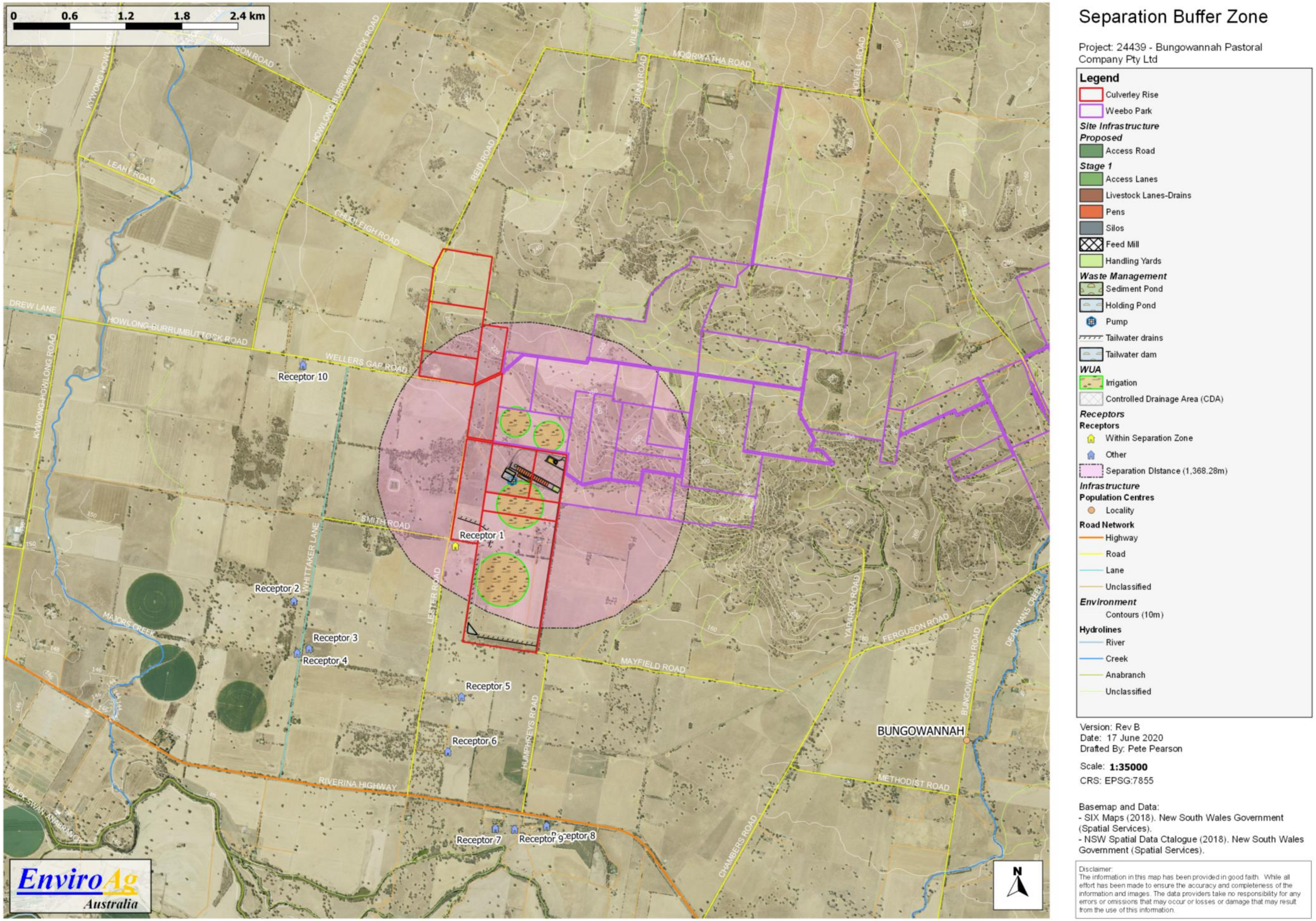


Figure 11 Separation Distance Buffer

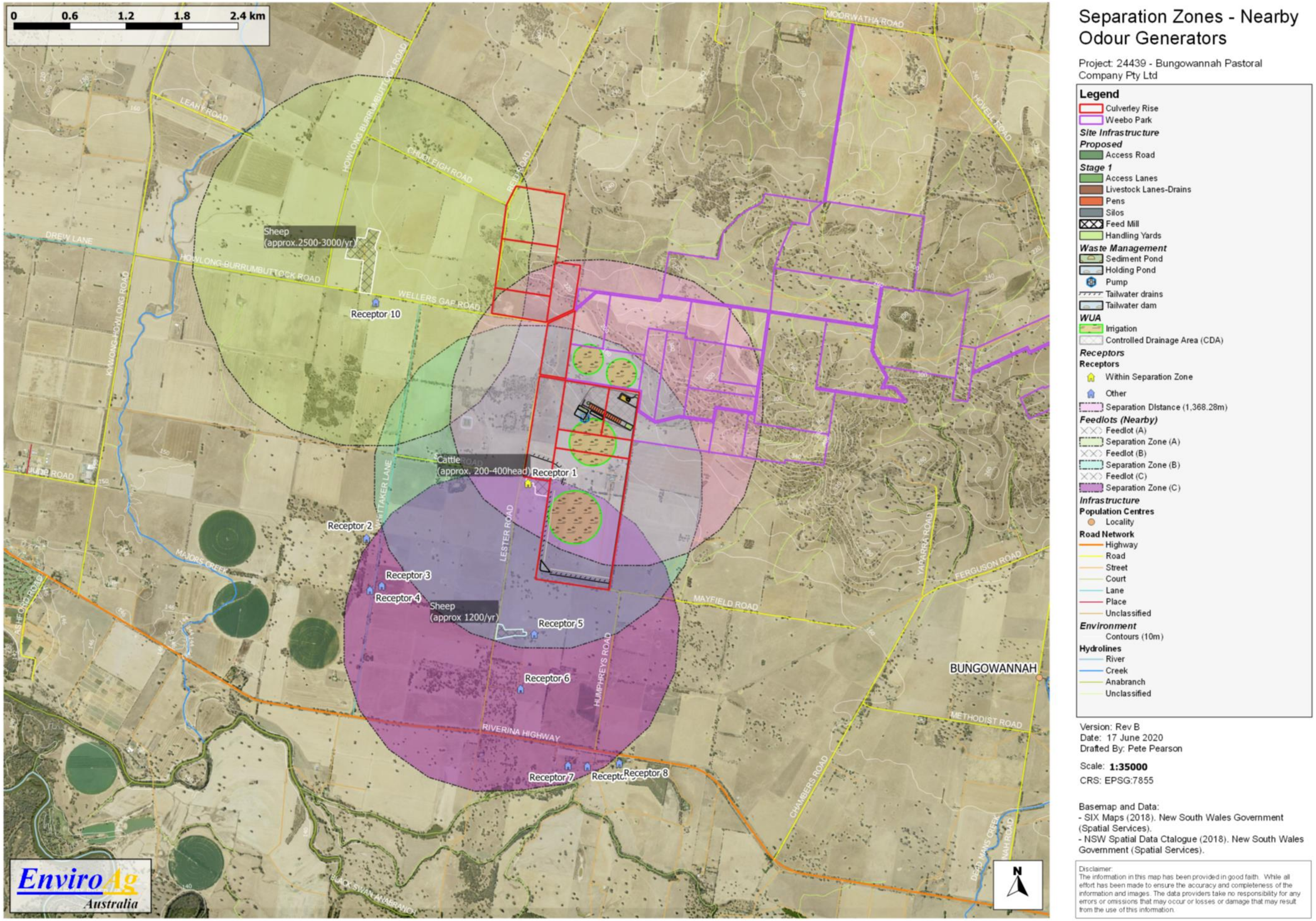


Figure 12 Nearby Feedlot Separation Zone

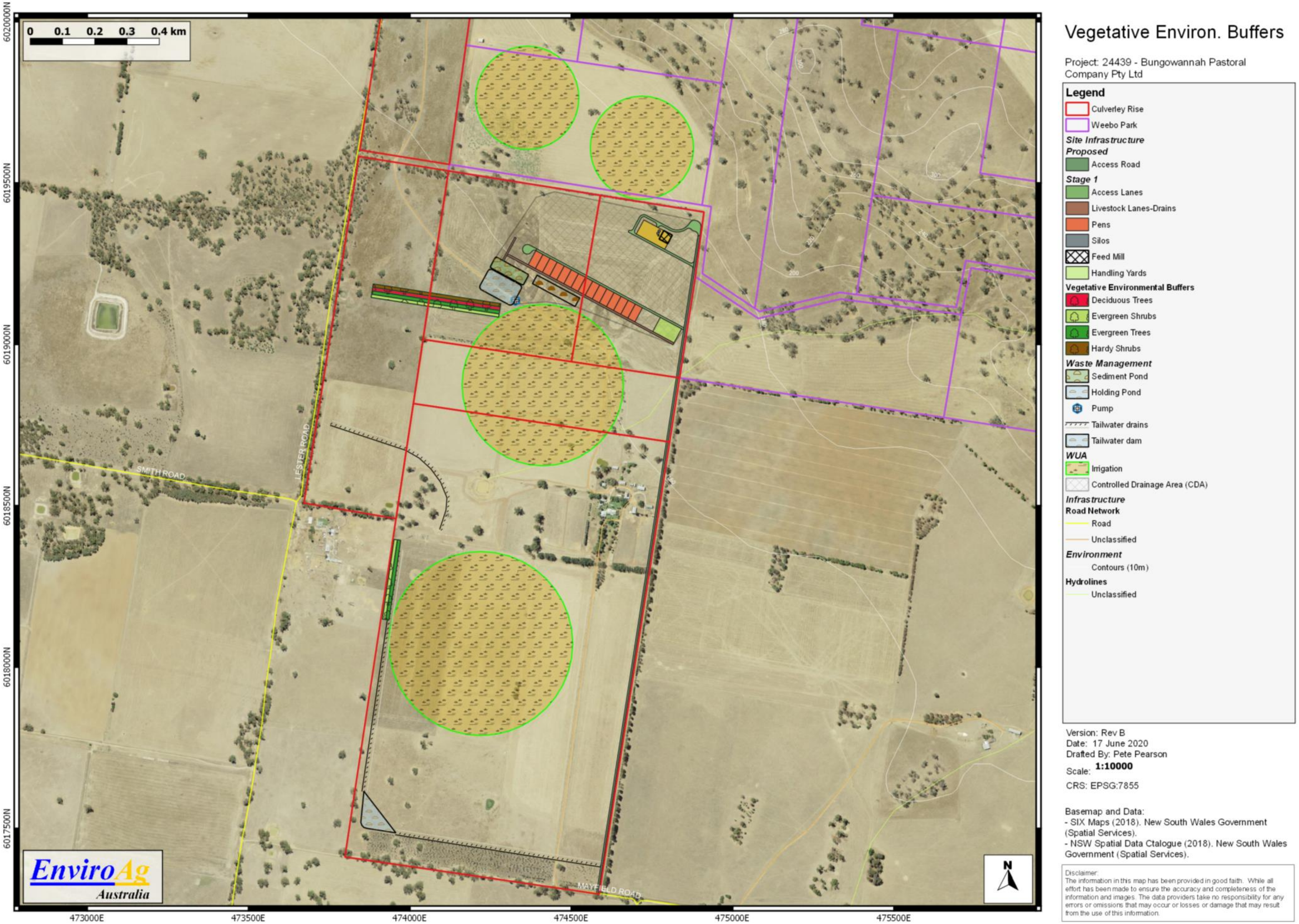


Figure 13 Proposed VEB

4.1.2.7. Dust Assessment

Dust is considered a fairly common occurrence in agricultural areas whcih is generally associated with visible haze and deposition on surfaces of buildings, equipment and clothing.

Dust impacts are anticipated to be greatest during the construction period of the proposed development; however, operational impacts may also be a point of concern for nearby sensitive receptors.

Potential generators of dust during the construction period include:

- Movement of machinery, trucks and vehicles on site;
- Vegetation clearing and topsoil stripping;
- Earthwork constructions;
- Stockpile of materials; and
- Infrastructure development.

Potential generators of dust during the operational period include:

- Truck and vehicle movements on site;
- Heavy machinery movements on site;
- Stock movement on site;
- Feed processing/distribution;
- Manure management activities on site; and
- Stockpiling of materials on site.

There are some dust emission investigations that have been carried out for feedlots across Australia. However, these are limited to cattle feedlots in particular. One investigation, completed by the Queensland Department of Primary Industries and Fisheries in 2005 at a 15,000 SCU beef cattle feedlot on the Darling Downs, identified that dust produced by a feedlot in an agricultural area was unlikely to travel and cause nuisance above the levels of dust already experienced as a result of other agricultural activities in that area (MLA 2005). The high volume sampling performed in this investigation demonstrated that 24 hour TSP concentrations inside the pen area of a feedlot average approximately 169µg/m^3. The dust deposition gauges placed over a 12 month period at various locations onsite and outside of the site identified that the recorded insoluble solid levels (dust) were:

- up to 20 g/m^2/month inside the feedlot pen area;
- up to 5 g/m^2/month just outside of the feedlot pen area;
- up to 30 g/m^2/month at background receptors; and
- up to 90 g/m^2/month near local roads.

This indicates that the source of nuisance dust in the agricultural area was not from the operation of the feedlot, which consistently showed dust levels below 20g/m^2/month inside the pen area. The recorded dust levels near the road were intermittent and elevated levels most likely attributed to vehicle movements. Elevated background levels were also intermittent and most likely due to activities performed during the time of monitoring (e.g. crop planting / harvesting).

The *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA 2016)* outlines that the impact assessment criteria for TSP is 90g/m^2/month which is taken over an annual averaging period. The feedlot study referenced averaged 20g/m^2/month inside the feedlot pen area which is significantly less than the impact assessment criteria levels. It can be determined that if dust levels inside the pen are significantly less than the impact assessment criteria, then the dust levels at receptors should also be well below the impact assessment criteria, and where they are not it is unlikely to be the result of unrelated agricultural operations.

Bardsley (2000) outlines that insoluble solids provide an indication of nuisance and the typical dust fall for rural sites is between 0.39 – 1.95g/m^2/month. Based on the Darling Downs feedlot study dust levels just outside of the feedlot operational area averaged 5g/m^2/month, any nearby receptors that were located at the prescribed separation distance (or further away) would unlikely experience dust levels above those generally considered normal for a rural locality.

Dust deposited at nearby receptors is unlikely to be directly related to the feedlot as studies have shown the dusts from feedlots drop out of air suspension quickly and monitoring events do not correlate between wind direction and dust fallout recorded at monitoring locations.

With the nearest receptor to the site being 921m to the south west and prevailing wind conditions being predominantly from the west, it is highly unlikely the proposed sheep feedlot operations will result in dust nuisance at the nearest sensitive receptor. All properties located to the northeast and east of the site are owned by the ‘Culverly Rise’ feedlot owner; therefore, impacts would not be of concern.

Any dust issues associated with the development can be managed through the implementation of appropriate management measures.

4.1.3 Mitigation and Management Measures

Construction should not produce any odour nuisance, but operation of the proposed sheep feedlot will produce odours. The facility is designed to minimise odour and dust. The crux of both issues stems from manure management or lack thereof. The object is to ensure that no wet manure accumulates, as this encourages odour-causing bacterial growth, and to ensure that no dry, powdery manure is generated that can give rise to dust when strong winds occur. To achieve this objective, all pens are to be covered where possible and their floors are sloped to allow good drainage and maximise drying and dry manure conditions. Free draining drains lead to holding ponds which can be dosed with lime if they become malodourous. Treated wastewater is also directly placed onto irrigation grounds via low pressure application to negate aerosol generation.

Even though the prevailing winds are not directed towards the nearest receptor, the proposed VEB will ensure that any winds that may occur in the direction of the south western receptor will pass through the VEB and reduce the odour emissions from the sheep feedlot and associated infrastructure (i.e. holding ponds).

Key operation management features include:

- Frequent, scheduled pen cleaning will ensure the depth of (dry) manure is maintained at 100mm or less;
- Pens will be cleaned, at minimum, every 13 weeks;
- Management of pen stocking densities so that they are not too wet, nor dry;
- Use dust suppression systems to “lay” dust as soon as it is noticed. The dust suppression systems will be used early in the morning and late in the afternoon to minimise humidity and impact on livestock. Application rates will not exceed 6mm at one time;
- Monitoring of compost moisture and temperature levels as per the MLA (2012) National Guidelines;
- All compost will be utilised in the designated irrigation area prior to the wet season; and
- Recirculation of holding water with an input of lime to adjust the pH and remove odorants.

In an emergency the following measures will be applied:

- Lime will be applied to pen surfaces;
- Lime will be added to anaerobic manures in compost windrows; and
- Gypsum and/or lime dosing will be used to rapidly alter pH and conditions in waste water storages.

Monitoring of air quality and potential for odour and dust nuisance will include:

- Recording of daily stock numbers;
- Recording of wind speed and direction;
- Recording of feed fed;
- Monitoring of compost moisture and temperature levels;
- Record of complaints;
- Record of dust suppression systems use; and

- Records of any emergency use of gypsum or lime to treat sources of odour.

The methods of assessing odour nuisance are well defined and consistent with the requirements of the MLA Guidelines (MLA 2011). The management practices, mitigation measures and monitoring described above are also consistent with well established, scientifically based principles and practices detailed in various codes of practice, guidelines and standards (MLA 2012; Skerman 2004).

4.2 Noise

Noise may arise from stock handling activities, vehicle movements including feed trucks and stock transports, feed milling and handling, and other plant or equipment used at the site (MLA 2012). Currently there are limited noise guidelines and noise assessments that have been completed for sheep feedlots. The feedlot will be designed and operated to minimise noise.

4.2.1 Existing Environment

Background noise levels in rural environments are generally perceived to be quite low level; however, it is often variable dependant on a range of extenuating factors. Ambient background noise levels can range from approximately 25dBA to 45dBA (MLA 2012), this dramatic fluctuation in noise levels can be attributed to a range of natural and man-made factors, some examples are:

- Wind interacting with vegetation;
- Presence of vocal fauna species (such as cicada's, birds, frogs, etc); and,
- Seasonal factors that result in more noise being generated by man-made factors (such as crop harvesting).

At present, the most significant generators of high noise activity during the day in the general area would be traffic noise from the Riverina Highway and other agricultural activities undertaken on nearby properties.

Noise received at nearby receptors from noise generating activities (such as feedlots) can be affected by distance, meteorological conditions and general site terrain. Meteorological conditions affect noise levels by (ABD 2008):

- Absorption of noise in the atmosphere is affected by temperature and humidity which impact the frequency of sound increases; and
- Vertical temperature and wind gradient affect how sound refracts in the atmosphere. In downwind conditions with wind conditions increasing with height and temperature inversions, sound tends to bend toward the ground which elevates noise levels at receptors.

Typically, environmental factors, such as night-time temperature inversions and low wind speeds, are generally more prominent in rural areas and can increase propagation or decrease attenuation in these areas.

Noise received at receptors can change significantly throughout the day depending on weather conditions, and studies have shown that as high as an 18dB difference between morning and afternoon recording periods of the same noise due to differing meteorological conditions, such as temperature inversions (NCHRP 2018).

Temperature inversions generally occur on cold clear nights (autumn / winter periods) when the surface temperature drops quickly and persist into the mid-morning of the next day (Qld Government 2019). Noise from feedlot activities would be of greatest impact to nearby receptors during autumn and winter conditions when temperature inversions are more likely to persist into the mid-morning period (as per Table 6).

4.2.2 Assessment

Ambient noise levels in rural areas are generally considered to be quite low (<30dB), particularly at night-time. Thus, any new, unusual or particularly loud noises are likely to be noticed, and could become a nuisance (MLA, 2012).

Noise anticipated to be generated from the site from the proposed development includes the following:

- Site construction works;
- Truck movements on site;
- Truck loading and unloading of sheep;
- Heavy vehicle reversing alarms;
- Operation of any on site pumps;
- Operation of on-site irrigation equipment (dependant on the type installed);

- Operation of any heavy machinery on site (including tractors, front-end loaders, etc.);
- Manure and carcass management operations;
- Pen cleaning;
- Animals held on site; and
- Workshop operations.

The NSW EPA (2017) specifies a 'project noise trigger level' to assess noise. The trigger level is tailored for each specific circumstance to take into account a range of factors that may affect the level of impact, including:

- the receiver's background noise environment (RBL=rating background noise level);
- the time of day of the activity;
- the character of the noise; and
- the type of receiver and nature of the area.

The NSW EPA (2017) determined background noise levels at sensitive receptors for rural areas are as follows:

- Day (7am to 6pm): 40dB(A)
- Evening (6pm to 10pm): 35dB(A)
- Night (10pm to 7am): 30dB(A)

The noise in the area is dominated by natural sounds. The land zoning, the subjective assessment of the acoustic environment in the area, and the acquired background noise levels would support a rural residential RU1-Primary Production Zone according to the *Noise Policy for Industry* (NSW EPA 2017).

Table 11 Estimated Noise Level for Different Time Period (NSW EPA 2017)

Period	Intrusiveness noise level	Project amenity noise level
Day	45dB LAeq, 15min (40+5)	48 LAeq, 15min (50-5+3)
Evening	40dB LAeq, 15min (35+5)	43 LAeq, 15min (45-5+3)
Night	35dB LAeq, 15min (30+5)	38 LAeq, 15min (40-5+3)

Notes:

1. Intrusiveness noise level is LAeq,15min ≤ RBL + 5 (Section 2.1 of Noise Policy for Industry).

2. Project amenity noise level (ANL) is urban ANL (Table 2.1 of Noise Policy for Industry) minus 5 dB(A) plus 3 dB(A) to convert from a period level to a 15-minute level (dB = decibel; dB[A] = decibel [A-weighted]; RBL = rating background noise level).

The project noise trigger level is the lower value of the intrusiveness and amenity noise levels. Therefore the project noise trigger levels for the proposed feedlot are as follows:

- Day (7am to 6pm): 45dB(A)
- Evening (6pm to 10pm): 40dB(A)
- Night (10pm to 7am): 35dB(A)

A noise study conducted by Golder Associates (2016) for a cattle feedlot in Victoria has identified that feedlot operations (i.e. movement of trucks, cattle loading and unloading and cattle movement into pens) produces a noise level of approximately 33dB(A) at an outside location of sensitive receptors approximately 1km away from the feedlot source. The proposed operation of the site involved a temporary accommodation of up to 14,000 cattle across the site at any time. These studies were conducted in open rural areas that are representative of the proposed sheep feedlot site. In general it is known that sound pressure decreases by 6dB per double of distance from a source (Slabbekoorn et al. 2019). The operation scale and stock holding capacity of the 'Culverly Rise' feedlot is relatively lower than the Victorian cattle feedlot site. Therefore, the noise generated from the feedlot is anticipated to be less than 33dB(A).

Utilising the sound attenuation formula (refer to Equation 2) the expected noise level at the nearest receptor (Receptor 1 – refer to Figure 9) is 33.71dB (A).

The development is considered to cause a noise impact if the predicted noise level at the receiver exceeds the corresponding project noise trigger level. The extent of noise impact from the development is defined by the extent the predicted noise level exceeds the project noise trigger level (NSW EPA 2017). This noise level is within the limits for NSW day-time, evening, and night-time standards and the calculated sound level at each receptor is much lower than the estimated project trigger level during different time periods (min 35dB(A)-max 45dB(A))

Equation 2 Sound Attenuation Formula

$$SPL2 = SPL1 - 20 * \log (R2/R1)$$

Where:

SPL1 = Sound Pressure Level at point 1

SPL2 = Sound Pressure Level at point 2

R1 = distance from the sound source to point 1

R2 = distance from the sound source to point 2

Table 12 Estimated Sound Level at each receptor

Receptor Number	Distance from feedlot (m)	Estimated Sound Level (dB(A))
Reference Point	1000	33
1	921	33
2	2625	24
3	2795	24
4	2922	23
5	2298	25
6	2894	23
7	3548	22
8	3463	22
9	3526	22
10	2428	25

As discussed above, the majority of the high noise emission activities will be associated with livestock and feed loading and unloading activities. These activities are expected and common in agricultural areas.

Suitable noise mitigation and management measures will be implemented onsite during operations to ensure that noise levels generated from the site are not obtrusive for nearby receptors. Vegetation buffers have an effect on sound propagation. Peng et al. (2014) found that the excess attenuation of traffic noise through 10 to 20m of trees (tree spacing 0.5m) was typically 2 to 3dB(A), and up to 7dB(A) through 120m of eucalypts (spacing >0.5m) relative to the Calculation of Road Traffic Noise (CoRTN) predictions. This suggests that existing vegetation and/or implementation of vegetation buffers can be a protection/mitigation strategy to reduce noise generated by the feedlot operation.

4.2.3 Mitigation and Management Measures

Implementing sufficient noise mitigation and management measures on site will ensure that the site operations do not become intrusive to nearby receptors and maintain community wellbeing.

A summary of the mitigation and management measures, which include operational, engineering and design controls, are outlined as follows:

- Construction activities will be carried out 6 days a week between the hours of 6am and 6pm Monday to Saturday.
- All equipment will be fitted with exhaust silencers, where practical.
- All equipment will be maintained to reduce noise emissions.
- Noisier activities will be undertaken in the late morning and early afternoon when most people are at work.
- Vehicle engines (specifically trucks) will be turned off and not left idling when not in use.
- All efforts will be made to reduce the effects of noise on personnel and neighbours.
- The use of reverse beepers and horns are to be limited to standard operational hours.
- Ensure design of facility meets appropriate buffer distances between activities and nearby receptors.
- Establish VEBs between the facility and nearby receptors.

4.3 Surface Water

The magnitude and nature of waste streams in feedlots mean that if not properly managed, these wastes could otherwise cause significant environmental contamination or harm to surface water bodies. This would be by way of processes such as deoxygenating, putrefaction and eutrophication. As a result manure and wastewater require appropriate management.

The potential impacts on surface water include:

- Uncontrolled drainage from the feedlot complex;
- Contaminated tailwater from wastewater irrigation (or rainfall runoff soon afterwards) leaving the property;
- Eroded, nutrient-rich soil carried in stormwater runoff leaving the property; and
- Overtopping of the wastewater management system.

The proposed feedlot will result in demand for stock drinking water as well as that required for dust suppression, cleaning activities and supplementary irrigation. This water is to be sourced by existing licensed groundwater points and from onsite dams, it is not anticipated the proposed feedlot will represent a substantial increase on water demand in the local region.

4.3.1 Existing Environment

Majors Creek, located approximately 3,500m to the south west of the 'Culverly Rise' property (refer to Figure 14) is the nearest waterway to the proposed development. Majors Creek is a tributary to the Murray River which is located approximately 4.5km south west of the 'Culverly Rise' property.

The Murray River originates in the Australian Alps of NSW and Victoria and flows in a general westerly direction to its outlet on the South Australian coast. The Murray River is regulated by the Hume Dam, upstream of Albury. In the Lower Murray GMA, a complex series of irrigation channels diverge from the river, distributing water across the floodplain.

The major tributaries entering the Murray River downstream of Yarrawonga from Victoria are the Goulburn, Campaspe and Loddon Rivers.

4.3.2 Flooding

Flooding is not likely to be a concern for the proposed feedlot site. EPI Flood mapping (refer to Figure 14) indicates that flooding from the Murray River is more likely to impact southern properties of the Murray River. The nearest extent of floodwater inundation to the site is mapped to be over 3.3km to the southwest of the 'Culverly Rise' southern property boundary.

Whilst the Probable Maximum Flood (PMF) level of the Murray River has not yet been mapped, the site would not be affected based on the elevated nature of the site compared to the floodplain.

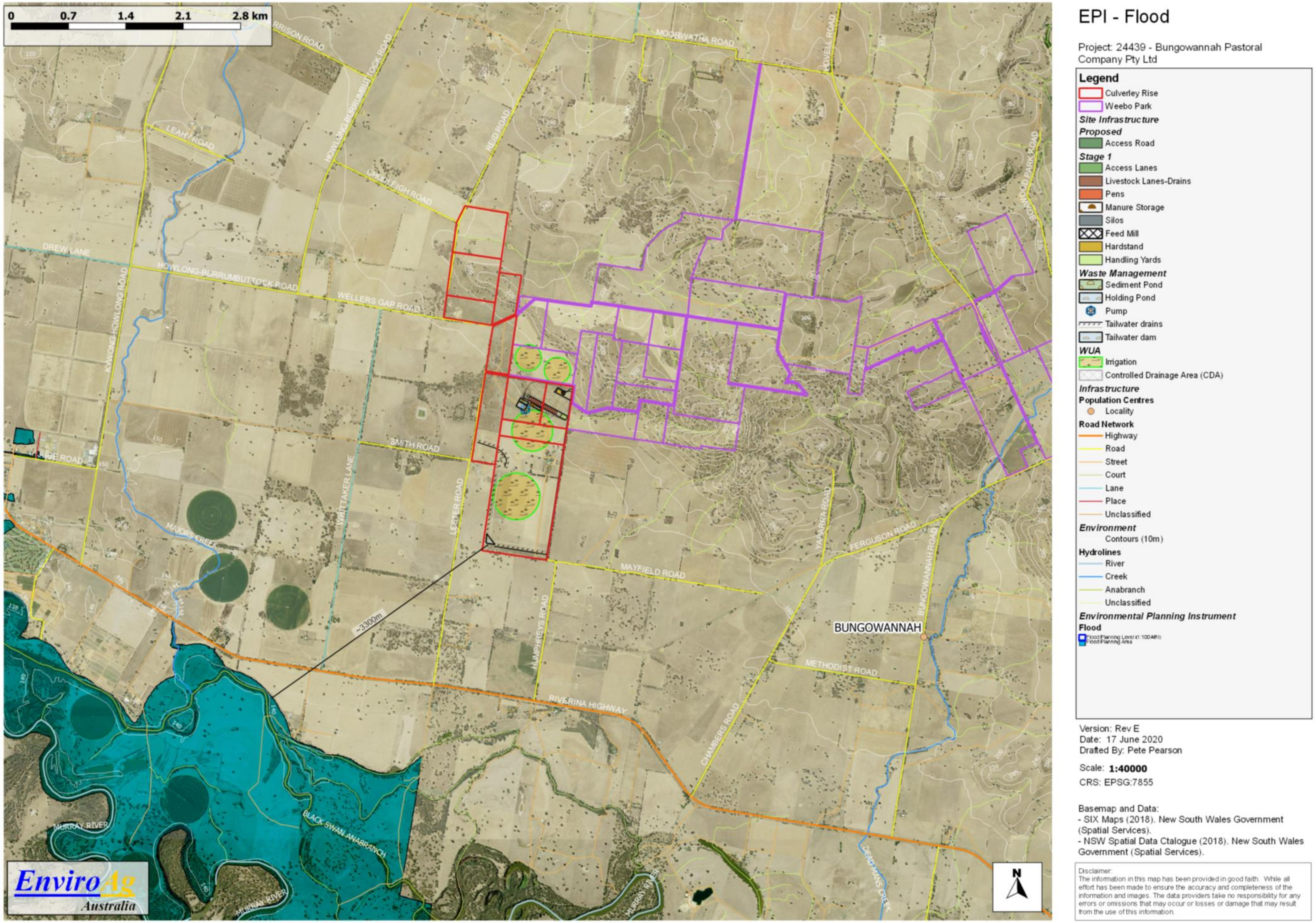


Figure 14 Flood Mapping

4.3.3 Assessment

The wet season will be the most challenging time of year for drainage and stormwater management. Excess water runoff from the feedlot has the potential to spread sediment and nutrients to neighbouring properties and water systems, increasing the risk of aquatic ecosystem damage.

The construction phase removes vegetation and increases erosion, so there is a high risk of drainage and stormwater issues during the construction phase. As part of the detailed site design, a construction management plan that incorporates an erosion and sediment control plan will be developed once the development approval for the proposed feedlot has been issued.

The impact of the feedlot on the environment from improper drainage and stormwater management while operational is largely mitigated by the design of the facility. Open drainage channels along boundaries, as well as along the lower boundary of the irrigation block will catch stormwater and direct it to the WUA tailwater dam at the lowest point of the property (south-western corner). All stormwater will be directed to these drains by the topography of the site, excluding that of the pens/compost manure pad which is directed to the holding pond through bunding and sloping of these areas. The drainage channels will be made of compacted clay seeded with grass to decrease the speed of water flow. A CAR storage pond is available should the holding pond become too full. The site coverage of this drainage system ensures that runoff is captured from all areas and there should be no impacts external to the property. However, these design features rely on proper management and maintenance to function efficiently.

Improper management of waste water applications could potentially result in:

- Contamination of surface water downslope causing, eutrophication, degradation of aquatic ecosystems;
- Generation of offensive odours;
- Contamination of groundwater aquifers, particularly during the wet season when groundwater levels are closer to the surface;
- Degradation of the soils of irrigation areas (increased salinity, acidification, breakdown of soil structure);
- Altering the nutrient balance in the soils causing nutrient accumulation; and,
- Insufficient uptake of nutrients by the irrigated crops due to nutrient overload, insufficient water, waterlogging, salinity, sodicity, and soil degradation, or other factors affecting plant growth such as disease, pests, or toxic chemicals in the irrigation water.

4.3.3.1. Hydrological Modelling

The FSIM model (Lott 1995 and Lott 1998) simulates the hydrological mass balance of open pens or yards such as those used in the proposed sheep feedlot with particular emphasis on the water balance of the pen surface. The model uses distributed parameters to describe the various aspects of the hydrological balance and has been developed to incorporate variables for factors such as land use and feedlot management practices.

Long-term daily climate data (precipitation and evaporation) for the site or a site representative station is a basic requirement. Output is in various forms and can be tailored to investigate the specific factors influencing the hydrology of the feedlot catchment. The model was developed using hydrological data collected in commercial feedlots. The FSIM model has been subsequently calibrated and the accuracy of its predictions of catchment conditions and rainfall runoff in feedlot catchments has been verified and tested (Lott 1998). The research data and model was used to derive the co-efficient used in the current State and National feedlot guidelines (MLA 2011).

The FSIM model was used to simulate the hydrological performance of the ‘Culverly Rise’ catchment including the holding pond and effluent utilisation area.

Various models exist for modelling wastewater application to land areas (for example MEDLI; Waste load and others).

These models do not account for the following management practices and soil development and soil-crop interactions:

- Soil temperature and pH directly affect the availability of soil nutrients. Increasing soil pH will result in an increase in bound nutrients and a reduction in availability of some key macro nutrients that are of environmental concern (e.g. Phosphorus);
- Soil organic matter (SOM) holds both water and nutrients. In well managed wastewater irrigation systems general increases in SOM are observed. This holds nutrients in complexes reducing the likelihood that they will go into the soil water solution and be leached from the soil profile. The increase in SOM is achieved through soil health management focused on the same;
- Gypsum and lime applications to the soil increase the abundance of calcium. While calcium displaces hydrogen and sodium ions from exchange sites (clays, reactive silts and organic colloids) they also bind with ions such as phosphorus and sulphur to form calcium phosphate and gypsum in the soil. This process essentially builds the soil and removes nutrients from the exchangeable pool of nutrients; the same processes occur with iron and other elements that bind with nutrients to remove them from the soil water solution often permanently; and
- Where nutrients are abundant, crops will luxuriantly uptake nutrients at rates above those generally reported in the literature.

The above models are also based on traditional assessments of “nutrient” deficit agronomy in subtropical, temperate or Mediterranean climates where soil nutrient availabilities are based on a lack of nutrient and crop uptake being limited by the same. None account for nutrient complexing, soil development (soil building) and luxuriant uptake; where applicable.

Some models are physically based and deterministic. None have been separately calibrated, and validated. This is a fundamental deficiency of all the models. It means that that no scientific reliability can be placed on them, and, at best, they can only be used for “decision support”.

No models exist for assessment of the application of feedlot wastewater to land for crop utilisation. Consequently, the models have been set aside as they are known to diverge from actual soil monitoring outcomes.

Given the above, the land capability assessment has focused on considering the hydraulic loading rates using standard irrigation modelling techniques and then the application of simple nutrient mass balances given potential additions, losses, storage and sorption of phosphorus. This approach has proven to be conservative and is considered most appropriate for the assessment.

4.3.3.2. Waste Water Irrigation

The runoff from the feedlot controlled drainage area captured in the holding pond is to be irrigated on land adjacent to the feedlot (refer to Figure 15) where the nutrients and water can be utilised in plant production. The soil in this wastewater utilisation area (WUA) provides a “sink” for the assimilation of applied nutrients.

The environmentally sustainable use of the WUA is directly related to the amount of nutrient applied to such areas, the amount of nutrient recovered in produce harvested or removed from the area and the amount of nutrient able to be safely stored in the soil. Some loss of nutrient (and salts) from the system will occur by way of leachate moving below the root zone of the crops and through processes such as erosive soil loss. It is also necessary for increased amounts of salt to be drained from the soil in the WUA; however, salinization of the soil profile is to be avoided. This loss of nutrients and salts will not impact on the environmental value of any associated surface or groundwater resources.

Generally, one of the plant macronutrients (nitrogen, phosphorus or potassium), rather than either the hydraulic or the organic matter loading rate, is the limiting factor in determining the net annual application volume of waste water in the WUA. Conversely this will impact the required size of the WUA. The use of a source of “fresh” or “clean” irrigation water to supplement the applied wastewater will generally be necessary to help maximise crop yields and so maximise nutrient removal from the WUA. In the long term, rainfall or fresh irrigation water applications in excess of that utilised directly by the crops will be necessary to leach salts from the soil profile.

The amount and timing of both wastewater and fresh water applications will be largely determined by the irrigation requirement of the crops. In abnormally wet years or seasons, hydraulic loading may in the short term become the limiting factor on wastewater applications. Some guidelines (MLA, 2012) attempt to address this by stipulating that the WUA must be of sufficient size to allow wastewater irrigation in a 90 percentile wet year. Consistent with this, the FSIM model determines both the optimum size of the WUA and the optimum size of the holding pond necessary to provide sufficient storage capacity to safely store the wastewater in a 90 percentile wet year.

The FSIM model provides output that allows the calculation of the average annual yield of runoff from the feedlot and the mean annual volume of wastewater available to irrigate the WUA. This data has been used as input data into the nutrient balance. The results suggest that an irrigation area cropped to improved pasture would need to be 30 ha in size to enable wastewater applications to be sustainable from a nutrient balance viewpoint. An irrigation area of 60.9ha has been adopted for this site.

The irrigation areas of 60.9ha will be sown to an improved pasture and will be cut for silage production. It is estimated that irrigated improved pasture will have a gross water requirement of 9.58ML/ha/year respectively.

The annual average waste water production is estimated to be approximately 111ML per year, applied to 60.9ha this equates to approximately 1.8ML/ha/year. This is less than the expected crop water requirement of 9.58ML/ha/year.

Under this proposal, irrigation of the WUA will be undertaken using 4 pivot irrigators. When properly designed and managed such irrigators generate a minimum of irrigation tailwater. Nevertheless, the potential does exist where a significant storm event occurs during or immediately after a wastewater irrigation application where stormwater runoff from the WUA may transport concentrated amounts of nutrient and other potential contaminants offsite. Consequently, it is necessary to employ a terminal or tailwater system to capture and recycle stormwater runoff from the WUA. A WUA tailwater dam has been proposed on the south west drainage point of the site.

Current guidelines (MLA 2011) stipulate that the terminal system must be capable of capturing and storing the runoff equivalent to a minimum of 12mm over the entire WUA.

The WUA tailwater dam system has a proposed capacity of 26.5ML (capturing the first 25mm). The WUA tailwater dam will collect some of the clean water runoff from other areas of the site. These will dilute tailwaters from the irrigable areas.

4.3.4 Wastewater Quality

The expected average nutrient content of the treated wastewater is shown in Table 13 below. It is, generally, considered to be a medium strength waste water (NSW Waste Water Irrigation Guidelines) as the biological oxygen demand (BOD) will be below 1,000mg/L.

Table 13 Expected Average Nutrient Content of Treated Wastewater

Attribute	pH	EC	TDS (%)	TN (mg/L)	TP (mg/L)	K (mg/L)	Na (mg/L)
Average	7.2	2,000	0.1	150	15	300	100
Average Annual WW Generation (ML)				36.2			
Mass (kg/ha)	NA	NA	1,034 kg/ha	155.14	15.50	310	103.4
Losses in Wastewater (sludge) (Wet Weather Storage) (kg/ha)	NA	NA	50%	40-70% (50%)^ 356.25	10-40 (10%)# 17.9	(10%)# 142.5	
Irrigation Application (kg/ha)	NA	NA	**517**	**77.57**	**13.95**	**279**	**103.4**

^ Volatilization (denitrification and evaporation)

Chemical precipitation and deposition in algae detritus (sludges)

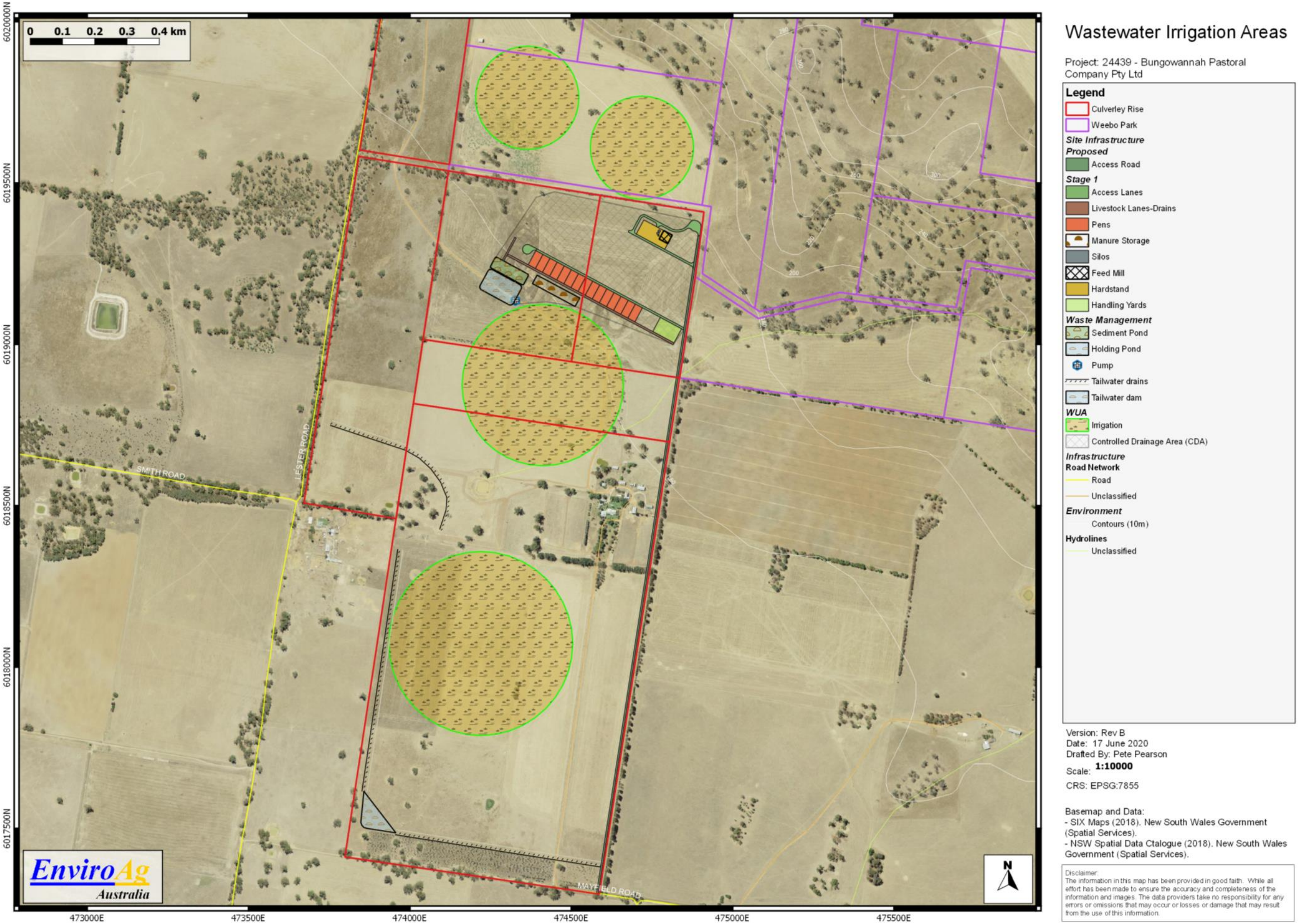


Figure 15 **Wastewater Irrigation Areas**

The holding pond, sediment basin and CAR dam proposed to be constructed for the feedlot are exempt from approval under the *Water Management Act 2000* and *Water Management (General) Regulation 2018* as they are agricultural wastewater management dams.

4.3.5 Mitigation and Management Measures

The amenable topography (uniform gentle slope) and design of the feedlot irrigable areas are contributing factors to minimise the potential for overland flow surface water impact. In addition to these measures the following aspects also reduce surface water contamination:

- Substantial vegetated land surrounding the WUAs;
- The site does not flood; and,
- The site has a comprehensive tailwater system.

The key monitoring variables are;

- Maintaining an active plant growth; and,
- Application rate and timing of irrigation.

Monitoring these variables it will ensure that no excess water flows to surrounding areas and drainage lines, eliminating any impact on surrounding creeks and river tributaries.

Key irrigation management features will include careful management of an irrigation program with consideration of potential loss of nitrogen and phosphorus offsite. This is best achieved by monitoring:

- Daily weather conditions on site;
- Applications of wastewater irrigation;
  - The actual frequency of the irrigation events will be determined on the rate of uptake by the crop, evapotranspiration rates, and effective rainfall.
  - Groundwater will be closely monitored via a piezometer in each irrigation area (to be included as part of the detailed design after approvals have been obtained). This will be conducted on a monthly basis in the first year, and then an assessment for further analysis will be undertaken based on the initial results; however, quarterly sampling is generally considered sufficient.
- Nutrients, when applied, will be applied frequently in low amounts;
  - Ongoing careful management of potential loss of nitrogen and phosphorus is important.
  - The physical and chemical properties (including soil nutrients) will be closely monitored via regular agronomic tests (annually), to adjust nutrient application rates.
  - The quality of wastewater applied to the irrigation block (nutrients, salts, etc.) will also be monitored.
- Site water balance, including harvested water and water applied to the irrigation area. This will include a record of incoming water (stored rain water, stored waste water, stored tailwater) and outgoing irrigated water (irrigated rain water, irrigated bore water, irrigated waste water, irrigated tailwater).
- Groundwater will be monitored through the installation of 5 proposed piezos in the following locations:
  - 1 piezo in each wastewater irrigation paddock (total of 4);
  - 1 piezo near the wastewater holding pond.
- Maintaining an active plant growth and dominance of improved pastures.
- Maintenance of improved pastures.
- Maximising organic matter content to maximise soil moisture and nutrient holding capacity.
- Maximising nutrient recovery by crop harvest.
- Irrigation will be undertaken when a soil moisture deficit occurs. The water deficit will be established by direct measurements by the farm manager.
- Irrigation will only be undertaken when rainfall is not imminent. Irrigation will not occur in the 4 days prior to crop harvest (hay cutting and bailing).

Fundamental surface water impact management measures are as follows:

- Holding pond and WUA tailwater dam levels to be monitored regularly;
- Records of the data and nature of cleaning and maintenance operations and any overtopping or spillages from wastewater storages ponds;
- Where an incident causes, or is threatening to or may threaten to cause, environmental nuisance or pollution resulting in material or serious harm, the EPA must be informed within 24 hours of first becoming aware of the incident;
- All roof runoff will be captured in gutters and piped to tanks or to separate clean water storage. This will reduce inflows to the feedlot waste water systems;
- Chemicals will only be mixed and handled in sealed and bunded areas by appropriately licenced/accredited personnel; and
- Pens will be cleaned out regularly to reduce the risk of overloading the wastewater system with nutrients just prior to the wet season.

4.4 Groundwater

Contamination from the feedlot site can reach groundwater via installed bores on site or by leaching through the soil. Contamination via the bore can result through back flow after filling chemical containers, damage to the bore or poor bore construction. However, this is unlikely as licenced, accredited operators have constructed the bores and any future bores will have proper placement to ensure that they are visible and protected.

The design of the feedlot includes the following features that will decrease the likelihood of contamination of groundwater via the soil:

- Clay lining of pens;
- Clay lining of the sediment basins;
- Clay lining and armouring of manure pad;
- Where appropriate, heavily trafficked areas will be concreted;
- Clay lining of all ponds and dams to reduce access to groundwater; and
- Bunding of fuel storage, as well as chemical storage areas.

These design features will reduce the risk of groundwater impacts occurring in the waste systems and feedlot areas. However, the application of manure and treated wastewater to the irrigation area can leach into groundwater if not properly managed.

4.4.1 Existing Environment

The Lower Murray GMA is within the Murray Geological Basin, a large saucer-shaped structure up to 600m deep, backfilled with sand and clay layers, which represent a 55 million year history of marine conditions, freshwater swamps and Riverine and aeolian (wind-borne) deposits (NSW OoW 2011).

Groundwater flow in the deep regional aquifers in the Murray Basin is from east to west (NSW OoW 2011). The general flow for the shallow aquifers in the Shepparton Formation is similarly east to west, but local variations can occur depending on the topography (NSW OoW 2011).

Groundwater bores located in close proximity to the creeks, rivers and intensely irrigated areas can have lower salinity water due to constant recharge (NSW OoW 2011). Increasing groundwater levels in the shallow aquifer, water logging and the subsequent soil salinisation have been a major environmental issue in the Murray Irrigation Districts for over four decades (NSW OoW 2011). Extraction of shallow groundwater via spearpoints has been encouraged in the Murray Irrigation Districts to mitigate the rising groundwater levels.

A 2011 study completed by the NSW Office of Water in the Murray Irrigation District between October 2009 and January 2011 identified that groundwaters in the Lower Murray area are generally saline and neutral pH waters between 6 and 8. Nutrient, mineral and metal content varies across the region sampled depending on the use and geology of the area.

There are 5 pre-existing bores on the ‘Culverly Rise’ property. (refer to Figure 16), details of these bores is provided in Table 14.

Table 14 On Site Bore Data

Bore Number	Usage	Depth
GW500946	Water Supply	40m
GW504748	Water Supply	13m
GW503143	Irrigation	46m
GW504749	Water Supply	14m
GW504747	Water Supply	14m

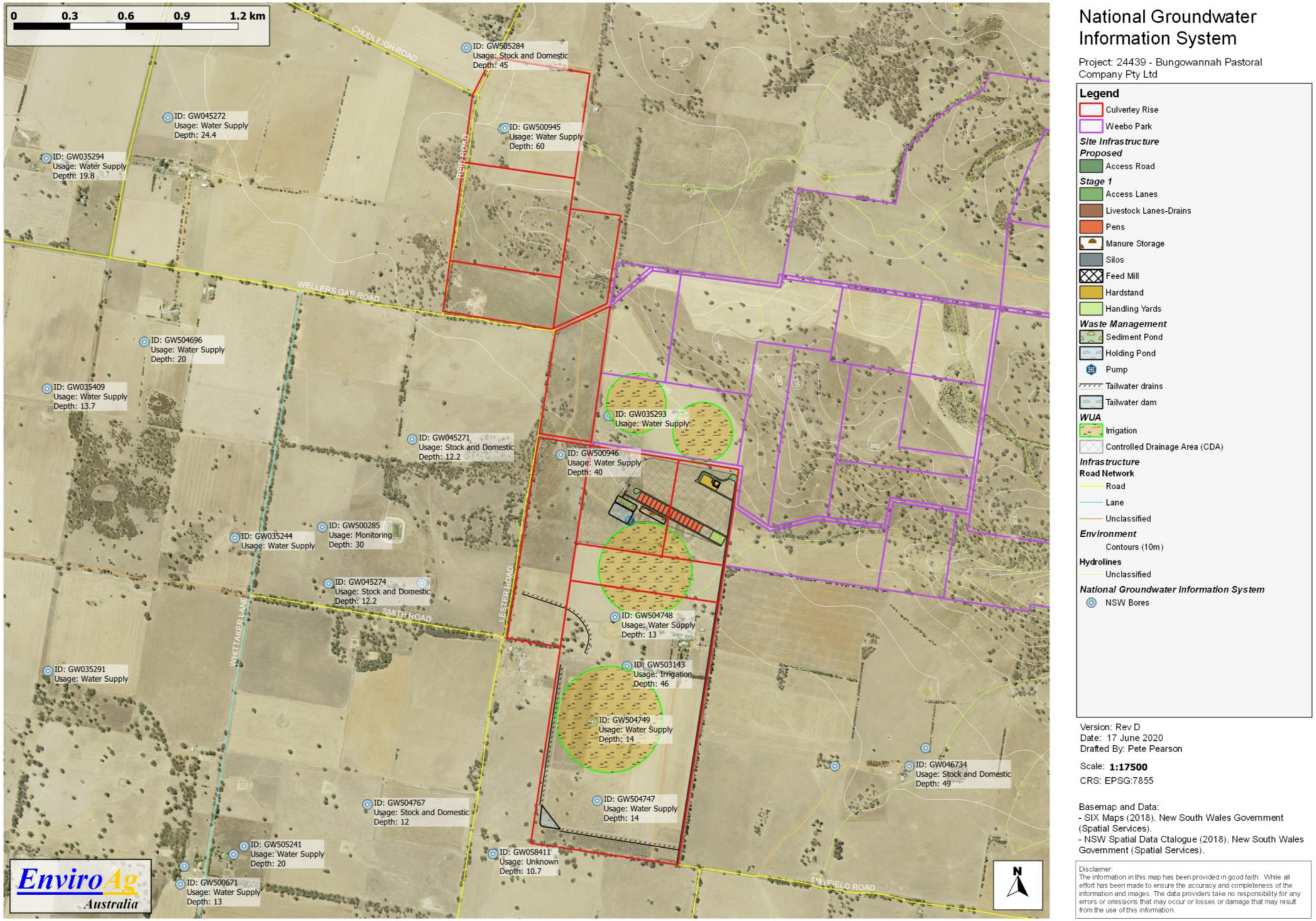


Figure 16 On site Bores

4.4.2 Assessment

4.4.2.1. Groundwater Dependent Ecosystems

Groundwater dependent ecosystems (GDEs) are ecosystems which require access to groundwater on a permanent or intermittent basis to meet all or some of their water requirements so as to maintain their communities of plants and animals, ecological processes and ecosystem services (Richardson, et al., 2011). Ecosystem dependency on groundwater may vary temporally (over time) and spatially (depending on its location in the landscape). These ecosystems can include aquifers, caves, lakes, palustrine wetlands, lacustrine wetlands, rivers and vegetation (WetlandInfo, 2017). Some GDEs will access groundwater that does not express at the surface, such as the roots of vegetation (WetlandInfo, 2015).

The three types of GDEs are:

- ecosystems dependent on the surface expression of groundwater (surface GDEs),
- ecosystems dependent on the subsurface presence of groundwater (terrestrial GDEs), and
- ecosystems dependent on the subterranean presence of groundwater (subterranean GDEs).

GDEs provide an array of ecological benefits including provision of (Wetlandinfo 2015):

- habitat for flora and fauna, including rare and unique organisms,
- providing corridors for fauna,
- mitigating the effects of floods,
- reducing soil erosion,
- reducing sediment and nutrient loss; and
- degrading pollutants and contaminants.

Groundwater supports terrestrial and aquatic ecosystems by supporting vegetation and providing discharge to channels, lacustrine and palustrine wetlands, and both the estuarine and marine environment. Groundwater also plays a critical role during extended dry periods in maintaining refuges for flora and fauna (WetlandInfo 2015).

Groundwater dependent ecosystem aquifer mapping is completed by the Federal Government to determine how and where groundwater moves through the landscape. This mapping incorporates a range of criteria including, but not limited to, confinement, geology, porosity, groundwater flow system, salinity, pH and recharge processes (DoPIE 2019). The mapping indicates the likely locations of GDEs at a regional scale and provides descriptions and system understanding where possible of the ecosystems.

The *BOM GDE Atlas (2020)* has identified that there is low potential terrestrial and aquatic GDEs in and near the site boundaries (refer to Figure 17). There is no data on subterranean GDEs in this area.

Livestock waste contains nitrogen both in inorganic and organic compounds. The inorganic fraction is equivalent to the nitrogen emitted in urine and usually greater than the organic form. Microbial action decomposes wastes containing organic nitrogen into ammonia, which is then converted into nitrite and nitrate. Nitrite is easily oxidized to nitrate, so nitrate is predominant in decomposed wastes. Nitrate-containing compounds in soil are generally soluble and can readily migrate through soil layers (MLA 2018). Thus, improper management of livestock waste can pose serious threats to groundwater via several pathways, such as surface runoff from farm building, improper discharge, leaking from storage facility, and excessive land application of wastes. Over-application of animal wastes or application of animal wastes to saturated soils can also cause contaminants to move into receiving waters through runoff and to leach through permeable soils to vulnerable aquifers (Barker & Zublena, 1995).

The soil for irrigation has permeable and well-structured surface soils due to its sand and silt content. Subsurface clays provide some plant available stored capacity but they restrict permeability below the root zone. The consequence of this is that leaching of nutrients to groundwater is highly unlikely, and irrigation needs to be applied in small amounts and frequently. This necessitates the use of low-pressure centre pivots as the means of irrigation.

If managed incorrectly, application of solid and liquid waste can exceed the capacity of crops to safely assimilate applied nutrients. Waste application mismanagement is likely to lead to localised degradation of soil and groundwater resources. Furthermore, significant over-supply of irrigation volumes can increase deep drainage above the modest increases estimated for post-development conditions. Regular monitoring of manure and effluent characteristics, in conjunction with crop type and soil condition will be required to minimise the potential for groundwater (and soil) impacts.

The design and construction of the feedlot facility is essential for ensuring contaminants from high impact areas such as pens, drainage areas, stockpile areas, and holding ponds, will not be leached to groundwater. The feedlot is to be designed and constructed in accordance with the National Guidelines (MLA 2011 and MLA 2012) which requires clay lining of all pens, pads and drainage to a maximum permeability of $1x10^{-9}$ m/s and constructed to a minimum depth of 300mm after compaction. Clay liners are to have mechanical strength testing after construction and prior to use, Californian Bearing Ratio tests are to be performed and must meet the minimum standard of 20% for wet and dry. Application of an appropriate clay lining will largely prevent the leaching of any surface contaminants to groundwater. Appropriate maintenance of clay liners will be ongoing through the life of the feedlot.

The localised GDEs are unlikely to be impacted from the construction and operation of the feedlot facility. The installation of drainage catchments along the western boarders (downstream catchment) directs potentially contaminated runoff waters to the CAR dam on the southern boundary of the property, thus protecting nearby GDEs.

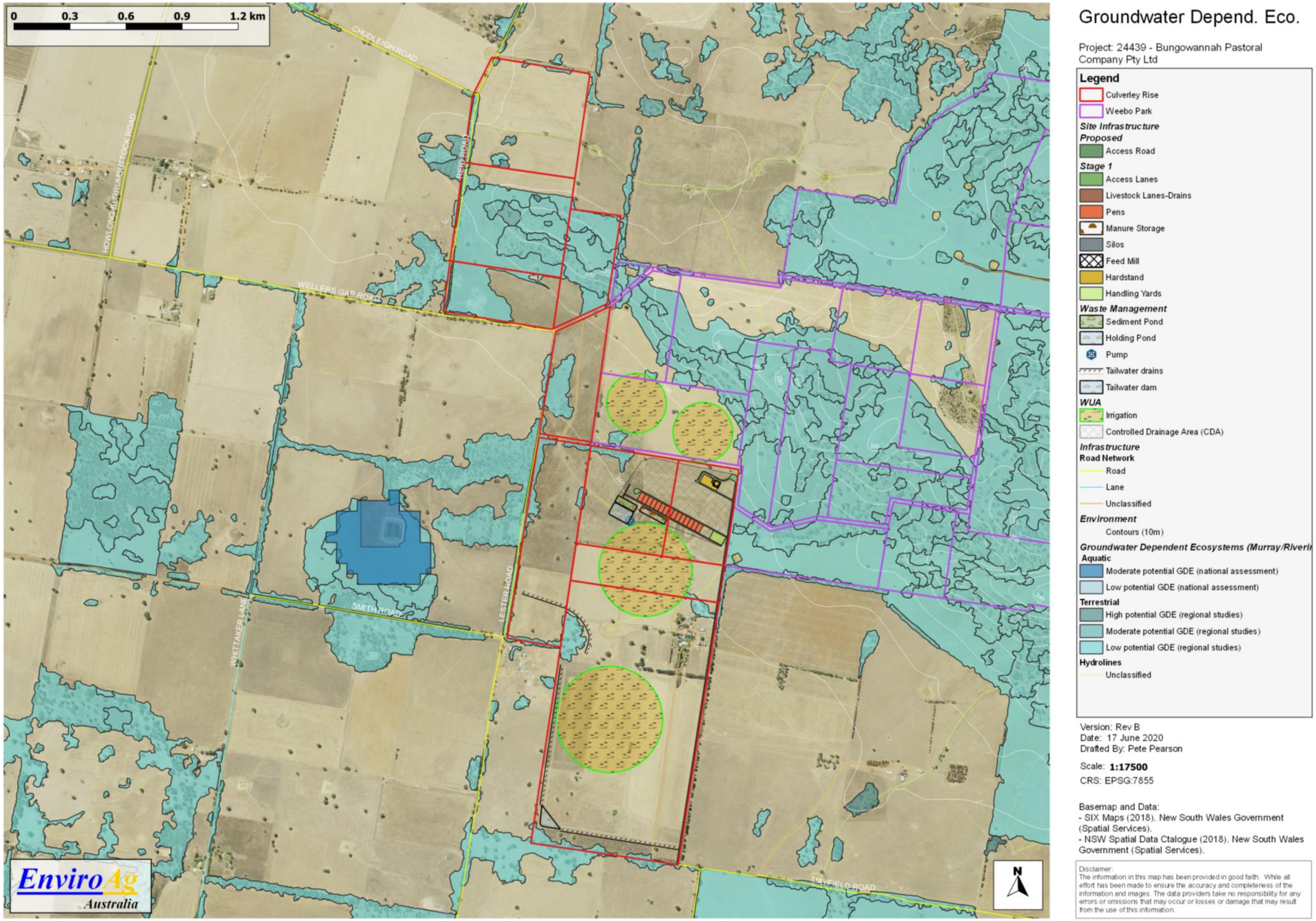


Figure 17 Groundwater Dependent Ecosystems

4.4.3 Mitigation and Management Measures

The soils on the site may be nutrient poor and have a high permeability, both factors would increase the potential for nutrients leaching into the soil and water. Ongoing careful management of potential loss of nitrogen and phosphorus is important. This is best achieved by:

- Maximising organic matter content to maximise nutrient holding capacity; and,
- Maximising nutrient recovery by crop harvest.

Monitoring these variables will ensure that nutrient balance and soil structure will be maintained; no issues will arise in the facility or on surrounding land and no impacts on groundwater underlying the irrigation site or surrounding land.

Key irrigation management features will include careful management of an irrigation program with consideration of potential loss of nitrogen and phosphorus offsite. This is best achieved by monitoring:

- Daily weather conditions on site;
- Applications of wastewater irrigation;
  - The actual frequency of the irrigation events will be determined on the rate of uptake by the crop, evapotranspiration rates, and effective rainfall.
  - Groundwater will be closely monitored via a piezometer in each irrigation area (to be included as part of the detailed design after approvals have been obtained). This will be conducted on a monthly basis in the first year, and then an assessment for further analysis will be undertaken based on the initial results; however, quarterly sampling is generally considered sufficient.
- Nutrients, when applied, will be applied frequently in low amounts;
  - Ongoing careful management of potential loss of nitrogen and phosphorus is important.
  - The physical and chemical properties (including soil nutrients) will be closely monitored via regular agronomic tests (annually), to adjust nutrient application rates.
  - The quality of wastewater applied to the irrigation block (nutrients, salts, etc.) will also be monitored.
- Site water balance, including harvested water and water applied to the irrigation area. This will include a record of incoming water (stored rain water, stored waste water, stored tailwater) and outgoing irrigated water (irrigated rain water, irrigated bore water, irrigated waste water, irrigated tailwater).
- Groundwater will be monitored through the installation of 5 proposed piezo's in the following locations:
  - 1 piezo in each wastewater irrigation paddock (total of 4); and
  - 1 piezo near the wastewater holding pond.
- Maintaining an active plant growth and dominance of improved pastures;
- Maintenance of improved pastures;
- Maximising organic matter content to maximise soil moisture and nutrient holding capacity; and,
- Maximising nutrient recovery by crop harvest.

The Feedlot Manager will ensure that:

- Assessment of the efficacy and improvements needed is completed;
- Induction and training is provided to all employees and contractors;
- All monitoring is completed to schedule;
- Annual environmental monitoring report is written and submitted to ascertain the nature of any impacts the feedlot has on water quality.
- Internal site audits are undertaken;
- All records and monitoring data pertaining to the plan are kept and maintained (including training records);
- An annual review is carried out.

4.5 Land

The magnitude and nature of a sheep feedlot mean that if not properly managed, pollutants, waste, and erosion could otherwise cause significant environmental contamination and degradation to land. This would be by way of processes such as waste runoff, soil pollutants, and a non-compacted clay liner at the base of the feedlot. As a result wastewater, feedlot construction, and site operations require appropriate management. Consequently, an assessment of the potential impacts upon any land has been undertaken.

4.5.1 Existing Environment

The 'Culverly Rise' site is mapped to have Qb3 (Chromosols) as shown in Figure 18. These soils are characterised to be hard neutral red soils present in undulating plains. Chromosols are known to have a substantially abrupt increase in clay content as the soil profile drops; however, the neutrality of the soils does not tend to change with profile depth. There is generally a strong texture contrast between A and B horizons. Surface soil textures and depth can vary considerably and have significant implications for management; affecting soil workability, permeability, crop establishment, moisture availability and erodibility. Red Chromosols are the most permeable of the Chromosols group (CSIRO 2016).

Under the NSW OEH *Land and Soil Capability Assessment Scheme* (2012), the land has been mapped as Class 3 which is characterised as:

> *"High capability land: Land has moderate limitations and is capable of sustaining high-impact land uses, such as cropping with cultivation, using more intensive, readily available and widely accepted management practices. However, careful management of limitations is required for cropping and intensive grazing to avoid land and environmental degradation."*

The proposed feedlot site crosses two surface geological boundaries, both Os and Qrs, as shown in Figure 19. Os consists of quartzose siltstone, sandstone, quartz-mica schist, pelite, chert, locally metamorphosed; minor quartzite, graphitic schist, hornfels. While Qrs areas consist of unconsolidated riverine deposits of clay, silt, sand and gravel. The proposed WUAs are only located in Qrs areas.

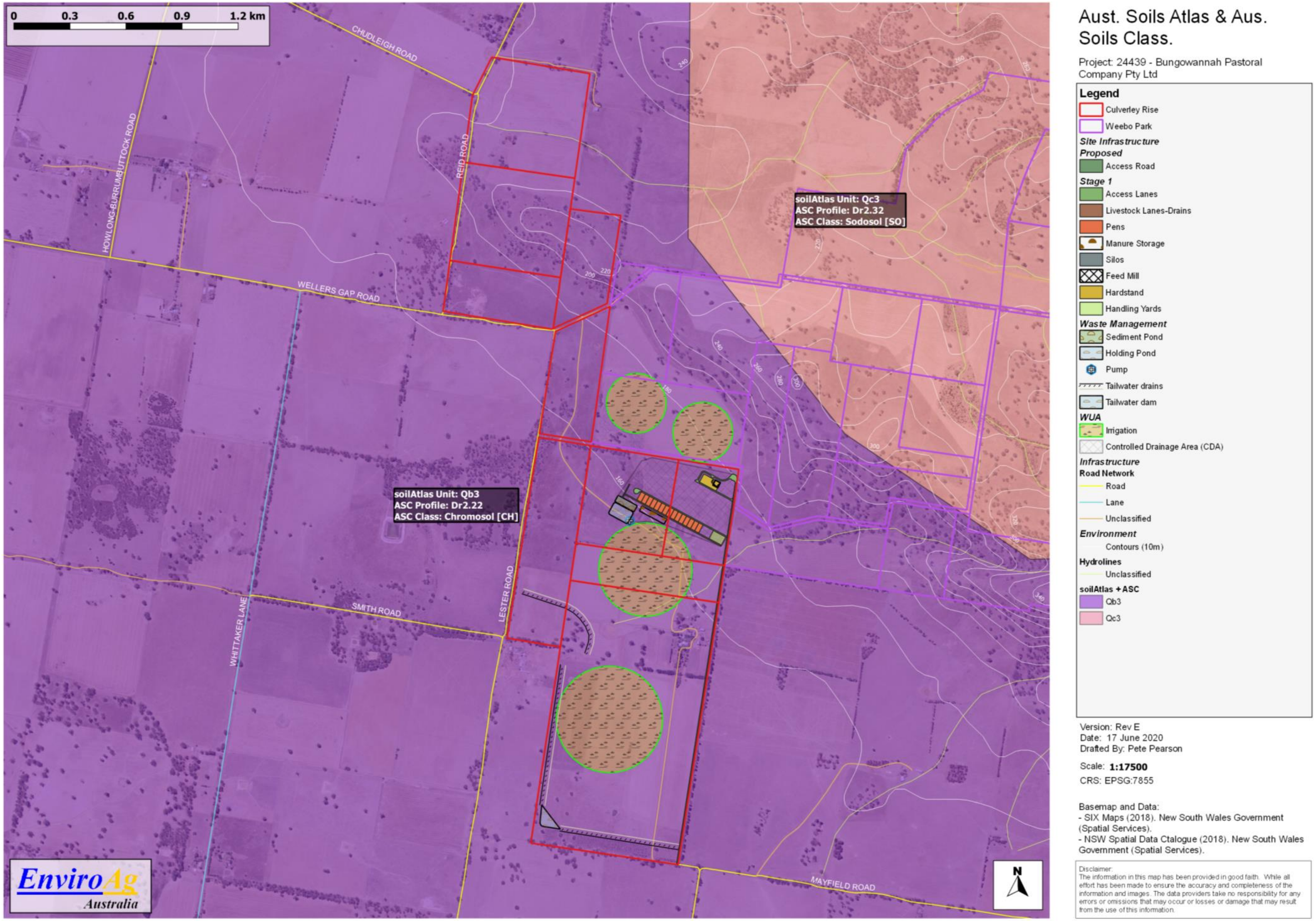


Figure 18 **Mapped Soils**

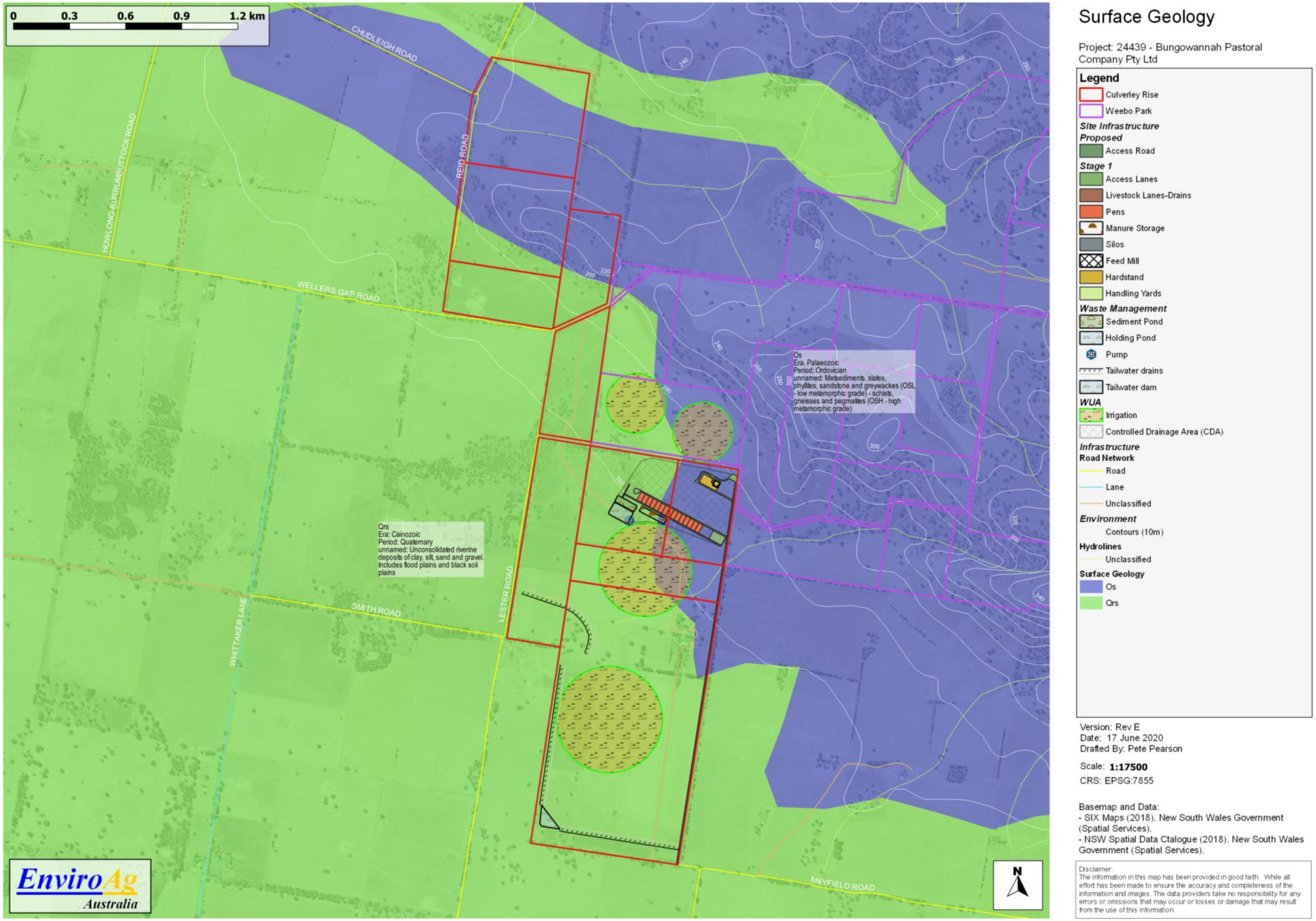


Figure 19 Mapped Geology

4.5.2 Assessment

Potential soil impacts that might be associated with the proposed development are degradative processes associated with soil nutrient storage, structural decline and acidification.

Operation of the feedlot will introduce significant levels of nutrients to the feedlot facility and waste systems zones. However, all ponds, dams, pens and the manure pad will have compacted clay lining to minimise nutrient leaching and contamination of soil (in accordance with MLA National Guidelines). All chemical storage in these areas will also be bunded in accordance with relevant Australian Standards.

4.5.2.1. Waste Utilisation Areas

It is intended to utilise composted manure generated from the proposed feedlot on to the designated improved pasture areas, known as the waste utilisation areas (WUAs), refer to Figure 20. The application of effluent and manure to land can cause nutrient imbalances to soils. The following has been considered in selection of the WUAs:

- Nutrients from waste application activities will most efficiently be removed by growing a high yielding crop that is harvested and transported from the site (refer to section 4.5.3). The selected area is intended to be irrigated.
- The selected area has good agricultural soils (e.g. adequate nutrients, plant available water capacity) with no serious limitations to plant growth (e.g. no subsoil constraints, not prone to salinity, waterlogging or flooding). The land has suitable topography for cropping (not steeply sloping).
- The utilisation area is large enough to spread the nutrients in the wastes at sustainable levels.
- There are adequate buffers between utilisation areas and watercourses.
- There are adequate separation distances to nearby sensitive receivers.

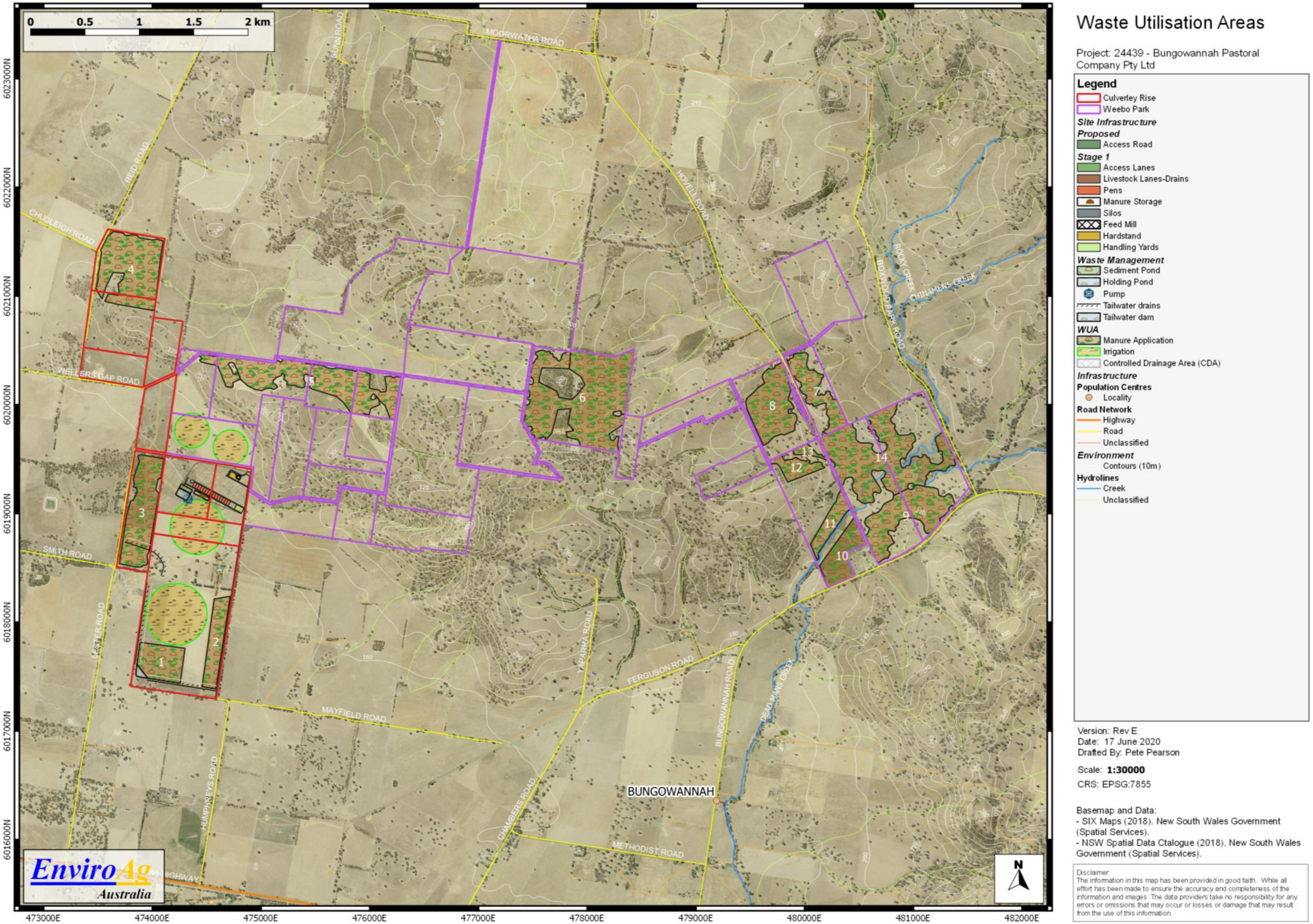


Figure 20 **Proposed Waste Utilisation Areas**

4.5.2.2. Composted Manure Application

Composted manure application can range from 5t/ha to 30t/ha depending on the soil and crop needs (MLA 2015). The proposed manure application areas total of 318.8ha. The feedlot would produce approximately 1,687.5t of manure per year (as per section 3.12.1), a single spread of 5.2t/ha would need to occur over the designated manure application areas in order for all composted manure to be utilised on site. Dryland cropping areas will only receive composted manure application every 3 years to ensure nutrients are applied in moderation.

Slattery et al (2002) outlines that manure contains excessive quantities of cations such as sodium and potassium, which may result in long-term sustainability problems for the soil, particularly when large amounts are applied over short time periods.

In a study of 2 sites in north-eastern Victoria, it was found that applications of composted manure over a 12 month period resulted in a 1% increase in soil organic carbon, an increase in soil pH by 1.5 units, increased levels of magnesium, calcium, nitrogen and potassium in the surface 10 cm soil layer, and an increase in extractable phosphorus levels in the subsoil. A decrease in sodium was observed in the 40–80 cm soil layer, which may indicate that soluble organic compounds, migrating down through the soil profile are able to complex with sodium and effectively remove some of this cation from the exchange sites of the clay surfaces. It was concluded from the study that applying composted manure to improved pastures may be a promising means of reducing sodicity (Slattery et al. 2002).

2% organic matter content is considered desirable for maintaining good soil structure for agricultural activities (Greenland, 1971), but many NSW surface soils have organic carbon levels less than 1% (Spain et al., 1983). The application of composted products to agricultural lands can make a beneficial contribution to address a range of land degradation problems. It can help to reverse the rapid rate of soil organic matter and nutrient decline by providing organic carbon and nutrients to the soil.

Soil erosion, structural decline, nutrient decline, salinity, sodicity and acidity are the main categories of land degradation, which may be addressed by the application of composted products (DEC 2007). Due to the stability of soil aggregates, which improves soil structure, the application of compost prevents surface sealing, improves water infiltration and the water holding capacity thus reducing runoff generation and soil erodibility (Bresson et al., 2001; Albaladejo et al., 2000; Stocking and Albaladejo, 1994).

As previously discussed, an increase in soil organic matter content also reduces the effect of soil sodicity. Excess sodium is removed due to complexing sodium with soluble organic compounds and by decreasing precipitation of calcium, this results in a decrease in exchangeable sodium percentage (Kaur et al., 2002; Slatterly et al., 2002; Wahid et al., 1998; Churchman et al., 1993; Sekhon and Bajwa, 1993). Application of organic matter also enhances migration of sodium to lower soil layers due to the increase in porosity, which is a consequence of improved water stability of aggregates (Sekhon and Bajwa, 1993; Wahid et al., 1998). Therefore, organic matter application effectively modifies the effect of exchangeable sodium in soils.

The use of compost has also been shown to ameliorate soil acidity due to its proton consumption capacity and ability to complex aluminium ions (Mokolobate and Haynes, 2002; Van den Berghe and Hue, 1999; Pocknee and Sumner, 1997).

Other positive effects of using composted products on agricultural soils include improvement in biological activity (Broken et al., 2002), cation exchange capacity (Shiralipour et al., 1992), macro and micronutrients availability (Movahedi and Cook, 2000), and the suppression of soil borne diseases (Alvarez et al., 1995;Tilston et al., 2002).

The ideal timing of manure applications depends on factors including (DCSS 2006):

- crop or pasture needs;
- manure or compost maturity;
- timing of other management events (cultivation to incorporate manure);
- field conditions (soil moisture); and
- wind conditions.

For practical and agronomic reasons it is often beneficial to apply several years of manure or compost nutrients at each spreading. Spreading at higher rates less frequently can help to spread wastes more evenly, overcome some nutrient availability challenges, minimise the need for regular soil disturbance that may damage soil structure, reduce the risk of causing nuisance for neighbours and minimise dissolved nutrient losses. This strategy relies on storing some nutrients in the soil (Ferguson et al 2005).

The amount of nutrient that can be safely stored depends on the form of the nutrient and the physical and nutrient properties of the soil. Where a particular nutrient is deficient, it is reasonable to build soil levels through applying waste; conversely, if soils have elevated nutrient levels, rates of waste application should be lower (Ferguson et al 2005). Since manure nutrients are not all available in the year of spreading, applying nutrients to last several years helps to meet plant needs. For example, one third of manure nitrogen may be available in year one, with 20–30% being available in year two (DAF 2016). Applying three to four years' worth of manure initially will help to ensure there are enough nutrients for the plants.

Manure should not be spread when the soil is too wet to limit compaction.

Manure application to the WUAs will be completed using tractors that are GIS GPS capable, this will ensure that application only occurs in areas determined to be suitable (i.e. away from mapped State vegetation).

4.5.2.3. Effluent Application

Effluent irrigation will often be driven by the need to empty effluent ponds so that they are ready to receive future runoff. To reduce pathogen levels, effluent should be stored in the holding pond for at least a month before irrigating and then used to meet crop water demands like other irrigation (MLA 2015).

The irrigation area will be irrigated with treated wastewater and will require significant nutrient management to ensure its sustainable use. Based on the results of wastewater irrigation modelling conducted for the site (refer to Section 4.3.3.2), the amount of effluent produced is inadequate for providing the water and nutrient requirements of the proposed improved pasture areas. The crops will need to be carefully monitored to ensure adequate nutrients are available for crop uptake.

Effluent applications should never raise the soil moisture content above field capacity and the application rate must be controlled to ensure runoff does not occur. Irrigation will only be undertaken when rainfall is not imminent. Irrigation will not occur in the 4 days prior to crop harvest (hay cutting and bailing). Tailwaters should only be generated by rainfall runoff.

Feedlot effluent can have electrical conductivity levels of 4.2 mS/cm (MLA 2011), so it is best to test waters prior to utilising on particularly sodic soils. Gypsum may be applied to these areas at a rate of 2-5t/ha (NSW Agriculture 2000) to alleviate sodic issues that may arise.

The waste water produced for irrigation purposes is generally considered to be a medium strength waste water (NSW Waste Water Irrigation Guidelines 2004) as the biological oxygen demand should be below 1,000mg/L.

Improper management of the irrigation area could potentially result in:

- Contamination of surface water downslope causing, eutrophication, degradation of aquatic ecosystems;
- Generation of offensive odours;
- Contamination of groundwater aquifers, particularly during the wet season when groundwater levels are close to the surface;
- Degradation of the soils of the irrigation areas (increased salinity, acidification, breakdown of soil structure);
- Altering the nutrient balance in the soils causing nutrient accumulation; and,
- Insufficient uptake of nutrients by the irrigated crops due to nutrient overload, insufficient water, waterlogging, salinity, sodicity, and soil degradation, or other factors affecting plant growth such as disease, pests, or toxic chemicals in the irrigation water.

4.5.3 Crop Specifications

It is proposed to use a Brassica / Canola mix in the improved pasture areas. Forage brassica crops are considered an ideal complementary feed crop, especially when pasture quality is not optimal. Brassica crops offer high value feed and yield during summer and winter periods. They are also beneficial for pasture improvement programs. Brassica crops have a much higher water use efficiency potential compared to perennial ryegrasses. Brassica crops generally have a dry matter production of 20-40kg DM/mm (dry matter per mm of water received). Brassica forage crops are detailed in Table 15.

Table 15 Brassica Forage Crop Production

Crop Type	Winter Dry Matter Production (t DM/ha)	Summer/Autumn Dry Matter Production (t DM/ha)	Sowing Period
Bulb Turnips (*Brassica rapa*)	11	15	Spring / Summer
Leafy Turnip *(Brassica campestris spp.)*	12	12	Spring/ Summer / Autumn
Kale (*Brassica oleracea*)	18	N/A	Summer
Rape (*Brassica napus*)	10	10	Spring/ Summer / Autumn

Brassicas are sensitive to water deficit, especially at establishment. Shallow-rooted crops (leafy turnips, turnips) are more sensitive while deep-rooted crops (kale, rape) tolerate drought conditions better (NSW Agriculture 2002).

Recommended nutrient requirements for Brassica crops is as follows:

- Phosphorus: 40 – 80kg/ha;
- Nitrogen: 50 – 100kg/ha; and
- Potassium: up to 90kg/ha.

Winter canola has proven to be a very resilient plant when it comes to heat and dry periods over summer and autumn. Winter canola requires cold temperatures (vernalisation) to initiate flowering which provides a wide sowing window from early spring through to early autumn. Early-sown crops can produce good grain yield as a result of the ability to access to moisture by development of deep roots. Studies (GRDC 2016) have indicated that the average dry matter production of canola is 2.8 t/DM/ha.

Nutrient removal capabilities of crops will be dependant on soil type, climate conditions and crop health. In general the anticipated nutrient removal capabilities of canola and brassica crops are outlined in Table 16 (NSW DPI 2011, CFI 1998).

Table 16 Anticipated Crop Nutrient Removal Capabilities

Crop	**Nutrient Removed (kg/ha)**			
	N	**P**	**K**	**S**
Triticale / Oats for Hay	175	21	210	25
Canola	82	44	22	13
Brassicas	307	22	144	40

4.5.4 Crop Water Requirements

The annual average rainfall for Bungowannah is 571mm and the annual average evaporation is 1,509mm (refer to Table 5). Thus the average moisture deficit at the site is in excess of 938mm/year.

However, this is misleading with regard to actual deficits applicable to the crop. The site has relatively consistent rainfall across the year; however, the summer period has a significantly higher evaporation level than what is experienced over winter periods. The deficit over the summer season is the key variable in sustainable re-use of wastewater. The summer season (November through to April) monthly moisture deficit is approximately 170mm (on average).

Crop water use is proportionate to the evaporation and consequent transpiration of the environment. A Crop Factor (MLA 2012) is applied to the evaporation to determine a transpiration rate. The Crop Factor considers soil and climatic factors to accurately determine the transpiration rates in different conditions.

Given the soil type, selected cropping regime, and considering the climatic data, a crop factor of 0.9 has been applied for all months. This figure is a conservative consideration of crop growth between establishment and mid seasonal growth. The crop water demand for each individual month is represented in Table 17.

Equation 3 Crop Irrigation Determination (mm/month)

$$CI = (CF \times Epan) - R$$

Where:

CI: Monthly Crop Irrigation Determination (mm/month)

CF: Crop Factor

Epan: Mean Evaporation (mm/month)

R: Rainfall (mm/month)

Equation 4 Minimum Water Required (ML/ha/month)

$$WR = ((CF \times Epan) - R)*(10{,}000/1{,}000{,}000))*FPC$$

Where:

WR = Minimum Water Required (ML/ha/month)

CF: Crop Factor

Epan: Mean Evaporation (mm/month)

R: Rainfall (mm/month)

FPC: Foliage Project Cover (% of crop cover in project area)

The calculated monthly crop irrigation requirements and minimum site water requirements are outlined in Table 17.

Table 17 Monthly Crop Irrigation Requirements

	Monthly Crop Requirement (mm/month)	Minimum Water Required (ML/ha/month) @ 90% efficiency
January	191.86	2.13
February	153.12	1.70
March	110.95	1.23
April	43.03	0.48
May	-4.97	-0.06
June	-29.45	-0.33
July	-28.23	-0.31
August	-12.23	-0.14
September	19.32	0.21
October	58.47	0.65
November	114.66	1.27
December	171.05	1.90

A total annual water requirement of 9.58ML is required for this site.

Effective rainfall must also be taken into consideration when determining irrigation demand. While the winter season shows a moisture surplus, most of this surplus runs off. Dry conditions do occur (which is noted in 2019 climate data, refer to Figure 5); these do create short-term moisture deficits an analysis of daily rainfall through each month (wet days and likely runoff versus, dry days and crop evapotranspiration).

The 111ML/year of available waste when applied across approximately 60.9ha (dedicated area) with an efficiency of 90% will supply approximately 1.64ML/ha/year. This is not sufficient effluent waters to meet the irrigation demand for an improved pasture. It is proposed to use clean waters captured on site and bore water to supplement the irrigation in this period.

4.5.4.1. Other Soil Issues

Other land impacts associated with the WUAs include erosion of soil from the site from poorly designed drainage layout. If drainage for the cropping/irrigation area is not appropriately managed, large quantities of soils can be stripped from the site during rain events and lost into nearby waterways (DOA 2002). Appropriate site selection and design play a key role in ensuring the site maintains soil stability and nutrient retention for economic and environmental purposes.

The risk of nutrient loss from utilisation areas can be prevented or mitigated by selecting areas that provide suitable land and buffers to sensitive sites, by using appropriate spreading or irrigation practices, and by regularly monitoring soil nutrient levels and responding appropriately.

4.5.5 Mitigation and Management Measures

It is recommended that a Construction Management Plan be drafted for the construction phase which should include an Erosion and Sediment Control Plan to ensure soil resources are retained onsite.

Key irrigation management features will include careful management of an irrigation program with consideration of potential loss of nitrogen and phosphorus offsite. This is best achieved by monitoring:

- Daily weather conditions on site;
- Applications of wastewater irrigation and composted manure to WUAs;
  - The actual frequency of application will be determined on the rate of uptake by the crop, evapotranspiration rates, and effective rainfall.
- Nutrients, when applied, will be applied frequently in low amounts;
  - Ongoing careful management of potential loss of nitrogen and phosphorus is important.
  - The physical and chemical properties (including soil nutrients) will be closely monitored via regular agronomic tests (annually), to adjust nutrient application rates.
  - The quality of wastewater applied to the irrigation block (nutrients, salts, etc.) will also be monitored.
- Site water balance, including harvested water and water applied to the irrigation area. This will include a record of incoming water (stored rain water, stored waste water, stored tailwater) and outgoing irrigated water (irrigated rain water, irrigated bore water, irrigated waste water, irrigated tailwater).
- Groundwater will be monitored through the installation of 5 proposed piezo’s in the following locations:
  - 1 piezo in each wastewater irrigation paddock (total of 4); and
  - 1 piezo near the wastewater holding pond.
- Maintaining an active plant growth and dominance of improved pastures;
- Maintenance of improved pastures;
- Maximising organic matter content to maximise soil moisture and nutrient holding capacity; and,
- Maximising nutrient recovery by crop harvest.

4.6 Solid Waste

The primary solid waste produced by feedlots is manure bi-products from the livestock (MLA 2011). Other solid wastes that are produced on site include spoilt silage, mill run and mortalities. The nutrient content, organic matter, solids, pathogens and odorous compounds are of particular concern to the environment and local community.

Construction will generate non-hazardous wastes such as steel and metal, plastic from pipelines, as well as potentially hazardous wastes such as paints, resins, and cleaning products.

4.6.1 Assessment

All site activities directly associated with the feedlot will be contained within the controlled drainage area (CDA). Stormwater and other runoff from the feedlot site will be contained within the CDA. It is proposed to divert all upstream clean waters around the constructed feedlot area to ensure the quantity of "contaminated" water is reduced as much as practical.

4.6.1.1. Manure Management

Wet dung and urine accumulate quickly in feedlot pens; therefore, pen areas have to be cleaned regularly for efficient production and to minimise odour emissions. Thus the handling of manure becomes a major ongoing part of feedlot management. Harvested manure must be adequately stored and processed. Stockpiling and composting manure reduces its bulk, improves handling and concentrates some nutrients.

Manure consists of moisture and dry matter or total solids. The organic fraction of the total solids, or volatile solids (VS), breaks down over time reducing the total mass of manure solids. The remaining material, fixed solids, is inorganic material that cannot be broken down. The longer manure is stored on the pad, the more VS breakdown occurs. Approximately 80% of the total solids in excreted manure is VS that is quickly broken down on the pad. Approximately 60–70% of VS are removed after 20 days, 70% after 35 days and 75% after 80–100 days (Davis et al. 2010). The VS/total solids ratio of harvested manure (at pen cleaning) averages 0.64. This large, rapid loss of VS has significant implications for manure storage, management, and greenhouse gas (GHG) emissions (MLA 2015).

Odour from feedlot sites is mainly the result of anaerobic breakdown of manure. While good siting and feedlot design will minimise odour, good waste management is essential (MLA 2015). Dust from the manure stockpiling/composting area can be an issue under dry conditions, and flies are attracted to manure therefore appropriate control measures need to be implemented continuously.

Composted feedlot manure can be valuable sources of nutrients and organic matter for improving soil structure and fertility and crop and pasture production (MLA 2015). Khan et al (2007) outline that feedlots can also be a potential source of trace chemicals that cause human and environmental health exposure implications. Trace chemicals of concern include steroidal hormones, antibiotics, ectoparasiticides, mycotoxins, heavy metals and dioxins. Good management of ectoparasiticides including synthetic pyrethroids, macrocyclic lactones, fluazuron, and amitraz is important for the prevention of potential ecological implications, particularly towards dung beetles. Careful management is needed to gain the most benefit from manure utilisation while protecting the environment and local amenity.

Manure containing hormones may be stabilised through storage or composting before being spread on paddocks. Steroid hormones are known to slowly degrade in manure, soil and water (Lange et al 2002). Manure and effluent application rates to soils are typically macronutrient-based. The hormone-to-macronutrient ratios effectively determine the rates at which hormones will be applied to soils from manure and effluent (Raman et al 2001). Once released to soils, the environmental fate of steroid hormones depends upon the nature of the soil, in particular, particle size and organic components strongly affect adsorption and migration in soil (Lange et al 2002).

Particular concern has arisen for the unintended effects of ectoparasiticides on manure fauna. Manure fauna play a vital role in the processes of manure degradation, nutrient cycling and pasture hygiene. As a consequence of reduced insect activity, animal manure degradation has been shown to have been retarded in numerous studies (Lumaret and Errouissi 2002).

The amount of nitrogen, phosphorus and potassium in pen manure depends on the composition of the manure excreted by the livestock, but also on climate, pad conditions, pen cleaning practices and the use of dietary or pad additives that reduce volatilisation losses. The nutrient content of excreted manure is influenced by the class of sheep, their diet, their feed intake and other factors (Tucker et al. 2011).

Frequent, regular pen cleaning reduces the average depth of manure over the pens, promoting more rapid pen drying. Odour emissions from wet feedlot manure can be 50-100 times higher than from dry manure and the odour is more offensive (Tucker et al. 2015). Feedlot pens should be cleaned at least every 13 weeks, pen cleaning should occur when the manure is moist (but not wet). The bulk density of pen manure affects the volume of material for removal from the pens. Factors influencing this bulk density include the manure moisture content, manure age, and the amount of soil and rock that is harvested with the manure.

MLA (2015) suggests that the harvested yield of manure from sheep feedlot pens should be approximately 35kg total solids/SSU/year. However, this rate is dependent on the sheep feedlot operations maintaining the interface layer on the pen surface.

Stockpiling and composting manure reduces its bulk and sometimes the moisture content, concentrates some nutrients and improves handling by breaking up lumps. Space within this area may also be allocated for composting mortalities. The main facility design considerations for the manure stockpiling/ composting area are

- durable, impermeable base;
- good site drainage; and
- sufficient area.

Most feedlots need sufficient space to accommodate at least 6 months worth of manure (MLA 2015). Approximately 1,687.5 tonnes of manure is anticipated to be generated on site each year (refer to section 3.12.1) and an area large enough to support approximately 850 tonnes of manure would be required on site. A windrow 3m wide at the base and 2m high has a cross-section of $3m^2$, and a 75m long windrow will store approximately $225m^3$ of manure. Windrows should be spaced at least 5m apart with room at the ends to allow vehicle movement and turning equipment (DEC 2007). Piles that are too low will not heat up, a process which assists decomposition, pathogen deactivation and weed seed destruction. Piles that are too high may heat up excessively, particularly if they are not well compacted or contain wet manure (DEC 2007).

The stockpiling area should have a slope of 1-3% and windrows should be oriented with the long axis down the slope to promote drainage (O'Keefe et al. 2011).

Sedimentation facilities are designed to remove at least 50% of the settleable solids in the runoff, and should be cleaned out when they are dry to maintain removal capacity. This will reduce the amount of organic matter entering the holding pond and hence the potential odour emission rate (MLA 2015). Manure entering the holding pond is broken down by microbial action, but some un-degradable material is deposited as sludge on the floor of the pond. Holding ponds need to be cleaned when the required water storage capacity is compromised (e.g. less than 80% available).

Figure 3 indicates the proposed location of manure stockpiling area on site.

Composting is the microbiological breakdown of organic matter into compost or humus. Aerobic windrow composting uses organisms that need oxygen to function and is preferred over anaerobic composting because it minimises odour emissions, emits carbon dioxide rather than methane (lower net GHG emissions) and produces heat (DEC 2007).

The benefits of composting manure include

- reduced bulk and moisture content of the manure,
- more friable and consistent manure which is more easily handled and spread,
- possibilities of value adding on or off site,
- reduced viable weed seeds and pathogens,
- nutrients stabilised into a slow-release form,
- reduction in temporary nutrient draw-down that can occur when raw manure is spread on soil,
- reduced nitrogen losses on spreading,

- increased concentration of phosphorus, and
- less odour release during aerobic composting more predictable nutrients for application to agricultural land or for further processing.

Composting generally reduces the initial volume of material by 60- 70%. It is estimated that approximately 0.029t/SSU/year of composted material would be generated; this is based on no additional materials being added to the composted mixture (MLA 2015).

After two to three months of composting, most pathogens should have been substantially reduced in numbers but some pathogens may still be present in the finished compost. Very low concentrations of parasiticides and steroidal hormones may also be present (Tucker et al 2011).

In conventional composting processes, raw materials are typically mixed to provide an optimal carbon to nitrogen (C:N) ratio, a moisture content of 50-60% and good porosity. The materials are then regularly turned. However, the mixture is inconsistent with mortality composting. Livestock bodies have a large mass, a high moisture content, a low C:N ratio and almost no porosity. Consequently in the initial stage, the decomposition process close to the carcass is anaerobic. The fluids and gases released then move into an aerobic zone (DEC 2007). The recommended procedure for composting carcases (in accordance with MLA guidelines) is discussed in section 3.12.1 of this report. The pathogen content of cured carcase compost has been found to pose a risk similar to that of manure compost. Thus, this method of mortalities management is acceptable provided high temperatures (65 - 75°C) are achieved (MLA 2015).

4.6.1.2. Waste Generation

Solid waste expected to be generated during the construction phase of the feedlot is shown in Table 18.

Table 18 Construction Activities Resulting in Waste Generation

Waste Type	Source(s)	Management Method
Cleared Vegetation	Paddock area to be utilised for feedlot and irrigation areas.	Vegetation removed, chipped and composted and reused onsite
Excavated Soil	Earthworks, wastewater holding pond, sediment basin, and WUA tailwater dam.	Topsoil reused where possible, unsuitable soils stockpiles for use in earthen bunds.
Steel/Metal offcuts	Pen and yard fences, property fences, shed supports, buildings.	Reused where possible, taken to licenced landfill for disposal or recycling.
Oil, Batteries and tyres	Internal vehicles and machines only	Taken to a licenced landfill for disposal.
Paints and resins	Plumbing, drainage, structures, buildings	Disposed of at a licence waste management facility.
Poly offcuts	Pluming and drainage.	Re-used where possible, taken to a licenced recycling facility.
General Wastes including putrescibles & organic (food waste), some plastics and paper	Construction site	Where possible recyclables separated and disposed of at the local recycling facility, other wastes to be disposed of at a licenced waste management facility.

Solid waste expected to be generated during the operational phase of the feedlot is shown in Table 19.

Table 19 Operations Activities Resulting in Waste Generation

Waste Type	Source(s)	Management Method
Feed spoilage	Feedmill, pen and yards	Placed into windrows for composting
Batteries and tyres	Internal vehicles and machines only	Taken to a licenced landfill for disposal.
Paints and resins	Plumbing and drainage.	Disposed of at a licence waste management facility.
General Wastes including putrescibles & organic (food waste), some plastics and paper	Operation office, feedmill	Where possible recyclables separated and disposed of at the local recycling facility, other wastes to be disposed of at a licenced waste management facility.
Oily waters or hydrocarbon residues	Fuel storage, refuelling and wash down facilities	Where possible all works with oil and hydrocarbons would be undertaken within a bunded system and all wastewater would be flow through a sump unit.
Manure	Pens, yards, trucks, sediment basin, truck wash	Stockpiled and composted on site.
Biohazardous waste	Veterinary products, blood samples, quarantine products, carcases, out of date chemicals	Disposed of at a certified waste facility.
Dead carcases	Death by natural causes	Disposal on site via composting.

4.6.1.3. Waste Minimisation

In order to proactively implement efficient waste management principles on site, the waste hierarchy should be adhered to. The waste hierarchy (refer to Figure 21) is a set of priorities for the efficient use of resources; this underpins the objectives of the *Waste Avoidance and Resource Recovery Act 2001*.

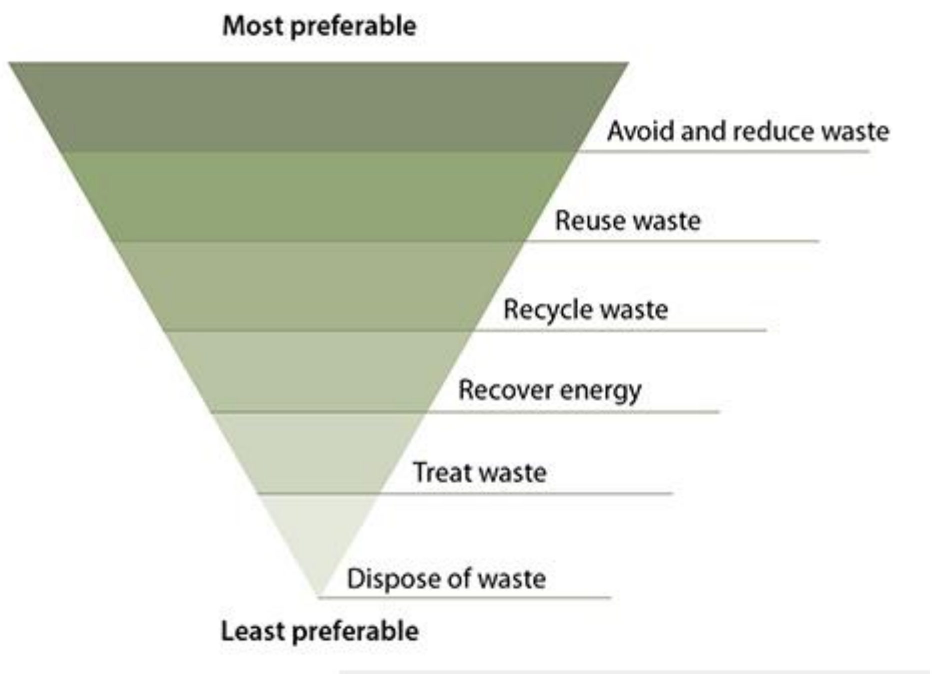


Figure 21 NSW Waste Hierarchy

The feedlot can implement these measures in a number of ways including:

- Buying in bulk to reduce excess packaging;
- Buying products that are recycled, recyclable, repairable, refillable, re-usable or biodegradable;
- Composting manure and effluent materials and utilising on site rather than disposing offsite;

- Returning packing to suppliers (where feasible);
- Separating waste materials (packaging products and other construction materials) so that recyclables can be sent to appropriate facilities; and
- Storing hazardous and other wastes in appropriate areas for transport to a suitably licensed waste management facility.

4.6.2 Mitigation and Management Measures

In all cases, the employee and contractors responsible for the construction and operation on the site will be expected to adhere to the:

- Protection of the Environment Operations Act 1997;
- Protection of the Environment Operations (Waste) Regulation 2014; and
- Waste Avoidance and Resource Recovery Act 2001.

The general objective is to minimise the amount of waste generated on site, and consequently, achieve the best environmental outcomes.

All waste will be managed through the NSW waste hierarchy.

Key compost/manure management include:

- Frequent, scheduled pen cleaning will ensure the depth of (dry) manure is maintained at 50mm or less;
- Pens will be cleaned, at minimum, every 13 weeks;
- Manure will be harvested as required;
- Compost manure pad will be maintained at conditions as described in Table 20;
- Manure and bedding (where relevant) materials will be windrowed in the manure compost management area;
- Compost windrows will be turned to reduce pest occupancy and moisture levels, at a rate dependant on moisture content and wind speed; and
- All compost will be utilised on site in irrigation areas and other designated improved pasture areas.

Table 20 Compost Conditions Recommended by the National Beef Cattle Feedlot Guidelines (MLA, 2012)

Parameter	Acceptable range	Optimum range
Carbon:Nitrogen	15:1 – 40:1	25:1 – 30:1
Moisture levels (%)	45-65	50-60
Oxygen levels (%)	>5	>5
pH	5.5 – 8.0	5.5 – 8.0
Temperature (°C)	40 – 65	55 – 60
Particle size diameter (mm)	5 – 50	5 – 25

Key non-compostable waste management measures include:

- All non-compostable waste will, to the extent that it is practicable, be recycled or reused;
- Any solid wastes unable to be recycled or reused will be disposed of off-site in an appropriate manner at licensed waste management facilities (particular emphasis will be given to the appropriate disposal of veterinary sharps and any empty or disused chemical, vaccine, drug and antibiotic containers and packaging);
- Any wastes arising from spills, such as contaminated runoff and contaminated soil will be collected and remediated on site, or transported to a suitable facility for disposal;

- General waste from the site is to be placed in the skip bin, which will be taken to a licenced waste management facility and emptied on a regular basis.
- Construction waste is to be separated and stockpiled, where possible, into waste type (e.g. Steel, plastic, timber, organic) to be reused or recycled, otherwise transported to a licenced waste management facility for disposal.
- Biohazardous waste is to be contained to one area of the site, and then removed from the site by a certified agent.

In an emergency the following measures will be applied:

- Lime will be added to anaerobic manures in compost windrows to provide for alkaline stabilisation whilst the anaerobic conditions are being reversed via mechanical aeration;
- In the event of a severe weather warning solid waste material should be covered or secured or removed from the site.
- In an event a mass death occurs at the site then the National AUSVET management plan for the same will be invoked:
  - A pit would be dug in a suitable section of the property;
  - The pit would be lined where possible, with clay prior to the placement of carcasses;
  - The carcasses would be covered with composted manure; and
  - Following decomposition, the mortalities would be exhumed and introduced back into specially sized compost windrows to be further composting within the composting area and allowing for the pit to be re-instated and brought back on line for ongoing composting operations.

Monitoring of solid waste will include:

- Heat and moisture content of compost windrows;
- Wind speed and direction (to reduce dust and odour nuisance when turning the compost);
- Pest species present in waste (including compost manure pad and pens);
- Records of all waste removed from the site and receipts from the facilities the waste is disposed at;
- Number of carcasses composted;
- Record of complaints; and
- Records of any emergency use of lime to treat sources of odour resulting from anaerobic conditions within the compost windrows

4.7 Animal Welfare

The *Australian Animal Welfare Standards and Guidelines for Sheep* (Animal Health Australia 2014) was implemented to improve animal welfare management in all Australian states and territories, which outlined the animal husbandry principles of:

- a level of nutrition adequate to sustain good health and welfare;
- access to sufficient water of suitable quality to meet physiological needs;
- social contact with other sheep;
- sufficient space to stand, lie and stretch their limbs and perform normal patterns of behaviour;
- handling facilities, equipment and procedures that minimise stress;
- procedures to minimise the risk of pain, injury or disease;
- provision of appropriate treatment, including humane killing if necessary;
- minimising the risk of predation;
- provision of reasonable precautions against extremes of weather and the effects of natural disasters;
- selection and breeding of sheep appropriate for the environment and the level of planned flock management to be provided;
- assessment of the need to undertake any husbandry procedures that may result in significant short-term pain against alternative strategies for the long-term welfare of the sheep;
- undertaking of any husbandry procedures required for planned flock management in a manner that reduces the impact of these procedures and minimises risks to sheep welfare.

4.7.1 Assessment

According to the *Model code of practice for the welfare of animals: the sheep* (Primary Industries Ministerial Council 2006), it is important for feedlot operators and workers to understand their responsibility of sheep management and perform the required tasks to minimise the risk to the welfare of sheep.

The feedlot should be designed and operated to ensure that the feedlot meets the requirement of all standards:

- Sheep should have access to nutritionally adequate food and sufficient good quality water to maintain health;
- Risk management of extreme weather, natural disasters, disease, injury and predation should be implemented and regularly assessed to minimise the impact of these threats to sheep welfare;
- Well-designed sheep handling facilities and equipment should be constructed and maintained to minimise the risk of any natural hazards, and animal injury and disease.
- Animal handling, movement and husbandry practices should be operated in a reasonable manner to minimise any distress or pain. Surgical procedures such as tail docking, castration and mulesing should be performed under good hygienic conditions.
- Sheep breeding management should apply appropriate practices to avoid unreasonable pain, distress and injury to the animals.
- Variable and sufficient supervision is needed to ensure the feedlot is in sound and healthy condition, including regular inspection of stock density, availability of suitable feed, reliability of water supply, sheep behaviour and health condition (e.g age, pregnancy status, disease prevention), climatic conditions and management practices.

4.7.1.1. Stocking Density

Overcrowding should be avoided. There are special floor space requirements for intensive sheep systems outlined in the *Model Code of Practices for the Welfare of Animals* (Primary Industries Ministerial Council 2006), see Table 21.

Table 21 Minimum Space Allowances (Primary Industries Ministerial Council 2006)

Single Pens	Minimum Space Allowances (m^2)
Wether or dry ewe	0.9
Ram, pregnant ewe or heavy wether	1.0
Lamb	0.6
Ewe with lamb	1.5
Group Pens	
Less than 8 sheep	0.9
8-15 sheep	0.8
16-30 sheep	0.6
31 or more sheep	0.5
Outdoor feedlots	
Lambs up to 41 kg	1.0
Adult sheep	1.3
Heavy wether	1.5
Ewe and lamb(s)	1.8

The proposed feedlot is to be designed with a stocking density of $5m^2$/head of sheep (as discussed in section 3.4). This far exceeds the Model Code of Practice (2006).

4.7.1.2. Weather

Sheep should be provided with adequate shelter, the proposed feedlot will be designed to have adequate shade structures in place and windbreaks are to be established on the western border (as outlined in section 4.1) which will have the benefit of reducing odour impacts as well as reducing weather impacts on the livestock in the feedlot.

Prior to commencement of site operations, a drought management plan should be developed to ensure appropriate management measures are investigated and documented in the event that drought conditions arise on site. Drought strategies should be implemented prior to drought conditions becoming critical on site.

4.7.1.3. Transport

According to the *Australian Animal Welfare Standards and Guidelines-Land Transport of Livestock* (Australian Government Department of Agriculture, Fisheries and Forestry 2009), the following specific requirements (Table 22 and Table 23) also apply to minimise the potential risks during loading and land transport of sheep.

Table 22 Minimum space allowances/appropriate loading densities (Australian Government DAFF 2009)

Mean Live Weight (kg)	Minimum Floor Area (m2/head)*	Number of Head per 12.5m x 2.4m deck
20	0.17	176
30	0.19	157
40	0.22	136
50	0.25	120
60	0.29	103

Table 23 Time off water requirements for each class of sheep during transport (Australian Government DAFF 2009)

Class	Maximum time off water (hours)	Minimum Spell duration (hours)
Sheep over 4 months old	48	36
Lambs under 4 months old	28	12
Ewes known to be more than 14 weeks pregnant, excluding the last 2 weeks	24	12

*Based on average live weight, wool of sheep recently shorn, and no horns.

4.7.1.4. Heat Stress

The term "heat stress" describes a state where animals are responding to excessive heat load (EHL). Normal function of various tissues and organs within the body require that body temperature be maintained within a relatively narrow range. If body temperature is raised beyond the level that animals can tolerate then there is a risk of organ dysfunction, and even death. Heat stroke is a term used to describe the life-threatening condition of failure of an animal's thermoregulatory system in response to EHL. Body temperature is the result of a balance between heat load and heat loss. Livestock normally maintain body temperature within a narrow range mainly by influencing metabolic heat production and evaporative heat loss through the respiratory tract, specifically the lungs and nose (De et al. 2017).

Environmental conditions that predispose to EHL include recent rainfall, high ambient temperature, high relative humidity, the absence of cloud cover or shelter with high solar radiation, minimal air movement over several days, and sudden adverse climatic conditions (Sejian et al. 2017).

Animal factors that may predispose to EHL include breed, coat type (dark and woolly coats may be more likely to accumulate heat), body condition (fatter animals accumulate more heat), lack of adaptation to heat, and concurrent illness (Sejian et al. 2017).

Flow of heat away from an animal depends on temperature and humidity gradients. If the surrounding environmental temperature is lower than the animal's body temperature then heat loss mechanisms such as convection, radiation and conduction can all operate to move heat from an animal to the environment (De et al. 2017).

As temperature and humidity rise, evaporative cooling from the skin is lost earlier than evaporative cooling from the respiratory tract. The reason for this is that air flow into the respiratory tract during panting will increase the temperature of the air slightly and this will raise the amount of water vapour that the air can retain (absolute humidity) and drop the relative humidity. As a result, evaporation may still occur, meaning that panting can function as a heat loss mechanism even when evaporative cooling from the skin is no longer occurring (Sejian et al. 2017). In windy conditions these effects would be less impacting.

In many hot climates, animals may accumulate heat through the hottest part of the day and then dissipate heat in the cooler parts of the day and continue to function normally. In situations where the environmental temperature remains high for most of the day and night, animals have relatively little opportunity to lose heat and they may gradually accumulate excessive heat over time (Sejian et al. 2017).

Heat stress can result in reduced feed intake along with depression, increased heart and respiratory rate. Heat stress is a significant stressor that in turn may reduce resistance to other pathogens. Panting and open mouth breathing predisposes to pneumonia. A continued rise in body temperature will eventually result in respiratory and circulatory failure and death (Sejian et al. 2017).

A range of factors other than environmental temperature and humidity may influence the risk of heat stress including physical activity, dehydration, ingestion of rapidly fermentable feed, febrile disease and concurrent diseases of the respiratory tract that interfere with evaporative heat exchange (De et al. 2017).

In general, to ensure that heat stress is prevented as much as practical in the livestock on site, adequate shelter will be provided as well as water and feed provisions, as well as sanitary disease free conditions which will reduce the chance of heat stress occurring. It is recommended that an EHL management plan is developed for the site and reviewed yearly prior to summer season commencing (MLA 2019).

In the event that heat stress does occur it is recommended that the following measures are implemented (ALEC 2019):

- Ensure there is unlimited access to clean, cool water for all animals.
- Minimise handling and disturbance of animals. Essential activities should be conducted at the coolest times of the day, usually early in the morning or late at night.
- Reduce stocking densities.
- Use low stress stock handling techniques.
- Erect shade that encourages air flow including over loading and unloading ramps.
- Consider moving affected animals to cooler pens with reduced stocking density, shade and better air flow.
- Remove barriers to wind.
- Temporarily reduce or cease feeding of concentrate and consider a higher roughage proportion in ration until other emergency measures are implemented.

Feeding management strategies for hot conditions can reduce the impact of heat stress on sheep (Sejian et al. 2017):

- using high-energy diets, to account for reductions in dry matter intake and the associated increase in energy requirements to maintain homeostasis;
- using supplements of dietary antioxidants to support immune function and oxidative status; and
- altering feeding time to reduce metabolic heat loads during the hottest hours of the day.

4.7.1.5. Food and Water

A nutritious diet that is adequate for maintaining health as well as meeting the appropriate physiological requirements for growth and withstanding cold exposure should be provided at all times while the sheep are on site.

Sheep being introduced to an intensive feeding system, particularly high starch diets, need to be given time to adjust both to the new dietary regime and the trough feeding system. For example, conversion to a grain based diet can be achieved by gradually replacing roughage over a period of 7-14 days (MLA 2011). Where sheep are being introduced to a diet containing more than 60% cereal grain, the roughage should be gradually withdrawn over a minimum of 3 weeks. Adequate trough space should be provided. Where sheep are being fed in groups on an ad-lib basis, or where the trough contains food for up to 15 hours per day, a minimum of 2cm of trough space per sheep is appropriate. Where smaller amounts of feed are offered at set feeding times, up to 20 cm of trough space, to allow all sheep to stand and feed at the same time, is needed to reduce adverse feeding competition (Department of Agriculture and Department of Local Government and Regional Development 2003).

Pre-weaning exposure to concentrates improves the rate of acceptance of feed in the feedlot and should be considered as routine pre-weaning treatment. Carefully controlled step-wise introduction of grain will ensure good early intakes and weight gain in the feedlot. Lambs can be safely introduced to ad libitum concentrate diets from the first day of feeding using added virginiamycin, commercial feedlot pellets, a total mixed ration or a step-wise increase of high-starch grains (Bowen et al. 2006).

The following management measures should be implemented on site:

- Feed should be protected from contamination by vermin, pests, weeds or feral/domestic animals;
- Feed troughs are to be cleaned regularly;
- Feed is to be stored in a clean, dry area;
- Purchased feed should be accompanied by a commodity vendor declaration;
- Old, spilt or contaminated feed should be disposed of safely (burial, composting, off-site disposal);

- Specialist advice should be sought to ensure rations are correctly formulated for the specific sheep kept on site.

Sheep and lambs require sufficient access to clean water which is free of toxic levels of salts or other contaminants at all times. A minimum of 6.5 litres of water per head (based on hot and humid weather) will be provided, troughs capable of holding at least 1,625 litres are required for each pen area. Animals are not to be deprived of water for more than 20 hours at any given time (MLA 2011). Water troughs are to be kept clean and a cleaning regime implemented on site to ensure this occurs.

All mechanical equipment controlling the delivery of water to the feedlot area will be regularly inspected to ensure it is functioning adequately. It is recommended that water quality tests are acquired of drinking water sources at least bi-annually to ensure water quality is adequate.

4.7.1.6. Sheep Management/Handling

All personnel handling and managing the sheep on site are to be appropriately trained to perform the required tasks in accordance with the *Model code of practice for the welfare of animals: the sheep*. Management procedures carried out on sheep should be performed by competent persons under the direct supervision of an experienced operator.

Sheep contained in the feedlot should be checked by an experienced stock person at least once per day for signs of injury, changes in food and water intake, illness and distress.

4.7.1.7. Disease Prevention and Management

It is essential to monitor animal health status regularly. Sheep can be vulnerable to summer conditions as their immune systems can be significantly affected by heat. Their reproduction and physiological performance such as milk production and composition could be reduced (MLA 2007). Therefore, provision of shade and spacing, good nutrition management and disease prevention can support reproductive success and a healthy feedlot system, especially during hot climatic conditions. The table below summaries some common diseases in sheep feedlots and management tactics to prevent that disease.

Table 24 Common Disease in Intensive Finishing Systems (MLA 2007)

Disease	Predisposing causes	Management for prevention
Acidosis (grain poisoning)	Rapid introduction of grain to the diet, rapid change from low to high starch grains or overindulging in grain leading to accumulation of lactic acid.	Gradual introduction to grain and changing to different grains slowly.
Enterotoxaemia (pulpy kidney)	Rapid change in the diet causing toxins to be produced.	Vaccination and avoidance of sudden changes in the diet.
Urolithiasis (urinary calculi or bladder stone)	Imbalance of calcium in relation to phosphorus in the diet.	Provide calcium supplementation to achieve a ratio for calcium to phosphorus of 2:1.
Scabby mouth	Infection occurs by a virus entering abrasions in the skin of the lips and hocks.	Vaccination of lambs following an outbreak on the property (as the vaccine is expensive). Outbreaks are rare, however the virus can survive in the soil and on infrastructure for many years.
Footrot	Predominantly seen in lambs born in high rainfall environments.	Source lambs from non-infected properties.
Cheesy gland	Bacteria causing abscesses in the internal organs and lymph nodes.	Vaccination at lamb marking.
Internal parasites	Worm larvae contaminated pastures.	Develop drench programs on an individual basis to minimise drench resistance and optimise effective kill.
Pink eye	Irritation secondary to dusty conditions or grass seed infestation; vitamin A deficiency.	Minimise dust in the yards through pad structure and stocking density.
Pleurisy and pneumonia	Cause multifactorial.	Do not drench lambs in marking cradle, ensure handling device is correctly adjusted. Reduce dust and fines in feed.
Coccidiosis	History of feedlot infection. Caused by protozoal parasites.	Inclusion of lasalocid sodium in ration of lambs considered at risk.

4.7.2 Mitigation and Management Measures

Animal health and welfare is very important for sheep/lamb feedlot management.

The proposed sheep feedlot development at 'Culverly Rise' will take the following livestock welfare aspects into account:

- Integrated animal welfare consideration across animal nutrition, disease and breeding practices, such as adding lasalocid sodium to the ration of lambs considered at risk of coccidiosis infection;
- Stress and risk management in animal handling, movement and transport;
- Pain and risk management in surgical operations;
- Regular heat stress assessment of sheep and providing shade and shelter to protect from heat and cold stress;
- Feedlot facility and equipment monitoring and supervision;
- Monitoring sheep/lamb performance through regular weighing and fat scoring;
- Continuous welfare monitoring and improvement.

4.8 Biosecurity

4.8.1 Pests

Many pests have the potential to breed in or derive shelter and sustenance in feedlots and water holding ponds. They may have an impact on community amenity, directly and indirectly affecting the health of people and domestic animals, reducing biodiversity in the natural environment, damaging crops and degrading soil and water resources.

Mice and rats are a seasonal or sporadic problem, breeding in the open under warm conditions and entering buildings and feedlots seeking food and shelter under cold and or wet conditions. They may spoil food, carry and spread disease, damage buildings, and can threaten agricultural productivity because they feed heavily on grain. The proposed development may make the site more attractive to these rodent pests.

Biting insects and flies may also be a problem. The proposed site will install wastewater ponds and a composting pad, which could potentially act as breeding grounds. Flies tend to be a seasonal problem in most rural areas, breeding in material such as animal dung under favourable temperature and moisture conditions. These insects may cause nuisance and amenity issues, as well as carry disease.

Of the major fly species found at feedlots, only house flies and stable flies breed at the feedlot; other species predominantly breed elsewhere. Flies breed in a number of relatively small areas, the most common being manure, vegetation and moist areas e.g. in hospital and induction areas, under fence-line manure, drains, silage pits and heavily grassed areas adjacent to the feedlot. Pen cleaning has a short-lived effect on fly breeding since manure quickly builds up under fences after cleaning. Because this manure is not trampled by the livestock it provides good larvae habitat. Most feedlots use fly control including baits, insecticide sprays and traps. Fly baits have limited effectiveness as they attract and kill only adult house flies. There are also resistance issues with these. On the whole, insecticidal treatments have limited effectiveness.

Urech et al. (2004) outlines the best control of nuisance flies at a feedlot site:

- Reduce fly breeding sites through:
  - good manure management: clean under fence lines, sedimentation basins, drains, hospital pens and manure stockpiles;
  - clean up feed spilled near the bunks, hospital pens, stables and feed mill good feedstuff storage – some ingredients, such as molasses and silage, attract more flies. Clean up spills and keep silage well covered;
  - appropriate mortalities management – compost and cover completely; and
  - maintaining the feedlot troughs, drains, sedimentation basins and vegetation management by mowing or slashing around the feedlot complex, particularly areas adjacent to drains and pens.
- Using insecticides selectively:
  - rotate chemical groups;
  - target insecticide use towards hot spots;
  - use residual adulticides, particularly on resting sites rather than manure;
  - use larvicides that will not affect beneficial insects; and
  - use baits for house flies with rotation between chemical groups.
- Lot feeding design principles, including:
  - suitable pen foundation and slope;
  - good feed bunk and water trough design;
  - fence design that allows for easy cleaning;
  - good construction of drains, sedimentation systems and effluent holding ponds; and
  - well-designed manure stockpile and composting area.
- Enhancing populations of biological control agents through:
  - biological control agents, such as parasitic wasps, predatory mites and entomopathenogenic fungi, that can play an important role in killing larvae and flies; further development is needed;

  - o sustaining target parasite and predator populations through appropriate management; and
  - o boosting parasite populations through strategic releases.
- Systematically monitor fly populations by:
  - o scouting adults and larvae to determine population thresholds;
  - o using traps for adults; larval density ratings for immatures; and
  - o observing animals.

4.8.2 Weeds

The proliferation of noxious and environmental weeds on and adjacent to this site may have significant impacts, including degradation of water quality, increased intensity of fires, toxic effects on stock, displacement of native flora and fauna, as well as legal implications for failing to control such weeds.

This development will have the potential to introduce weeds to the site and surrounds in several ways. They may be introduced to the site or spread to other sites via livestock (hooves, hides and manure), the transport trucks, construction and operation vehicles, and by vertebrae pests (e.g. foxes). Additionally weeds can be transported downstream if stormwater retention is found to be inadequate.

A search of the Environmental Protection and Biodiversity Conservation online database has identified that the following pest/invasive species may be present in the general area:

- Bridal Creeper (Asparagus asparagoides);
- African Boxthorn (*Lycium ferocissimum*);
- Chilean Needle Grass (*Nassella neesiana*);
- Serrated Tussock (*Nassella trichotoma*);
- Radiata Pine (*Pinus radiata*);
- Blackberry (Rubus fruticosus aggregate);
- Weeping Willow (*Salix spp*); and
- St John’s Wort (Hypercium perforatum).

Appropriate management of weeds will need to be undertaken to ensure that spread of noxious weeds does not occur.

4.8.3 Mitigation and Management Measures

The biosecurity objectives of the site are to:

- Manage and control noxious and environmental weeds and pests within the site area;
- Prevent the introduction of new weed or pest species to the site area as a result of construction and operational activities; and
- Prevent the spread/increase of current weed and pest populations within the site area or any areas adjacent to the site.

The following construction and operational mitigation and management procedures will be applied:

- Vehicles will be inspected while being washed at the wash-down facility to ensure that there are no “hitchhiking” weeds or pests;
- Additional manure will be added to burial piles with dead livestock to hide the smell from potential scavengers;
- Good “house-keeping” of the feed storage and feedmill areas will prevent infestation by rats, mice and rock doves. This is critical to reduction of feed spoilage and minimisation of disease risks;
- Any debris lying around will be stored to ensure that suitable habitat is limited for smaller pests;
- All wastewater and freshwater ponds will be monitored for pests; and

- Composting piles will be monitored for presence of pests.

Flies can breed in wet manure, decaying feed and dead animals. Fly breeding grounds will be eliminated with the following actions:

- Shaping all areas close to the facilities so that they are sloped and free draining so no wet areas exist;
- Manure will be managed so that there are no areas where wet manure can accumulate without being disturbed and aerated (by stock movement);
- Sludge will be collected frequently and taken to the compost area and placed in windrows;
- All spoiled feed will be collected and removed to the composting area; and
- Dead animals will be composted on site in windrows of manure and spent / spoiled feed (this is a common; and accepted practice in the Australian lot feeding industry; flies do not breed in hot compost windrows).

The best means of preventing infestations of midges and mosquitos is to ensure that there are as few open water bodies possible in which they can breed and if such water bodies do exist that they can be treated if required. Engineering and operational mitigation will be applied. These include:

- All drains will have slopes >0.5% so no low spots occur, eliminating any pooling;
- The sedimentation basin will be self-draining and concrete lined so it can be quickly and efficiently cleaned so sludge is removed quickly;
- Holding ponds will be designed and constructed so that there are no shallow areas; they will have steep batters (1H:3V) to prevent any shallow areas and the floor of the ponds will have slopes of 1%;
- WUA tailwater dams will be similarly designed and constructed;
- Vegetation will be regularly cleared from the edges of water storages and holding ponds; and
- Grassed areas close to drains, sedimentation basin, holding ponds and water storages will be regularly slashed; before the wet season and through the wet season where possible.

Recommended weed engineering and operational mitigation measures include:

- A wash-down area should be constructed to ensure that incoming vehicles and machinery do not bring weeds to the site;
- Livestock should be washed down on arrival;
- Feed stuffs purchased for use on the property will be procured on the basis that they are free of weeds;
- The property should be monitored regularly for weed presence and effectiveness of weed treatment methods;
- A Weed Management Plan should be developed to ensure that weed monitoring and treatment are carried out efficiently; and
- Weeds should be controlled either with herbicide or manually.

5. Summary of Mitigation and Management Measures

It is recommended that an Environmental Management Plan be developed for this site on receiving development consent from the local authorities. A summary of the recommended mitigation and management measure for this proposed sheep feedlot are outlined in the tables below and should be considered for inclusion with any Environmental Management Plan developed for this site.

Table 25 Air Quality Mitigation and Management Measures

Air Quality	Mitigation/Management Method
Pen surface dust/odour	• Establish vegetated buffers between the facility and nearby receptors. • As many pens as possible are to be covered, where practical. • Pens to be designed to allow good drainage and maximise drying and dry manure conditions; • Adequate cleaning schedule for pens to maintain a depth of (dry) manure of 50mm or less. • Management of pen stocking densities to regulate moisture levels. • Use dust suppression systems to "lay" dust as soon as it is noticed. The dust suppression systems should be used early in the morning and late in the afternoon to minimise humidity and impact on livestock. Application rates should not exceed 6mm at one time. • Gypsum (or lime) should be applied to pen surfaces if they become malodourous.
Stock handling facilities dust/odour	• Establish vegetated buffers between the facility and nearby receptors. • Use dust suppression systems to "lay" dust as soon as it is noticed. The dust suppression systems should be used early in the morning and late in the afternoon to minimise humidity and impact on livestock. Application rates should not exceed 6mm at one time.
Stormwater/wastewater drains odour	• Establish vegetated buffers between the facility and nearby receptors. • Drains to be designed to be free draining towards the holding pond and prevent ponding. • Gypsum (or lime) should be applied to drain surfaces if they become malodourous.
Wastewater holding pond odour	• Establish vegetated buffers between the facility and nearby receptors. • Operation of a suitable sized pump and adequately sized irrigation capacity to allow holding ponds to be empty as often as possible; • Application of lime to waters in holding pond if they become malodourous; • Recirculation of holding water with an input of lime to adjust the pH and remove odorants.
Manure storage and composting area dust/odour	• Establish vegetated buffers between the facility and nearby receptors. • Area to be appropriately designed and constructed to ensure water runoff into the sediment basin pond, no water should pond on this area. • Compost moisture and temperature levels are monitored daily and should ensure that these levels are optimal to reduce dust and increase composting efficiency (45-65% moisture content). • Manure to be added to the stockpile area in thin even layers. Layers should be dry (25% moisture) to reduce spontaneous combustion potential. Each layer should be compacted. • Manure stockpiles to be shaped to shed rain. • Compost to be removed off site or utilised on site prior to the wet season, where reasonably practical.

	• Gypsum or lime should be added to anaerobic manures in compost windrows. • Compost windrows are turned only in low wind conditions and when moisture levels are optimal.
Irrigation area odour	• Establish vegetated buffers between the facility and nearby receptors. • Direct placement of wastewater onto irrigation grounds to negate aerosol generation. (low pressure irrigation systems that should not create aerosols.) • WUA tailwater dam to be emptied (irrigated) as soon as practical after receiving inflow (runoff) from irrigation areas. • Irrigation not to occur on excessively windy days. Wind conditions to be monitored and recorded before application commences. • In the event that any obvious odours being generated from the irrigation area, all irrigation activities are to cease and the holding pond is to be dosed with lime/gypsum prior to irrigation activities re-commencing.
Access roads dust	• Unsealed access roads are to be appropriately graded and compacted with suitable gravel material to reduce dust generation.
Manure compost spreading dust/odour	• Establish vegetated buffers between the facility and nearby receptors. • Only apply manure to designated areas during low wind conditions. • Soil moisture is appropriate condition for manure spreading. • Manure moisture is appropriate for manure spreading. • In the event that dust or odour from manure spreading activities is becoming an obvious issue or generating community complaints, all spreading activities are to cease until weather conditions are favourable and/or manure composition can be tested to ensure it is adequate for spreading.
Offsite manure disposal dust	• Any manure to be removed offsite (where relevant, either sold or disposed of) is to be transported in appropriately covered trucks. No uncovered loads are to leave the site.
Greenhouse gas emissions	• Regular maintenance of vehicles, machinery and pumps is carried out. • Fuel use is monitored for the life of the feedlot operation.

Noise	**Mitigation/Management Method**
Stock Handling	• Establish vegetated buffers between the facility and nearby receptors. • Stock to be handled at cooler periods of the day (early morning or early evening). • Laneways, races, entrances and exits should be designed to take advantage of the social behaviour and movement patterns of stock. • Stock handling should be avoided between 10pm and 7am where possible.
Traffic (e.g. feed trucks, stock transport)	• Trucks are not left idling when not in use. • All employees and contractors should ensure that they report any vehicle or machine that is producing excessive noise. • Where possible trucks to arrive and leave the site during day-time hours. If reasonably practical no truck movements from site between 10pm and 7am. • The handling of gates and ramps on trucks should be managed quietly to reduce noise impacts. • The use of reverse beepers and horns should be limited between 6pm

	and 7am.
Feed Milling	• Establish vegetated buffers between the facility and nearby receptors. • Feed milling activities to be undertaken between 7am and 6pm where possible. • Feed milling activities should be avoided between 10pm and 7am.
Plant & Equipment	• Establish vegetated buffers between the facility and nearby receptors. • All equipment should be fitted with exhaust mufflers, where practical. • All equipment should be maintained to reduce noise emissions. • High noise activities (pump operation, manure application, etc) should be undertaken in the late morning and early afternoon, where possible, when most people are at work • All employees and contractors should ensure that they report any vehicle or machine that is producing excessive noise.

Water	**Mitigation/Management Method**
Wastewater irrigation activities and degradation of groundwater quality.	• Nutrients, when applied to pasture areas, should be applied frequently in low amounts; o Given the leaching fraction; ongoing careful management of potential loss of nitrogen and phosphorus to groundwater is important. o The physical and chemical properties (including nutrients) of groundwaters should be monitored regularly. o The quality of wastewater applied to the irrigation areas (nutrients, salts, etc.) should also be monitored. • Maintaining an active plant growth and dominance of improved pastures should ensure nutrients are maintained in vegetation and soils and not leaching to groundwaters. • Maximising organic matter content to maximise soil moisture and nutrient holding capacity of soils to ensure leaching to groundwater is reduced. • Maximising nutrient recovery by crop harvest. • Irrigating only when the irrigation area isn't saturated. • Stubble retention and suitable tillage practices for erosion control and preventing soil runoff. • Lime may be applied to soils receiving holding pond effluent so as to avoid acidification and aluminium toxicity.
Wastewater irrigation activities and degradation of surface water quality.	• All surface water runoff is to be directed to on site holding ponds (i.e. wastewater holding pond and WUA tailwater dam). • Holding ponds to be designed and constructed to contain runoff waters from the site that would occur in a 1 in 10 year rain event. • Holding ponds to be treated with lime/gypsum as required to ensure waters are adequate quality before release and/or utilisation on site. • Holding pond waters to be tested prior to utilisation on site or release from the holding pond.
Erosion and sediment control from operational areas (e.g. irrigation areas).	• Stubble retention and suitable tillage practices for erosion control and preventing soil runoff. • Minimising traffic across the paddock to minimise / reduce soil

	compaction which encourages sheeting of runoff waters. • Only traffic the paddock when soils are as dry as possible to reduce soil compaction and spread of loose soil materials. • Use low bearing pressure equipment on irrigation and pasture areas to reduce soil compaction. • Alleviate compaction by aeration and ripping; if required. • Applying gypsum to improve soil conditions and assist in flocculation of water in catchment ponds.
Chemical spills	• Contain all spills to the localised area as soon as possible after the spill has occurred. • Clean up any spilled material as soon as possible after spill has occurred. • Appropriately store or dispose of contaminated materials to ensure that any contaminants do not result in contaminated runoff into the stormwater management system.
Chemical storage	• All fuels, chemicals and other hazardous materials stored on site, and all maintenance and refuelling areas should have a secondary containment system (e.g. impervious bunding) in place to minimise the risk of contamination. • Stormwater accumulated in open bunded areas should be removed by a suitably qualified contractor.
Erosion from site construction and operations	• The site is to be appropriately designed to ensure soil erosion from operational activities (e.g. irrigation and planting activities) does not result in significant soil erosion from the site. • A suitable construction erosion and sediment control plan should be developed and implemented prior to construction activities commencing.

Land	**Mitigation/Management Method**
Wastewater irrigation activities and degradation of soil quality.	• Nutrients, when applied, should be applied frequently in low amounts; o Given the leaching fraction; ongoing careful management of potential loss of nitrogen and phosphorus is important. o The physical and chemical properties (including soil nutrients) should be closely monitored via regular agronomic tests (annually), to adjust nutrient application rates. o The quality of wastewater applied to the irrigation areas (nutrients, salts, etc.) should also be monitored (annually). • Maintaining an active plant growth and dominance of improved pastures. • Maximising organic matter content to maximise soil moisture and nutrient holding capacity. • Maximising nutrient recovery by crop harvest. • Irrigating the irrigation area only when the irrigation area isn’t saturated. • Stubble retention and suitable tillage practices for erosion control and preventing soil runoff. • Lime may be applied to soils receiving holding pond effluent so as to avoid acidification and aluminium toxicity.
Soil compacting activities (e.g.	• Minimising traffic across the paddock to minimise / reduce

ploughing, manure application, livestock grazing, crop planting, etc) and potential degradation of soil structure.	compaction. • Traffic the paddock when soils are as dry as possible. • Use low bearing pressure equipment. • Alleviate compaction by aeration and ripping; if required. • Applying composted manure and gypsum and lime to improve soil conditions. • Maximising organic matter content to maximise soil moisture and nutrient holding capacity. • Maximising nutrient recovery by crop harvest.
Chemical spills	• Contaminated material should not be removed from site without the appropriate permits/approvals in place. • All contaminated materials should be treated/removed from site in accordance with emergency management and legislative guidelines. • Appropriate spill kits are to be kept on site to manage any spill events from dangerous or hazardous materials (this includes lime).
Chemical storage	All fuels, chemicals and other hazardous materials stored on site, and all maintenance and refuelling areas should have a secondary containment system (e.g. impervious bunding) in place to minimise the risk of contamination.
Erosion from site construction and operations	The site is to be appropriately designed to ensure soil erosion from operational activities (e.g. irrigation and planting activities) does not result in significant soil erosion from the site. A suitable construction erosion and sediment control plan should be developed and implemented prior to construction activities commencing.

Biosecurity Issue	**Mitigation/Management Method**
Introduction of weeds or pests during construction activities.	All machinery and vehicles entering the site shall be cleaned before site entry to ensure new weeds or pests are not introduced to the site.
Exacerbation of weeds from clearing and construction activities.	Prior to commencing clearing activities, all declared weed species should be treated and/or removed from the site in accordance with the weed management guidelines.
Pest introduction with livestock arrival.	• Insecticide back-lining procedures are implemented for incoming livestock. • Staff are trained and inducted on pests and vermin. • Vehicles leaving the property should be checked for potential pest species (can be undertaken as part of the wash-down procedure). • Monitoring programs are carried out to identify any pests and vermin onsite and any control programs are undertaken as necessary. • Staff trained on proper cleaning practices.
Prevention of pest attraction to the site.	• Monitoring programs are carried out to identify any pests and vermin onsite and any control programs are undertaken as necessary. • Staff trained on proper cleaning practices. • Ensure that pen manure is cleaned at least every 13 weeks, and maintained below 50mm dry manure. • Maintenance routines and registers kept. • The pest register is maintained and acted upon. • Compost manure pad is monitored daily for pests and vermin. • Bait stations are placed out and checked weekly and replaced where necessary. • Silos and bins are all closed.

	• Good 'housekeeping' of the feed storage and feed mill areas should prevent infestation of rats and mice. This is critical to reduction of feed spoilage and minimisation of disease risks. • All wastewater and freshwater ponds should be monitored for mosquito larvae. • Manure piles should be monitored for presence of pests. • Shaping all areas close to the facilities so that they are sloped and free draining so no wet areas exist. • Sludge should be collected frequently and taken to the manure area and placed in windrows. • All spoiled feed should be collected and removed to the manure pad. • Any debris lying around should be stored to ensure that suitable habitat is limited for smaller pests such as rodents and cane toads. • All drains should have slopes so no low spots occur, eliminating any pooling. • Vegetation should be regularly cleared from the edges of water storages and holding ponds. • The sedimentation basin should be self-draining and clay lined, so it can be quickly and efficiently cleaned so sludge is removed quickly. • Holding ponds should be designed and constructed so that there are no shallow areas; they should have steep batters (1:3) to prevent any shallow areas and the floor of the ponds should have slopes of 1%.
Reducing weed introduction to the site	• Staff are trained and inducted on weed identification. • Vehicles entering and leaving the property should be checked for potential weed species (seeds on vehicles and animals). • Vehicles and machines to undergo wash down procedures prior to leaving the site. • Feed stuffs purchased for use on the property should be procured on the basis that they are free of weeds. • The property should be monitored regularly for weed presence and effectiveness of weed treatment methods.

6. Environmental Monitoring

Recommended environmental monitoring to be conducted for this proposed sheep feedlot is detailed in Table 26. Any environmental monitoring requirements should be clearly detailed in an environmental management plan developed specifically for this site.

Table 26 Recommended Environmental Monitoring

Management areas	Item	Monitoring Requirements

General monitoring	Weather conditions	• Air temperature should be monitored 3 times per day, including:
		  o Morning;
		  o Midday; and
		  o Evening.
		• Wind speed and direction should be monitored 3 times per day, including:
		  o Morning;
		  o Midday; and
		  o Evening.
		• Rainfall should be recorded daily.

Water Quality Management	Groundwater bores	• Bore water usage should be monitored and recorded daily.
		• Monitoring bores should be monitored in accordance with the requirements stipulated in the development consent for the site. Where there are no requirements stipulated the following monitoring regime should be implemented:
		  o monthly for the first year for;
		    ▪ Temperature;
		    ▪ Standing water levels;
		    ▪ pH;
		    ▪ Electrical conductivity;
		    ▪ Total Suspended Solids;
		    ▪ Total Dissolved Solids;
		    ▪ Total nitrogen;
		    ▪ Nitrate;
		    ▪ Ammonia; and,
		    ▪ Total phosphorus.
		  o After the first year ground water monitoring for the above parameters is to occur quarterly.

<table>
<tr><th>Management areas</th><th>Item</th><th>Monitoring Requirements</th></tr>
<tr><td></td><td>Holding Pond Water</td><td>

Holding pond water should be tested for the following parameters prior to release for the first wastewater irrigation application, then quarterly after this period:

Total Phosphorus
Ortho Phosphorus
Sodium Adsorption Ratio
Electrical Conductivity
pH
Total Kjeldahl Nitrogen
Potassium
Ammonium – Nitrogen
BOD
Total Nitrogen

All quantities of wastewater irrigated on site should be recorded at all times.
Areas where wastewater has been irrigated should be recorded as having irrigation activities applied. Records are to include:

Date and time irrigation commenced;
Date and time irrigation ceased;
Notes of whether water quality monitoring was performed prior to irrigation;
Weather observations for at least the last 7 days and include a basic forecast for upcoming week;
Current weather observations at commencement of irrigation and during irrigation activities, i.e. temperature, wind direction, cloudy/sunny, etc;
Quantity of water applied during the irrigation event; and
Location of where irrigation occurred.

Any application of lime, gypsum or other flocculants or odour suppressors to the wastewater holding pond should be recorded. Records must contain:

Date and time of application;
Quantity of material applied;
Details of agitation methods used; and
Reason for product application.

</td></tr>
</table>

Management areas	Item	Monitoring Requirements

Land Management	Soil monitoring	• Any nutrients applied to the improved pasture areas, in addition to the wastewater irrigation, should be recorded. Records should include:
		o Date and time of application;
		o Weather conditions during application (i.e. temperature, wind direction, etc);
		o Type of nutrients applied;
		o Quantity of nutrients applied;
		o Method of application; and
		o Reasoning for nutrient application.
		• Soil monitoring of improved pasture areas should be performed annually (unless otherwise specified by the development consent). Soil monitoring should be conducted for the following parameters:
		o Available phosphorus (mg/kg);
		o Cation exchange capacity (cmol(+)/kg);
		o Electrical conductivity (dS/m);
		o Exchangeable calcium(cmol(+)/kg);
		o Exchangeable magnesium (cmol(+)/kg);
		o Exchangeable potassium (cmol(+)/kg);
		o Exchangeable sodium (cmol(+)/kg);
		o Nitrate;
		o pH; and
		o Total organic carbon (%).

	Erosion and Sediment Control	• Daily checks by site operators; • Weekly recording of detailed site inspection; and • Records of any soil movement into nearby waterways after rain events.
Air Quality Management	Dust monitoring	• Dust monitoring of the site operations should be performed daily by site operators. Any dust occurrence should be recorded with details of cause and wind direction at the time of occurrence. • Any dust suppression methods utilised should be recorded.
	Odour monitoring	• Any odours detected on site should be recorded daily, records should also include wind direction and speed at the time of odour occurring. • Any odour generating activities should be recorded when they occur, activities may include, but are not limited to: o Compost turning; o Livestock loading and unloading; o Livestock feeding times; o Pen cleaning; o Manure application; o Wastewater irrigation; and o Nutrient application to improved pastures.

Management areas	Item	Monitoring Requirements
Noise Management	Operational noise	• Daily operational hours should be recorded. • Times of loading and unloading livestock should be recorded. • Operation of machinery or equipment on site (e.g. tractors, pumps, generators, etc) should be recorded. • Complaints received about operational noise should be recorded.
Biosecurity Management	Weeds	• Vehicles entering and leaving property should have weed and seed checked, and wash-down, where required. Records of check and wash-down to be kept on site. • Site should be checked for noxious and environmental weeds regularly.
	Pests	• Site should be checked for pests regularly. • All water holding areas should be checked for biting insects daily. • Site should be checked for any areas ponding water after rain events. The site should be free draining to the designated catchment areas.
Waste Management	General waste	Waste receipt from waste contractor or waste receipt from local waste management centre should be kept on record for all general waste moved off site.
	Manure (general stockpiles) monitoring	Compost moisture and temperature levels should be monitored regularly and ensure that these levels are optimal to increase composting efficiency (45-65% moisture content 40-65°C temperature); The manure stockpiles should be sampled for the following parameters prior to application on site or removal from the site; ○ Total Phosphorus ○ Ortho Phosphorus ○ Sodium Adsorption Ratio ○ Electrical Conductivity ○ pH ○ Total Nitrogen and TKN ○ Ammonium – Nitrogen ○ Potassium • Quantities of manure compost utilised on site should be recorded on a site register. The register should have details of: ○ Date and times of application to improved pastures; ○ Weather conditions at the time of application (temperature, wind direction and chances of rain); and ○ Manure application methods utilised. • Quantities of manure compost removed from the site should be recorded. The records should include contact details of the location where the manure compost has been taken to.

Management areas	Item	Monitoring Requirements
	Manure (carcass stockpiles) monitoring	Core temperatures should be monitored weekly at a minimum of 10 spots along the windrow during the “active” phase. Temperatures need to be at 50-60°C within 2-3 days and remain at this level for at least 2 weeks. The manure stockpiles should be sampled for the following parameters prior to application on site or removal from the site; ○ Total Phosphorus ○ Ortho Phosphorus ○ Sodium Adsorption Ratio ○ Electrical Conductivity ○ pH ○ Total Nitrogen and TKN ○ Ammonium – Nitrogen ○ Potassium ○ Magnesium ○ Total sodium
	Hydrocarbon / contaminated waste	• All hydrocarbon and other contaminated waste should be stored on site in a covered and bunded area until it can be removed off site by a licensed contractor. Quantities of waste generated must be kept on record. • Hydrocarbon and other hazardous waste products that are removed off site should be recorded in a register for who transported the material off site and disposal location.

7. Evaluation and Conclusion

The project has been designed to avoid impacts to the environmental values of the site where practicable and minimise any remaining potential impacts through appropriate design and management measures. A thorough and comprehensive assessment of existing environmental values and potential environmental impacts has been undertaken enabling future preparation of a detailed Environmental Management Plan (EMP) to guide the day-to-day operation of the project.

Only one receptor was identified as potentially being impacted by odour generated from the site; however, this particular receptor is also operated as a small scale feedlot. Implementing appropriate management measures, such as the VEB, will assist in reducing any additional odour impacts to this receptor.

Assessment of the project determined that the key aspects with the potential to cause environmental impacts were:

- noise and air quality;
- soil quality and water quality;
- biosecurity; and
- animal welfare.

The assessment of air quality, land impacts, biodiversity and water quality identified a comprehensive range of management measures should be implemented to mitigate and minimise the risk of potential and cumulative environmental impacts.

The project will avoid and minimise potential impacts to a degree that will enable significant economic and operational benefits to be sustainably achieved.

8. References

Albaladejo J., Castillo V., Diaz E. 2000. *Soil loss and runoff on semiarid land as amended with urban solid refuse*. Land Degradation & Development 11: 363-373.

Animal Health Australia (2014). *Australian Animal Welfare Standards and Guidelines-Sheep*. (online) Available at: <http://www.animalwelfarestandards.net.au/files/2011/01/Sheep-Standards-and-Guidelines-for-Endorsed-Jan-2016-061017.pdf> (Accessed 13 April 2020).

Australian Government Department of Agriculture and Animal Health Australia (2016). *Australian Animal Welfare Standard and Guidelines for Sheep*. (online) http://www.animalwelfarestandards.net.au/files/2011/01/Sheep-Standards-and-Guidelines-for-Endorsed-Jan-2016-061017.pdf (accessed 28/02/2020).

Australian Government Department of Agriculture, Fisheries and Forestry (2009). *Australian Animal Welfare Standards and Guidelines – Land Transport of Livestock*, PISC Report Series XX, CSIRO Publishing 2009. [online] Available at: <http://www.animalwelfarestandards.net.au/files/2011/02/Land-transport-of-livestock-Standards-and-Guidelines-Version-1.-1-21-September-2012.pdf> (Accessed 13 April 2020).

Bardsley, T (2000). *Air Pollution Measurement Manual, Fifth Ed : Measurement of dust fall*. (online) https://www.casanz.org.au/shop/publications/casanz-air-quality-journal/ (accessed 30/03/2020).

Bowen et al. (2006), Improving Sheep Feedlot Management, *Wool Meets Meat (eds. P.B. Cronjé & D. Maxwell). Proceedings of the 2006 Australian Sheep Industry CRC Conference.*

Bresson L.M., Koch C., Le Bissonnais Y., Barriuso E., Lecomte V. 2001, *Soil surface structure stabilization by municipal waste compost application*. Soil Sci. Soc. Am. J. 65:1804-1811.

Broken W., Muhs A., Beese F. 2002. *Changes in microbial and soil properties following compost treatment of degraded temperate forest soils*. Soil Biology & Biochemistry 34:403-412.

Canadian Fertiliser Institute (1998). *Nutrient Uptake and Removal by Field Crops*. (online) https://www.canolawatch.org/wp-content/uploads/2012/02/CFI_nutrient_uptake_for_wcanada_2001.pdf (accessed 01/05/2020).

Churchman G.J., Skjemstad J.O., Oades J.M. 1993. *Influence of clay minerals and organic matter on effects of sodicity on soils*. Aust. J. Soil Res. 31:779-800.

Cole, N.A., Todd, R. W., Hales, K. E., Parker, D. B., Brown, M. S., and MacDonald, J.C. (2012). *Nutritional Management of Feedlot Cattle to Optimize Performance and Minimize Environmental Impact*. In Proceedings of the 4th International Symposium of Beef Cattle Production (pp. 1-49).

Colletti J.P., Hoff S., Thompson J. and Tyndall J. (2006). *Vegetative environmental buffers to mitigate odour and aerosol pollutants emitted from poultry production sites. In: Aneja V.P. et al (eds) Proceedings: Workshop on Agricultural Air Quality: State of the Science, Species for odour Management around Poultry Production Facilities.*(online) https://www.sciencedirect.com/science/article/abs/pii/S1352231007006450 (accessed 30/03/2020).

Davis RJ, Watts PJ and McGahan EJ. (2010). *Quantification of feedlot manure output for BEEF-BAL model upgrade, RIRDC Project No. PRJ–004377*. (online) https://www.agrifutures.com.au/wp-content/uploads/publications/12-010.pdf (accessed 01/05/2020).

De et al. (2017). *Ideal Housing Systems for Sheep to Cope with Climate Change*. In: V. Sejian et al. (eds.), Sheep Production Adapting to Climate Change. Springer Nature Singapore Pte Ltd.

Department of Agriculture and Department of Local Government and Regional Development (2003), *Code of Practice for Sheep in Western Australia*. [online] Available at: <https://www.agric.wa.gov.au/sites/gateway/files/Code%20of%20Practice%20for%20Sheep%20in%20Western%20Australia_0.pdf> (Accessed 15 April 2020).

Department of Planning and Environment (2019). *Planning Guidelines: Intensive Livestock and Agriculture Development*. (online) https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0008/194399/planning-guidelines-intensive-livestock-agricultural-development.pdf (accessed 30/03/2020).

Diary Australia (2005). *Regrowth Brassicas: Project 3030*. (online) https://content.dairyaustralia.com.au/dairyaustralia/farm/feedbase-and-animal-nutrition/crops/brassicas?keyword=regrowth%20brassicas (accessed 01/05/2020).

Elliot, LF, Doran, JW and Travis, TA 1978, '*A Review of Analytical Methods for Detecting and Measuring Malodors*'. Soil Sci. Soc.

Golder Associates (2016). *Goolagar Stockholding Facility Preliminary Noise Impact Assessment*. (online) Available at: <https://www.glenelg.vic.gov.au/Files/Planning/Amendment_C86_Preliminary_Noise_Impact_Assessment_August_2016.pdf> (Accessed 8 April 2020)

Grains Research & Development Corporation (2016). *Winter Canola for Grazing and Grain Production*. (online) https://grdc.com.au/resources-and-publications/grdc-update-papers/tab-content/grdc-update-papers/2016/07/winter-canola-for-grazing-and-grain-production (accessed 01/05/2020).

Greenland D.J. (1971). *Changes in the nitrogen status and physical condition of soils under pastures, with special reference to maintenance of the fertility of Australian soils used for growing of wheat*. Soils and Fertilisers 34: 237-251.

ICIAI, (1997). *The New South Wales Feedlot Manual*, The Interdepartmental Committee on Intensive Animal Industries (Feedlot Section), NSW Agriculture, Orange, NSW.

Jacobs et al. (2002). *Effect of seedbed techniques, variety, soil type and sowing time, on Brassica dry matter yields, water use efficiency and crop nutritive characteristics in western Victoria*. Australian Journal of Experimental Agriculture 41, 743–751.

Jacobs et al. (2006). *Irrigation and nitrogen fertiliser effects on dry matter yield, water use efficiency and nutritive characteristics of summer forage crops in south-west Victoria*. Australian Journal of Experimental Agriculture 46, 1139–1149.

Kaur B., Gupta S.R., Singh G. 2002. *Bioamelioration of a sodic soil by silvopastoral systems in northwestern India*. Agroforestry Sys. 54:13-20.

Lange IG, Daxenberger A, Schiffer B,Witters H, Ibarreta D, Meyer HHD.(2002*). Sex hormones originating from different livestock production systems: fate and potential disrupting activity in the environment*. (online) https://www.sciencedirect.com/science/article/abs/pii/S0003267002007481 (accessed 01/05/2020).

Lott, S., (1994), *Drainage*, in '*Designing Better Feedlots*', eds. Watts, P. and Tucker, R., Queensland Department of Primary Industries, Toowoomba, Qld., pp. 5.5–37.

Lott, S.C., (1994), *Feedlot Hydrology in "Designing Better Feedlots",* Eds. Watts, P. and Tucker, R., Queensland Department of Primary Industries, Toowoomba, QLD.

Lott, S.C., (1998), *Feedlot hydrology*, PhD thesis, University of Southern Queensland, Toowoomba, QLD.

Lumaret JP, Errouissi F. (2002). *Use of anthelmintics in herbivores and evaluation of risks for the non target fauna of pastures*. (online) https://www.researchgate.net/publication/11073443_Use_of_anthelmintics_in_herbivores_and_evaluation_of_risks_for_non_target_fauna (accessed 01/05/2020).

Lunney, C.M. & Smith, R.J., (1995), *An Odour Emission Model for Feedlots, in "Proceedings of the Feedlot Waste Management Conference"*, Royal Pines Resort, Gold Coast, QLD. 12-14 June 1995.

Maunsell Australia (2003), *Development of a heat stress risk management model*, project code LIVE.116, Meat & Livestock Australia, North Sydney.

McCarthy, M., (2003). *Investigation into reducing odour emissions from partly loaded sheep vessels whilst in port*. Project LIVE.213 A Final Report. Published by Meat and Livestock Australia I SBN 1 74036 409 0

Meat & Livestock Australia (2005). *Department of Primary Industries and Fisheries: Dust Emissions from a Beef Cattle Feedlot on the Darling Downs.* (online) https://www.mla.com.au/research-and-development/search-rd-reports/final-report-details/Productivity-On-Farm/Dust-emissions-from-a-beef-cattle-feedlot-on-the-Darling-Downs/1884 (accessed 30/03/2020).

Meat & Livestock Australia (2012). *National Guidelines for Beef Cattle Feedlots Australia.* (online) https://www.mla.com.au/CustomControls/PaymentGateway/ViewFile.aspx?QcyEIgTQngTm70Ea6OZR/MDZg3dm+mO3vWCcz9tYt1wX46/4IEqi/3wVtYwQ+L1k3EYMKKAfsht7d1Tnt3BqiA== (accessed 30/03/2020).

MLA (2007), *A producers' guide to production feeding for lamb growth*. Meat & Livestock Australia.

MLA (2011). *National Procedures and Guidelines for Intensive Sheep and Lamb Feeding Systems*. (online) https://www.mla.com.au/globalassets/mla-corporate/extensions-training-and-tools/documents/nationalproceduresandguidelineslambfinishing.pdf (accessed 13/04/2020).

MLA (2012) *Lot feeding Brief: March 2012*. Meat and livestock Australia, Sydney

MLA 2008, *Electrolyte supplementation of export cattle, and further investigations in the heat stress threshold of sheep and dairy cattle.*

MLA 2012, *National Guidelines for Beef Cattle Feedlots,* 3rd edn, MLA, Sydney.

Mokolobate M.S., Haynes R.J. 2002. *Comparative liming effect of four organic residues applied to an acid soil*. Biology and Fertility of Soils 35:79-85.

NCHRP (2018). *How Weather Affects the Noise You Hear from Highways*. (online) Available at: <https://www.nap.edu/catalog/25226/how-weather-affects-the-noise-you-hear-from-highways> (Accessed 8 April 2020).

NDSU (2019). *Air Temperature Inversions Causes, Characteristics and Potential Effects on Pesticide Spray Drift*. (online) Available at: <https://www.ag.ndsu.edu/publications/crops/air-temperature-inversions-causes-characteristics-and-potential-effects-on-pesticide-spray-drift> (Accessed 8 April 2020).

NSW Agriculture (2002). *Forage Brassicas – Quality Crops for Livestock Production*. (online) https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0003/146730/forage-brassicas-quality-crops-for-livestock-production.pdf (accessed 01/05/2020).

NSW Department of Environment and Conservation & Recycled Organics Unit (2007). *Life Cycle Inventory and Life Cycle Assessment for Windrow Composting Systems*. (online) http://www.mncompostingcouncil.org/uploads/1/5/6/0/15602762/__composting_life_cycle.pdf (accessed 01/05/2020).

NSW Department of Primary Industries (2011). *Forage Brassicas for Autumn/Winter Milk Production*. (online) http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/386944/Forage-brassicas-for-autumn-winter-milk-production.pdf (accessed 01/05/2020).

NSW EPA (2017). *Noise Policy for Industry*. (online) Available at: <https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/noise/17p0524-noise-policy-for-industry.pdf> (Accessed 8 April 2020).

NSW Government, Department of Environment and Conservation (2006). *Technical Notes: Assessment and Management of Odour from Stationary Sources.* (online) https://www.environment.nsw.gov.au/resources/air/20060441notes.pdf (accessed 30/03/2020)

NSW Government, Environmental Protection Authority (2016). *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*. (online) https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/air/approved-methods-for-modelling-and-assessment-of-air-pollutants-in-nsw-160666.pdf (accessed 30/03/2020).

NSW Rural Fire Service Retrieved from https://www.rfs.nsw.gov.au/plan-and-prepare/building-in-a-bush-fire-area/tools-for-assessment

Office of Environment and Heritage Retrieved from http://www.environment.nsw.gov.au/Salisapp/resources/spade/reports/

Ormerod, R., & Zeise, K. (1995). *Risk based techniques for assessing acute air quality impacts*. Clean Air, 28(2), 53-56.

Parker, D.B., W. Malone and D. Walter. (2012). *Vegetative environmental buffers and exhaust fan deflectors for reducing downwind odour and VOCs from tunnel ventilated swine barns.* (online). https://www.researchgate.net/publication/269392467_Vegetative_Environmental_Buffers_and_Exhaust_Fan_Deflectors_for_Reducing_Downwind_Odor_and_VOCs_from_Tunnel-Ventilated_Swine_Barns (accessed 30/03/2020)

Pasquill, F and Smith, FB 1983, *Atmospheric Diffusion*. Chichester, Ellis Horwood.

Peng et al. (2014). *The effect of vegetation on road traffic noise*. (online) Available at: <http://www.acoustics.asn.au/conference_proceedings/INTERNOISE2014/papers/p83.pdf> (Accessed 8 April 2020).

PPG Wrightson Seeds (2012). *Brassica Management Guide*. (online) https://www.pggwrightsonseeds.com.au/Files/Files/Public/SeedsAU/Brassica-Guide-2019.pdf (accessed 01/05/2020).

Primary Industries Ministerial Council (2006). *The Sheep Second Edition Model Code of Practice for the Welfare of Animals PISC Report No.89*. [online] Available at: <http://www.australianwoolgrowers.com.au/news/2012/Model_code_of_practice_Sheep_2006.pdf> (Accessed 13 April 2020).

Queensland Government, Wetland Info (2015). *Groundwater Dependent Ecosystems*. (online) https://wetlandinfo.des.qld.gov.au/wetlands/facts-maps/gde-background/gde-faq/ (accessed 09/04/2020).

Queensland Government, Wetland Info (2017). *Types of Groundwater Dependent Ecosystems*. (online) https://wetlandinfo.des.qld.gov.au/wetlands/ecology/aquatic-ecosystems-natural/groundwater-dependent/

Raman DR, Layton AC, Moody LB, Easter JP, Sayler GS, Burns RT, et al. (2001). *Degradation of estrogens in dairy waste solids: effects of acidification and temperature*. (online) http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.899.9708&rep=rep1&type=pdf (accessed 01/05/2020).

RIRDC - Australian Government: Rural Industries Research and Development Corporation (2015). *Vegetative Environmental Buffers for Australian Meat Chicken Farms: A Guide for Growers*. (online) https://www.agrifutures.com.au/wp-content/uploads/publications/14-063.pdf (accessed 30/03/2020).

SCARM (1997), *National guidelines for Beef Cattle Feedlots in Australia 2nd Edition,* Standing Committee on Agriculture and Resource Management, Collingwood, Victoria.

Schoenian, S. (2018). *Sheep 201, Nutrient Management on Sheep Farms*. (online) http://www.sheep101.info/201/nutrientmgt.html (accessed 30/03/2020)

Sejian, V, Krishnan, G, Bagath, M, Vaswani, S, Pragna, P, Aleena, J, Lees, AM, Maurya, VP, Bhatta, R (2017), Measurement of severity of heat stress in sheep, *Sheep Production Adapting to Climate Change*, pp. 307–18, doi: 10.1007/978-981-10-4714-5_14.

Sejian, V., Bhatta, R., Gaughan, J., Malik, P., Naqvi, S. and Lal, R., (2007). *Sheep Production Adapting To Climate Change*.

Sekhon B.S., Bajwa M.S. 1993. *Effect of organic matter and gypsum in controlling soil sodicity in rice-wheatmaize system irrigated with sodic water*. Agricultural Water Management 24: 15-25.

Shiralipour A., McConnel D.B., Smith W.H. 1992. *Physical and chemical properties of soils as affected by municipal solid waste compost application*. Biomass and Bioenergy 3(3-4): 261-266.

Silanikove, N (2000), Effects of heat stress on the welfare of extensively managed domestic ruminants, *Livestock Production Science*, vol. 67, issues 1–2, pp. 1–18, doi: 10.1016/s0301- 6226(00)00162-7.

Skerman, A 2000, *Reference manual for the establishment and operation of beef cattle feedlots in Queensland,* Queensland Department of Primary Industries, Brisbane.

Slabbekoorn, H., Dooling, R., Popper, A. and Fay, R.,(2019). *Effects of Anthropogenic Noise on Animals*. [s.l.]: Springer-verlag new york.

Slattery W.J., Christy B., Carmody B.M., Gales B. 2002. *Effects of composted feedlot manure on the chemical characteristics of duplex soils in north-eastern Victoria*. Aust. J. Exp. Agri. 42: 369-377.

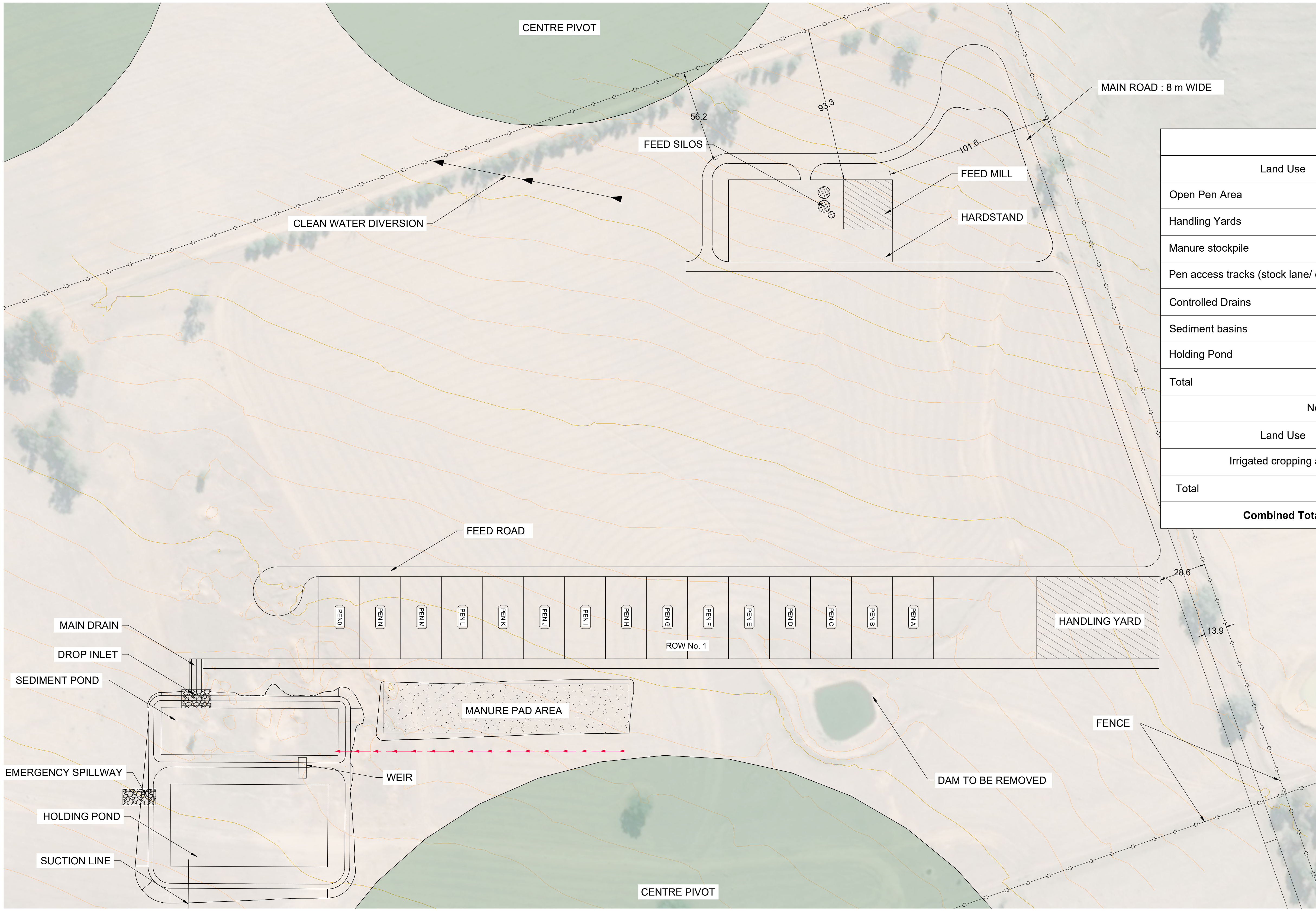
Spain, A.V., Isbell, R.F. and Probert, M.E. 1983. *Soil organic matter. In: 'Soils: An Australian Viewpoint'*, CSIRO, Melbourne, Academic Press, London, pp 551-563.

Tucker R, Roser R, Klein M and Khan S. (2011). *Guidelines for the safe management of feedlot wastes, Report for MLA Project FLOT.333: Managing the Contaminants in Feedlot Wastes*. (online) https://www.mla.com.au/CustomControls/PaymentGateway/ViewFile.aspx?+SLAyu18/eE/UidSAmpo4STV9t5HVkQR3jxv+o0PV/dDMonSpEh3apVm2vgDTT8r3EYMKKAfsht7d1Tnt3BqiA== (accessed 01/05/2020).

Watts, P.J. Jones, M., Lott, S.C. Tucker, R.W., and Smith, R.J. (1994). *Feedlot Odour Following Heavy Rainfall*. Transactions of the ASABE, 37(2): 629-636.

9. Appendices

Appendix A. Concept Layout Design



LEGEND

- MAJOR CONTOUR NS (5.00m)
- MINOR CONTOURS (1.00m)
- FENCE LINE
- CENTRE PIVOT

Controlled Discharge Areas	
Land Use	Area (m^2)
Open Pen Area	18,750.000
Handling Yards	3,735.240
Manure stockpile	4,500.000
Pen access tracks (stock lane/ drain)	3,242.178
Controlled Drains	3,242.178
Sediment basins	4,370.080
Holding Pond	8,212.197
Total	46,051.873
Non Controlled Discharge Areas	
Land Use	Area (m^2)
Irrigated cropping area	609,859.756
Total	609,859.756
Combined Total	**655,911.629**

STAGE STORAGE : SEDIMENT POND

	LEVEL (m)	AREA (m^2)	DEPTH (m)	VOLUME (m^3)
	160.5	3,078.00	0	0
	161	3,494.57	0.5	1643.14
TWL	161.5	3,925.26	0.5	3498.1
	162	4,370.09	0.5	5571.93

STAGE STORAGE : HOLDING POND

	LEVEL (m)	AREA (m^2)	DEPTH (m)	VOLUME (m^3)
	158.5	4,800.00	0	0
	159	5,245.07	0.5	2511.27
	159.5	5,704.26	0.5	5248.6
	160	6,177.59	0.5	8219.06
	160.5	6,665.04	0.5	11429.72
	161	7,166.63	0.5	14887.64
TWL	161.5	7,682.35	0.5	18599.88
	162	8,212.20	0.5	22573.52

1:1500@ A1
1:3000@ A3
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 m

FOR INFORMATION

DRAWING NO.	REFERENCE DRAWING TITLE	REV	DATE	REVISION DESCRIPTION	DRAWN	DWG CHECK	DESIGN	ENG DES CHECK	DRAFT SUPER	PROJECT APPROVAL
		A	12/06/2020	ISSUED FOR INFORMATION	BA	SL	SL	SCL	SCL	SCL

PREPARED FOR:

PREPARED BY:
EnviroAg Australia
TOOWOOMBA OFFICE
PO BOX 411
1/3 FOUNDRY ST
TOOWOOMBA QLD 4350
T: 07 4638 2228

PROJECT: -----
DRAWING OFFICE: TOOWOOMBA

	BY	DATE
DRAWN	BA	16/06/2020
DWG CHECK	SL	16/06/2020
DESIGN	SL	16/06/2020
ENG DES CHECK	SCL	16/06/2020
DRAFT. SUPER.	SCL	16/06/2020
PROJECT APPROVAL	SCL	16/06/2020

TITLE
CULVERLY RISE
FEEDLOT DESIGN
STAGE 1

PROJECT NO. 24439
DRAWING NO. 24439.CR.001
REVISION A
MOD NO.
SCALE AS SHOWN
CADFILE 24439.CR.003 Pen Layout Site Plan - Stage 1.dwg
A1

Appendix B. Potential Future Concept Layout Design

LEGEND

- MAJOR CONTOUR NS (5.00m)
- MINOR CONTOURS (1.00m)
- FENCE LINE
- CENTRE PIVOT

1:1500@ A1
1:3000@ A3
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 m

FOR INFORMATION

REV	DATE	REVISION DESCRIPTION	DRAWN	DWG CHECK	DESIGN	ENG DES CHECK	DRAFT SUPER	PROJECT APPROVAL
A	12/06/2020	ISSUED FOR INFORMATION	BA	SL	SL	SCL	SCL	SCL

APPROVALS

DRAWING NO.	REFERENCE DRAWING TITLE

PREPARED FOR:

PREPARED BY:

EnviroAg Australia

TOOWOOMBA OFFICE
PO BOX 411
1/3 FOUNDRY ST
TOOWOOMBA QLD 4350
T: 07 4638 2228

PROJECT: -----

DRAWING OFFICE: TOOWOOMBA

	BY	DATE
DRAWN	BA	16/06/2020
DWG CHECK	SL	16/06/2020
DESIGN	SL	16/06/2020
ENG DES CHECK	SCL	16/06/2020
DRAFT. SUPER.	SCL	16/06/2020
PROJECT APPROVAL	SCL	16/06/2020

TITLE: CULVERLY RISE FEEDLOT DESIGN STAGE 1 AND 2

PROJECT NO. 24439

MOD NO.

DRAWING NO. 24439.CR.001

REVISION A

SCALE AS SHOWN

CADFILE 24439.CR.003 Pen Layout Site Plan - Stage 1 & 2.dwg

A1

APPENDIX D:

Traffic Assessment

Spotto CONSULTING

people-oriented traffic and transport solutions

Traffic Impact Assessment

Culverley Rise Feedlot

198 Humphreys Road

Bungowannah NSW

May 2020

Prepared by:

Spotto CONSULTING

For:

Bungowannah Pastoral Co Pty Ltd

Ref	Version	Date	Revision Details	Author
P0085	A	17 April 2020	Draft	SWS
	B	26 May 2020	Final	SWS

CONTENTS

1 INTRODUCTION

Spotto Consulting have been engaged by Bungowannah Pastoral Co Pty Ltd to complete a Traffic Impact Assessment. The study is in response to a proposed development at the property known as Culverley Rise, 198 Humphreys Road, Bungowannah. The development involves construction of a new property access off Humphreys Road to an internal road network, weighbridge and truck parking, holding pens and processing yards for livestock, feed receival, storage and processing as well as facilities for water, wastewater and waste materials including manure.

The purpose of the assessment is to review the existing conditions in the vicinity of the site, including traffic, parking and servicing, as well as the performance of the surrounding network. An evaluation is then required of the traffic, access and parking requirements for the proposed development, and the impacts on the surrounding road network.

The assessment concluded that:

- Traffic surveys and analysis of key roads in the vicinity of the site (including Humphreys Road, the Riverina Highway and Bungowannah Road) shows that the roads currently carry low levels of traffic, and operate at an excellent Level of Service (LOS A, the highest level);
- The proposed development is anticipated to generate an additional 2 vehicle trips per hour in the peak period, and a total of 7 vehicle trips per day, which will not have a significant impact on the performance of the surrounding road network;
- The site and proposed development allows vehicles to enter and exit the site in a forward direction, with adequate room available on site to park anticipated vehicles; and
- There is no significant impact of the proposed development on pedestrians and cyclists.

The assessment recommended that:

- The intersection of the Riverina Highway and Humphreys Road be upgraded to incorporate Rural BAR (Basic Right Turn) and Rural BAL (Basic Left Turn) treatments, capable of accommodating vehicles up to and including a B-Double;
- The intersection of Humphreys Road and Mayfield Road (including approaches) be upgraded to allow vehicles up to and including a B-Double to safely negotiate the turn, including possible removal and/or trimming of some trees;
- Mayfield Road be gazetted for travel by B-Doubles between Humphreys Road and the proposed site access (approximately 140m west of Humphreys Road); and
- Access into the site be designed as a typical rural property access (as detailed in Section 7.2.3 of the *Austroads Guide to Road Design Part 4: Intersections and Crossings – General* and shown in RMS (TfNSW) Model Drawing – Typical Rural Property Access Standards (Figure 2 – Articulated Vehicles).

2 EXISTING CONDITIONS

2.1 Site

The site is located at 198 Humphreys Road, Bungowannah, approximately 8km east of Howlong. The site is accessed off the Riverina Highway, via Humphreys Road and Mayfield Road. Figure 2-1 shows the location of the site.

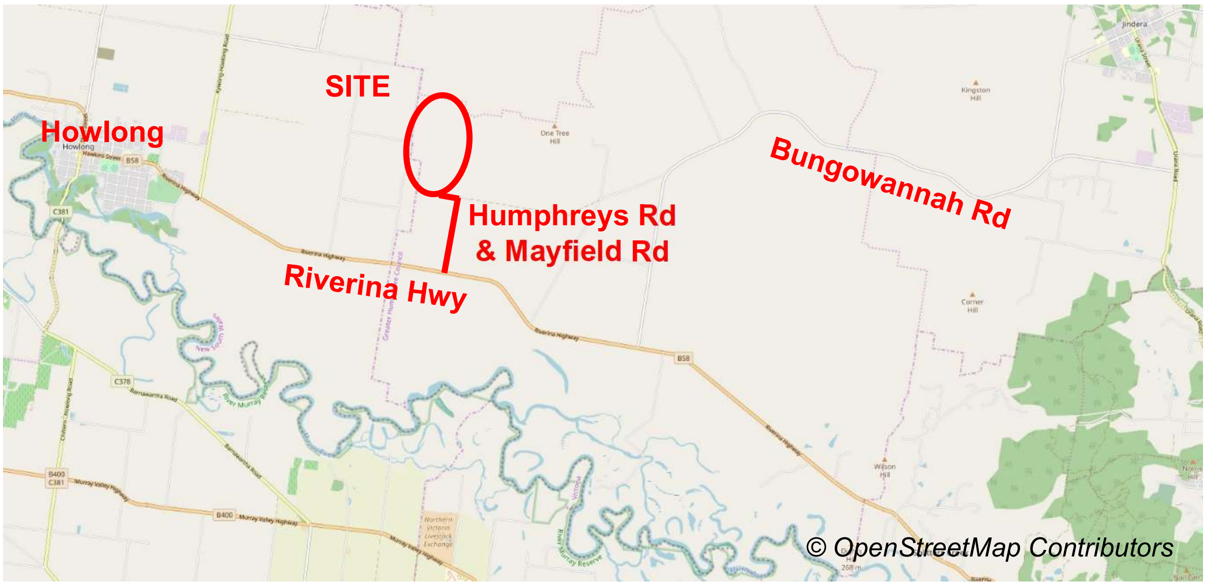


Figure 2-1: Locality Plan

The site is currently operating as a farming property, including broadacre and irrigated areas plus a dwelling with associated outbuildings. The development is limited to Lots 74-75 DP753749. Access to the site is provided from the Riverina Highway via Humphreys Road and Mayfield Road.

2.2 Surrounding Land Use

The site and immediate surrounds are currently zoned RU1 Primary Production under the *Greater Hume Local Environmental Plan 2012*. Surrounding land uses are predominantly rural and agricultural.

2.3 Road Network

2.3.1 Riverina Highway

The Riverina Highway is a significant east-west route. Commencing at the NSW/Victoria border east of Albury, it roughly follows the path of the Murray River west through Albury, Howlong and Finley, finishing at its intersection with the Cobb Highway at Deniliquin. It is a State Road under the control of Transport for NSW (TfNSW). Its role favours through movement over access.

In the vicinity of the site, the Riverina Highway is a two-lane, two-way rural sealed road. Contained within a 60m wide road reserve, the main carriageway contains one 3.4m wide through lane in each direction, with 0.8-1.0m wide sealed shoulders and table drains. No pedestrian or cyclist facilities are present, and there is no street lighting. It is authorised for travel by B-Doubles, but only as far east as the Greater Hume Council boundary (B-Doubles wishing to travel further east must either head south into Victoria, or north via Bungowannah Road). The speed limit in the vicinity of the site is the default rural speed limit of 100km/h.

Figure 2-2: Looking west along the Riverina Highway, with Humphreys Road on the right hand side

2.3.2 Humphreys Road and Mayfield Road

Humphreys Road and Mayfield Road are local roads that provide access to the site. Humphreys Road runs north from the Riverina Highway for approximately 1.7km before intersecting with Mayfield Road. Mayfield Road runs east/west. Both roads are local roads under the control of Greater Hume Council. Between them the roads provide no through connectivity to other roads, and so their role favours property access over through movement.

Humphreys Road and Mayfield Road are two-way rural gravel roads, with carriageway widths varying between 4.0-5.0m. No pedestrian or cyclist facilities are present, and there is no street lighting. B-Double access is permitted on Humphreys Road between the Riverina Highway and Mayfield Road. The speed limit on both roads is the default rural speed limit of 100km/h, although traffic data provided by Greater Hume Council indicates that the 85th percentile speed on Humphreys Road is much less than this at 63km/h.

Figure 2-3: Looking south along Humphreys Road

Figure 2-4: Looking west along Mayfield Road from the intersection with Humphreys Road

2.3.3 Intersections

The intersection of the Riverina Highway and Humphreys Road is located south of the site. It is a three-legged "T" intersection, with priority given to vehicles on the Riverina Highway. Property access driveways and a rural mail box are located on the southern side of the intersection. There are no auxiliary lanes or street lighting.

Figure 2-5: Looking west along the Riverina Highway towards the intersection with Humphreys Road

The intersection of Humphreys Road and Mayfield Road is located south of the site. It is a three-legged "T" intersection, with Humphreys Road forming the southern leg of the intersection and Mayfield Road to the west providing access to the site.

Figure 2-6: Looking north along Humphreys Road towards the intersection with Mayfield Road

2.4 Existing Traffic Conditions

Traffic data on roads in the vicinity of the site was obtained from several different sources, and included:

- Greater Hume Council – Midblock traffic data for Humphreys Road (between Riverina Highway and Mayfield Road, February 2013) and Bungowannah Road (between Riverina Highway and Methodist Road, August 2017); and
- Albury City Council – Midblock traffic data for Riverina Highway, Splitters Creek (between Waterview Road and Laboratory Lane, February 2013) and turning movement data at the intersection of the Riverina Highway and Pemberton Street, West Albury (March 2010 and February 2018).

A summary of the data from these various sources is provided in Table 2-1, below.

Table 2-1: Midblock traffic data – summary

Location	Weekday Veh/d	Weekday AM Peak Veh/h	Weekday PM Peak Veh/h
Humphreys Road (2013)*	15	2	1
Riverina Highway, Splitters Ck (2013)	3,139	295	272
Eastbound	1,574	225	88
Westbound	1,565	69	184
Riverina Highway, West Albury (2010)	3,317	301	322
Eastbound	1,726	213	115
Westbound	1,591	88	207
Riverina Highway, West Albury (2018)	3,538	331	319
Eastbound	1,852	235	117
Westbound	1,686	96	202
Bungowannah Road (2017)	549	52	49
Northbound	264	21	28
Southbound	285	31	21

** Traffic volumes on Humphreys Road are so low that northbound and southbound volumes have not been detailed*

The key points to note from this data include:

- A comparison of the West Albury and Splitters Creek traffic data shows that traffic volumes decrease along the Riverina Highway the further west the site is from Albury. It is likely that the traffic volume on the Riverina Highway at Humphreys Road would be similar to the Splitters Creek volumes – although through volumes from Albury may be slightly lower, this would be offset to some extent by traffic using Bungowannah Road; and
- Analysis of the traffic volume on the Riverina Highway at West Albury shows that traffic volumes grew by 6.7% over the 8 years between 2010 and 2018, which equates to an annual average growth rate of approximately 0.8% pa. It is likely that traffic volumes on the Riverina Highway at Humphreys Road, as well as on Bungowannah Road and Humphreys Road, would grow at a similar long-term rate.

Based on this data and analysis, a summary of the midblock data for key roads in the vicinity of the site in 2020 is provided in Table 2-2, below.

Table 2-2: Midblock traffic data – 2020

Location	Weekday Veh/d	Weekday AM Peak Veh/h	Weekday PM Peak Veh/h
Humphreys Road*	16	2	1
Riverina Highway	3,318	311	287
Eastbound	1,664	238	93
Westbound	1,654	73	194
Bungowannah Road	562	54	51
Northbound	270	22	29
Southbound	292	32	22

** Traffic volumes on Humphreys Road are so low that northbound and southbound volumes have not been detailed*

No turning movement data has been collected as part of this assessment. However the data from Table 2-2 shows that traffic volumes on Humphreys Road are relatively low, and in turn, the turning movements at the intersections of Humphreys Road/Riverina Highway and Humphreys Road/Mayfield Road would also be relatively low – of the order of 1-2 vehicles per hour in any one direction.

2.5 Parking Supply and Demand

No vehicles were observed parked on the Riverina Highway, Humphreys Road or Mayfair Road during site inspections. This is to be expected for rural areas, where vehicles are typically parked off-street.

2.6 Public Transport

Buses provide a public transport connection between Howlong and Albury, with two services per day operating. From Albury, Inter-city coach and rail services are available from the Albury Train Station to locations including Melbourne and Sydney.

The Riverina Highway is also used by school bus operators.

2.7 Pedestrians and Cyclists

There are no dedicated cyclist or pedestrian facilities in the vicinity of the site, which is common in rural areas.

3 PROPOSED DEVELOPMENT

The proposed development is a sheep feedlot with a capacity for up to 3,750 head. Meat and Livestock Australia describes feedlotting as:

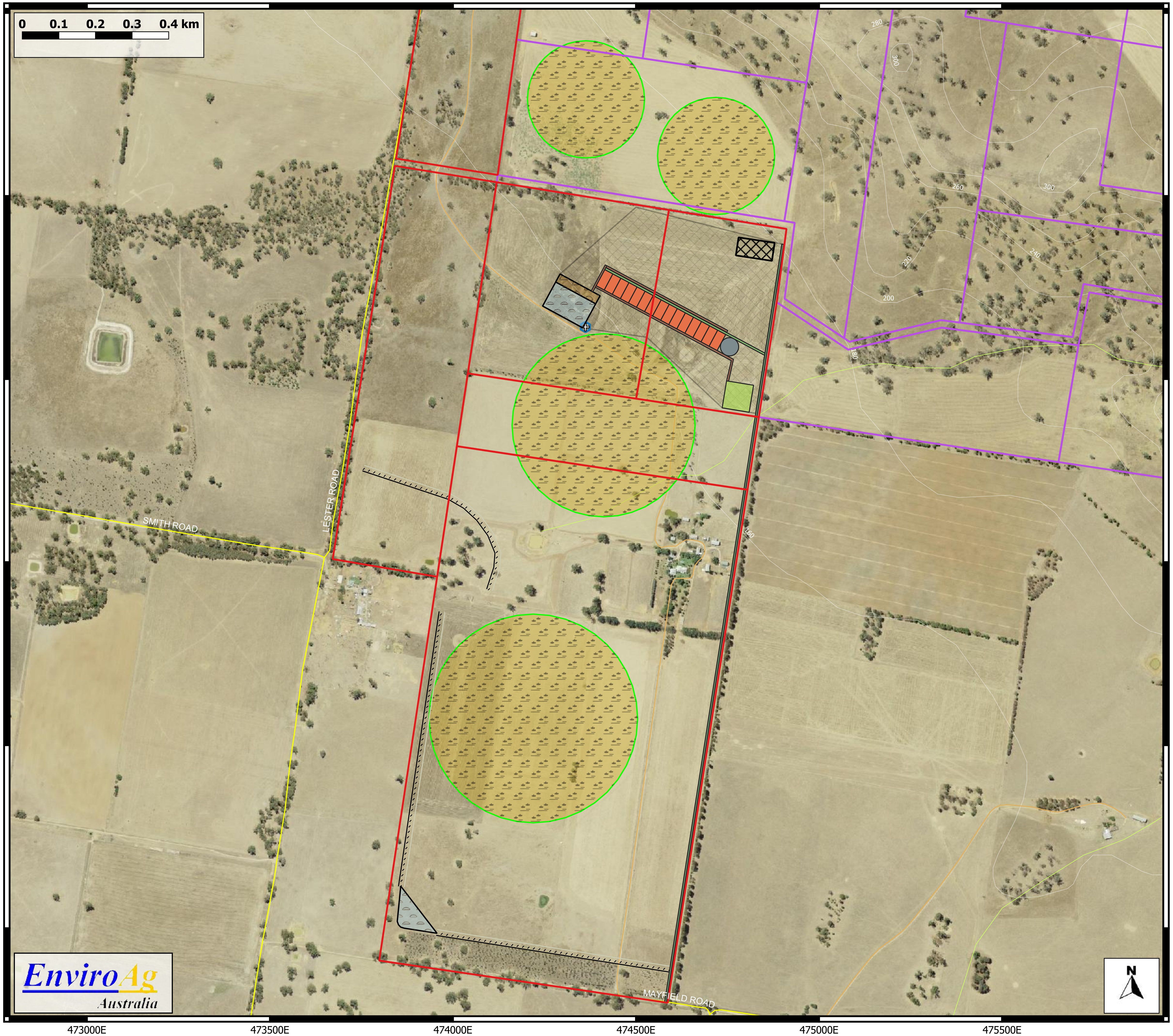
> *An intensive form of animal production where groups of animals are placed in yards or enclosures of a minimum size consistent with animal health and comfort. These animals are fed high quality feed rations to achieve optimal rates of liveweight gain.*

The proposed development consists of the following components:

- New property access off Mayfield Road, located near the eastern boundary of Lot 7 DP665615 and capable of accommodating vehicles up to and including B-Doubles;
- Facilities for bringing in, storing and removing livestock, including access roads (8m in width with cul-de-sac heads 36m in diameter), and handling yards;
- Holding pens and processing yards for livestock;
- Facilities for receival, storage and distribution of feed for livestock, including feed mill and silos; and
- Facilities for water and wastewater processing and storage, as well as for waste materials including manure.

Recognising the requirements for animal welfare, the site is proposed to operate 24 hours per day, however stock loading and unloading are not proposed to occur until after 5AM.

Plans of the proposed development are included below.



Concept Plan

Project: 24439 - Bungowannah Pastoral Company Pty Ltd

Legend

- Culverley Rise
- Weebo Park

Site Infrastructure

Proposed

- Access Road
- Access Lanes
- Livestock Lanes-Drains
- Pens
- Silos
- Feed Mill
- Handling Yards

Waste Management

- Sediment Pond
- Holding Pond
- Pump
- Tailwater drains
- Tailwater dam

WUA

- Irrigation
- Feedlot Area

Infrastructure

Road Network

- Road
- Unclassified

Environment

- Contours (10m)

Hydrolines

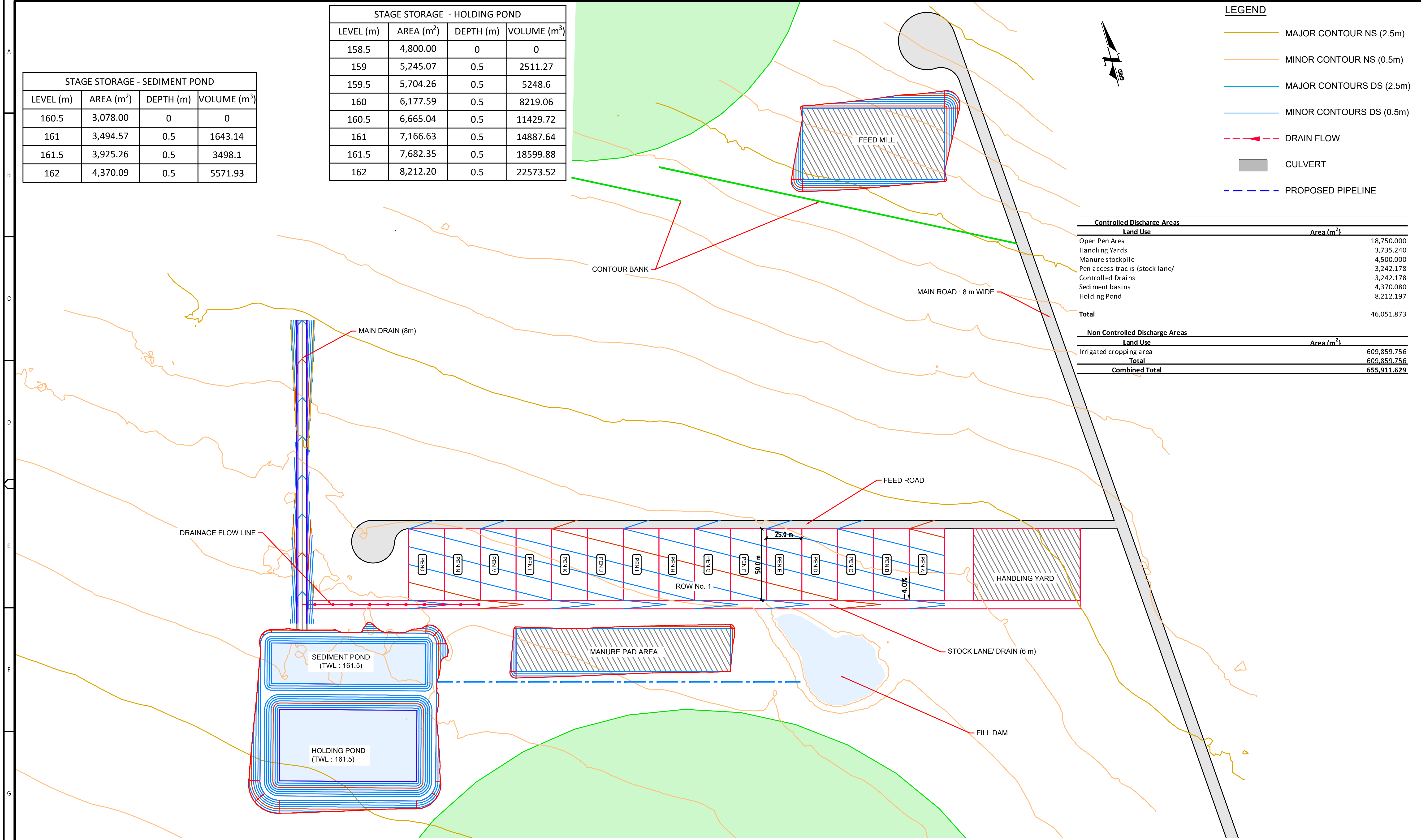
- Unclassified

Version: Rev B
Date: 19 May 2020
Drafted By: Pete Pearson
Scale: **1:10000**
CRS: EPSG:7855

Basemap and Data:
- SIX Maps (2018). New South Wales Government (Spatial Services).
- NSW Spatial Data Ctalogue (2018). New South Wales Government (Spatial Services).

STAGE STORAGE - SEDIMENT POND			
LEVEL (m)	AREA (m^2)	DEPTH (m)	VOLUME (m^3)
160.5	3,078.00	0	0
161	3,494.57	0.5	1643.14
161.5	3,925.26	0.5	3498.1
162	4,370.09	0.5	5571.93

STAGE STORAGE - HOLDING POND			
LEVEL (m)	AREA (m^2)	DEPTH (m)	VOLUME (m^3)
158.5	4,800.00	0	0
159	5,245.07	0.5	2511.27
159.5	5,704.26	0.5	5248.6
160	6,177.59	0.5	8219.06
160.5	6,665.04	0.5	11429.72
161	7,166.63	0.5	14887.64
161.5	7,682.35	0.5	18599.88
162	8,212.20	0.5	22573.52



LEGEND

- MAJOR CONTOUR NS (2.5m)
- MINOR CONTOUR NS (0.5m)
- MAJOR CONTOURS DS (2.5m)
- MINOR CONTOURS DS (0.5m)
- DRAIN FLOW
- CULVERT
- PROPOSED PIPELINE

Controlled Discharge Areas

Land Use	Area (m^2)
Open Pen Area	18,750.000
Handling Yards	3,735.240
Manure stockpile	4,500.000
Pen access tracks (stock lane/	3,242.178
Controlled Drains	3,242.178
Sediment basins	4,370.080
Holding Pond	8,212.197
Total	46,051.873

Non Controlled Discharge Areas

Land Use	Area (m^2)
Irrigated cropping area	609,859.756
Total	609,859.756
Combined Total	**655,911.629**

1:1500@ A1
1:3000@ A3 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 m

SITE LAYOUT PLAN

SCALE 1 : 1000

FOR INFORMATION

REV	DATE	REVISION DESCRIPTION	DRAWN	DWG CHECK	DESIGN	ENG DES CHECK	DRAFT SUPER	PROJECT APPROVAL
A1	08/05/2020	ISSUED FOR INFORMATION	BA	SL	SL	SCL	SCL	SCL

DRAWING NO. | REFERENCE DRAWING TITLE

PREPARED FOR:

PREPARED BY:

EnviroAg Australia

TOOWOOMBA OFFICE
PO BOX 411
1/3 FOUNDRY ST
TOOWOOMBA QLD 4350
T: 07 4638 2228

PROJECT: -----
DRAWING OFFICE: TOOWOOMBA

	BY	DATE
DRAWN	BA	08/05/2020
DWG CHECK	SL	08/05/2020
DESIGN	SL	08/05/2020
ENG DES CHECK	SCL	08/05/2020
DRAFT. SUPER.	SCL	08/05/2020
PROJECT APPROVAL	SCL	08/05/2020

TITLE
PROJECT NAME
PROJECT DESCRIPTION
SHEET CONTENTS

PROJECT NO. 24439
MOD NO.
SCALE AS SHOWN
DRAWING NO. 24439.CC.001
CADFILE CONCEPT PLAN CULVERLY RISE - REV A.dwg
REVISION 0
A1

4 IMPACT OF PROPOSED DEVELOPMENT

4.1 Traffic Generation and Impact

Traffic generation levels for proposed developments are typically determined by reference to published standards such as the *RTA (TfNSW) Guide to Traffic Generating Developments*, with the amount of traffic generated depending on the land use. In some cases, previous studies of similar sites can be used where published standards do not provide clear or up-to-date guidelines. Alternatively, traffic generation rates can be determined by a first-principles approach, based on an understanding of the site's operations.

No published standards or studies of similar sites could be found to substantiate a traffic generation rate for this type of land use. The anticipated traffic generation must therefore be estimated based on the anticipated operations at the site.

The sheep feedlot capacity is 3,750 head. Sheep will be delivered in either B-doubles or semi-trailers (assumed to be in a 50/50 split), capable of bringing in 800 and 350 sheep, respectively.

Sheep will then spend an average of 50 days at the facility, meaning there is an absolute maximum of seven drafts per year, although on average it is anticipated there will only be four drafts per year. The total number of sheep expected through the facility in any one year is therefore 15,000.

With a 50/50 split between B-Doubles and semi-trailers, a total number of sheep of 15,000 per year, and a capacity of 800 or 350 sheep per B-Double/semi-trailer, the total amount of traffic generated by bringing the sheep in is estimated to be 18 B-Doubles and 42 semi-trailers per year.

While at the facility, the sheep will be fed a mixture of grain, pellets and hay, some of which will be grown at the facility, but most of which will be imported. Sheep are fed approximately 1.5kg per head per day of grain, and 0.2kg per head per day of hay, for a total annual consumption of approximately 1,125 tonnes of grain and 150 tonnes of hay. Like the sheep, this will be delivered in a 50/50 split of B-Doubles and semi-trailers, capable of delivering 32 tonnes and 20 tonnes of either grain or hay respectively. Grain deliveries will require 17 B-Doubles and 28 semi-trailers per year, while hay deliveries will require 2 B-Doubles and 3 semi-trailers per year.

After spending 50 days at the facility, sheep will then be removed. With a 50/50 split between B-Doubles and semi-trailers, a total number of sheep of 15,000 per year, and a capacity of 750 or 300 sheep per B-Double/semi-trailer, the total amount of traffic generated by removing the sheep is estimated to be 20 B-Doubles and 50 semi-trailers per year.

In addition to traffic movements associated with sheep and feed, there will also be some staff movements, as well as servicing and deliveries/removals (such as plant, machinery and equipment servicing, or waste removal). It is assumed that there will be two staff on-site and one servicing or delivery per day.

Based on these assumptions, the traffic-generating activities for the proposed development are summarised in Table 4-1.

Table 4-1: Traffic Generating Activities – Proposed Development

Element	Trips per year	Trips per week	Trips per day
Sheep brought in	36 B-Doubles 84 Semis 120	2.3	0.3
Feed delivered	38 B-Doubles 62 Semis 100	1.9	0.3
Sheep removed	40 B-Doubles 100 Semis 140	2.7	0.4
Staff	1,460	28	4
Ancillary deliveries and servicing needs	730	14	2
Total	*2,550*	*49*	*7*

It is anticipated that at four drafts per year, the proposed development will generate an average of 7 trips per day, with 2 trips per hour anticipated in the peak hour. Even if the facility operated with seven drafts per year, the proposed development would generate an average of 8 trips per day, with 2 trips per hour anticipated in the peak hour. The majority of these will be light vehicles. Although it is noted that these average values may vary throughout the year, the amount of traffic generated by the proposed development is very low.

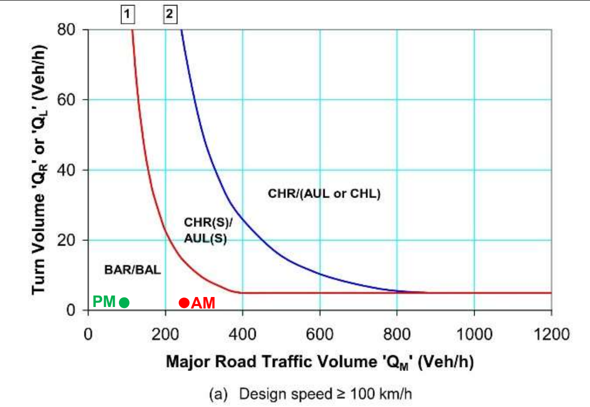
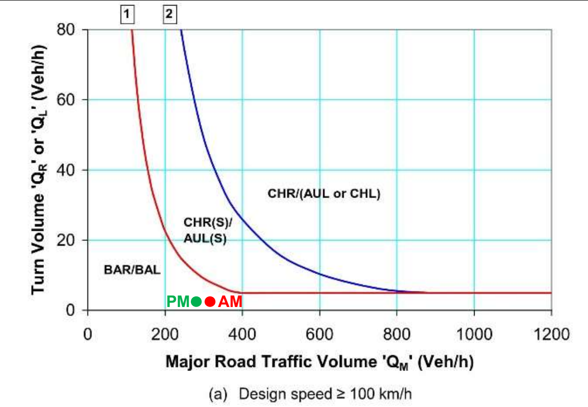
Noting that the Riverina Highway, Bungowannah Road and Humphreys Road carry 3,318, 562 and 16 vehicles per day (respectively), it is not anticipated that the additional seven vehicles per day generated by the proposed development would have any appreciable impact on the level of service of any of the key roads in the vicinity of the site.

As vehicles travel further throughout the network, traffic generated by the proposed development becomes more dispersed, and hence has a lower net impact on other roads. Hence if the impact on key roads in the vicinity of the site is within acceptable limits, then beyond these roads the impact will be even lower. It is concluded that there will be no significant impact on roads surrounding the site or further afield as a result of the proposed development.

4.2 Intersections

An assessment has been carried out to determine whether the volume of traffic generated by the proposed development is sufficient to warrant the provision of turning lanes at the intersection of the Riverina Highway and Humphreys Road, and if so, what type. This has been carried out in accordance with the procedure outlined in Appendix A.8 of the *Austroads Guide to Road Design Part 4: Intersections and Crossings – General*, using the anticipated traffic generated by the proposed development detailed in Section 4.1. These movements can then be used to determine the major road and left/right turning volumes (Q_M, Q_L/Q_R, respectively), which can then be plotted onto Figure A 10 from the *Austroads Guide to Road Design Part 4* to determine what turning lanes, if any, are warranted. This is shown in Table 4-2, below.

Table 4-2: Major road and turning volumes – with proposed development

Left Turn	Right Turn
	

This shows that the following auxiliary lane treatments are warranted at the intersection of the Riverina Highway and Humphreys Road:

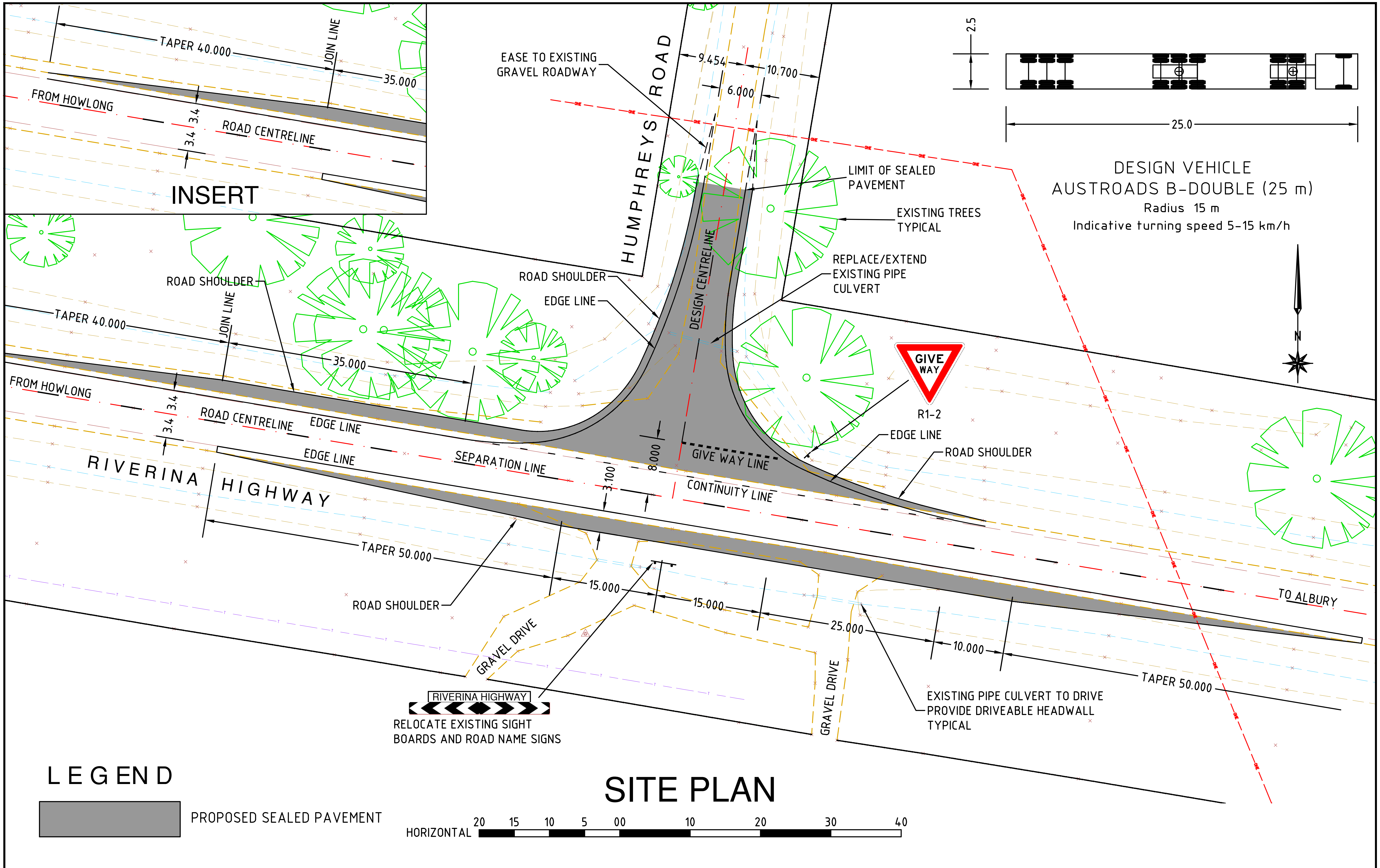
- A Rural BAR (Basic Right Turn) treatment for westbound traffic on the Riverina Highway turning right into Humphreys Road; and
- A Rural BAL (Basic Left Turn) treatment for eastbound traffic on the Riverina Highway turning left into Humphreys Road.

A concept design for the proposed intersection is included as Drawing 0085-01, below, with the following characteristics:

- Design speed 110km/h (slightly higher than posted speed limit of 100km/h);
- Design vehicle 25m B-Double;
- Rural BAR treatment based on criteria in Section A.16.5 of *Austroads Guide to Road Design Part 4: Intersections and Crossings – General* (including Figure A 28), with pavement widened from 3.4m to 6.5m, storage length 25m and distance X equal to 15m; and
- Rural BAL treatment based on criteria in Section 8.2.1 of *Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections* (including Figure 8.2), with pavement widened from 3.4m to 6.0m, setback from centre of road to side road hold line (S_b) equal to 8.0m and length of parallel widened shoulder (P, from Table 8.1) equal to 35m.

An assessment has also been carried out to determine the ability of the intersection of Humphreys Road and Mayfield Road to accommodate turning movements by vehicles up to and including B-Doubles. A swept path analysis is included as Drawings 0085-02 and 0085-03 (below) demonstrating that vehicles can make this turn and remain with the road reserves of Humphreys Road and Mayfield Road. This may require removal and/or trimming of some trees on the northern side of the intersection to accommodate these movements.

It should also be noted that although Humphreys Road is authorised for travel by B-Doubles, Mayfield Road is not. Mayfield Road should be gazetted for travel by B-Doubles between Humphreys Road and the site access.



Spotto CONSULTING

DESIGNED BDC

DRAWN BDC

20 / 04 / 20

SWS

APPROVED

RIVERINA HIGHWAY

PROPOSED SHEEP FEEDLOT - BUNGOWANNAH

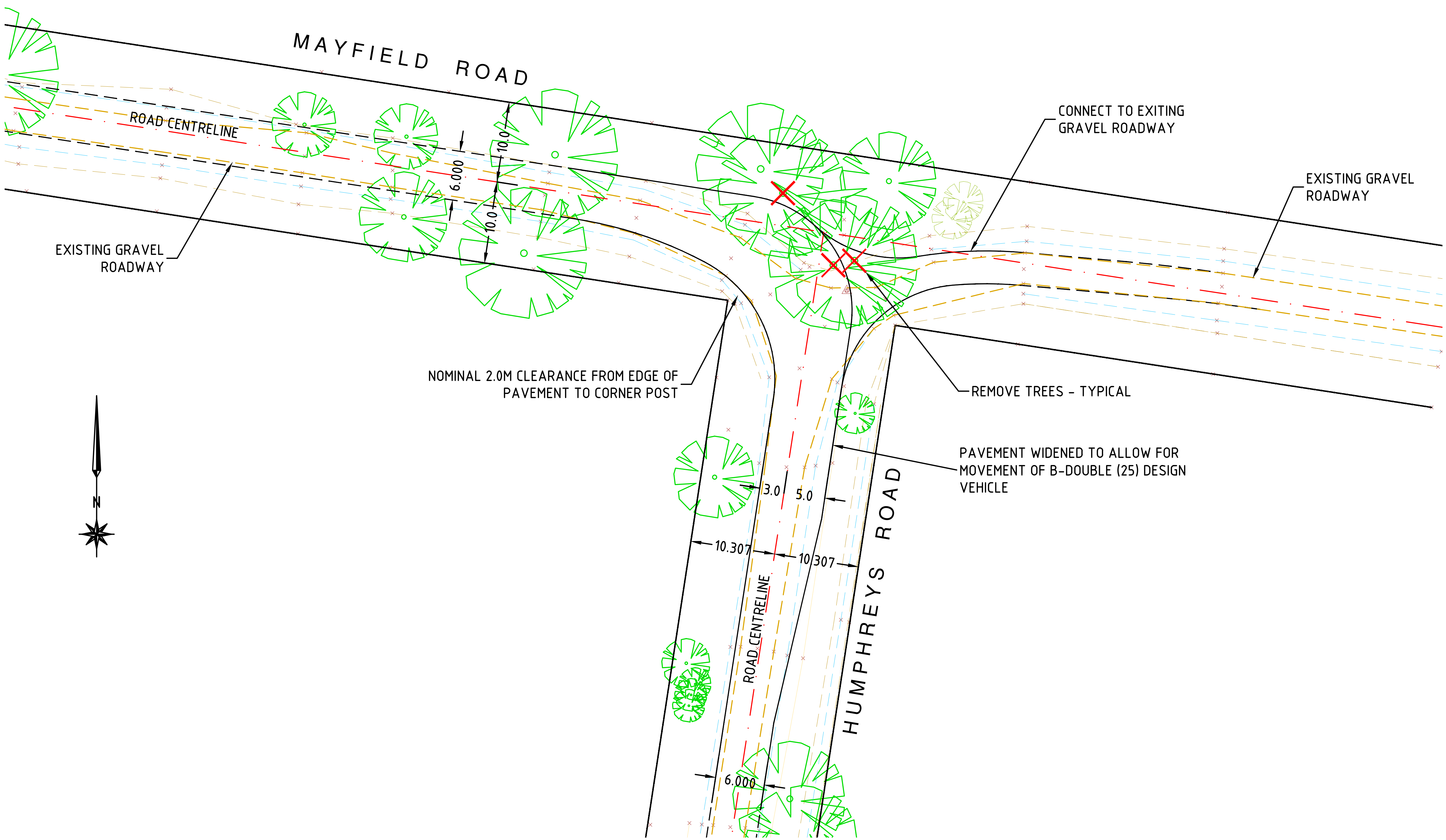
HUMPHREYS ROAD - PROPOSED INTERSECTION UPGRADE

SCALE 1 : 500

REV.

A3

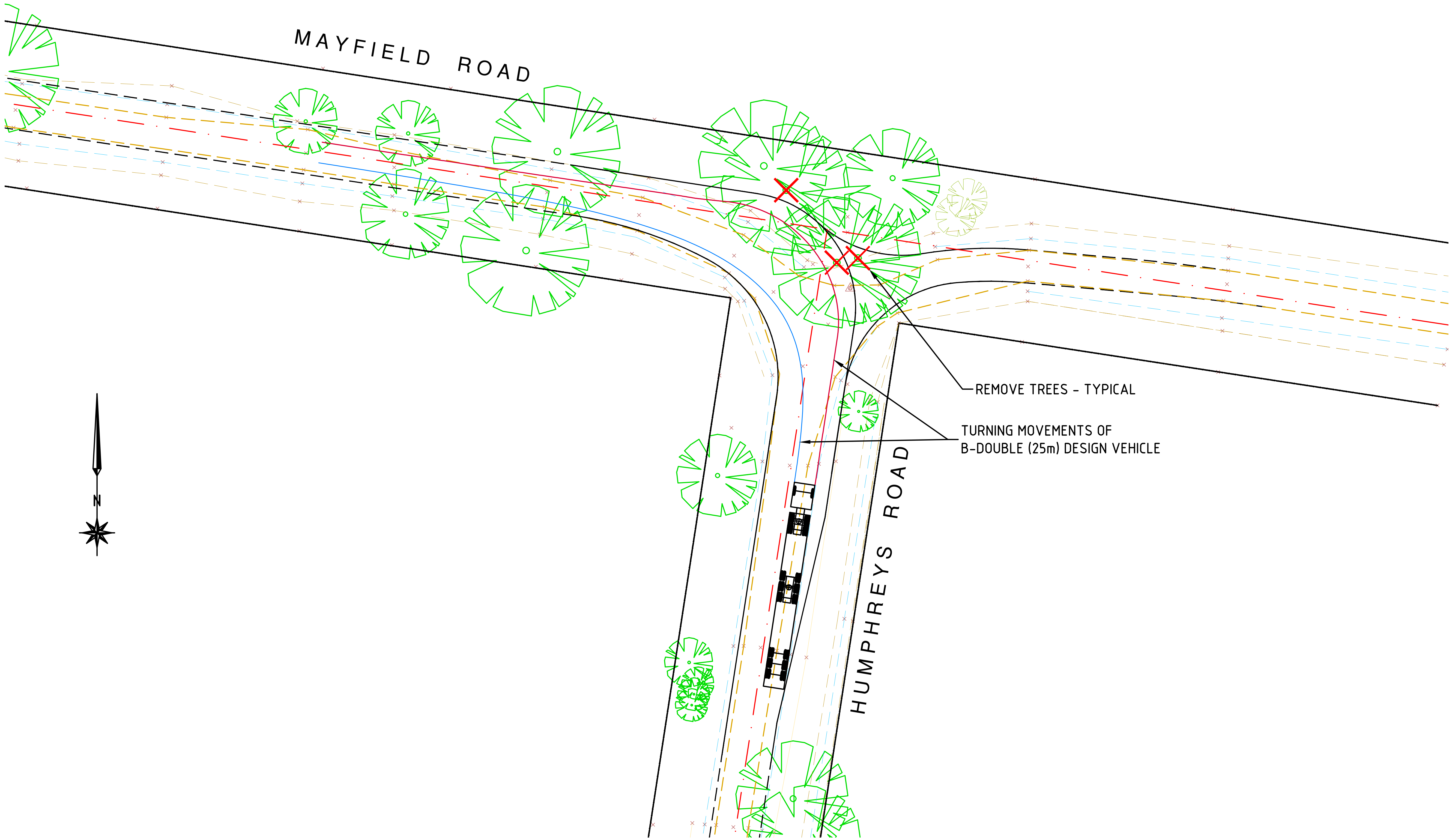
DRAWING NUMBER 0085-01



SITE PLAN

HORIZONTAL 20 15 10 5 00 10 20 30 40

Spotto CONSULTING	DESIGNED BDC DRAWN BDC	20 / 04 / 20 SWS APPROVED	RIVERINA HIGHWAY PROPOSED SHEEP FEEDLOT - BUNGOWANNAH HUMPHREYS ROAD - MAYFIELD ROAD INTERSECTION	SCALE 1 : 500 REV. A3 DRAWING NUMBER 0085-02



B-DOUBLE (25m) TURNING MOVEMENTS

HORIZONTAL 20 15 10 5 00 10 20 30 40

Spotto CONSULTING	DESIGNED BDC DRAWN BDC	20 / 04 / 20 SWS APPROVED	RIVERINA HIGHWAY PROPOSED SHEEP FEEDLOT - BUNGOWANNAH HUMPHREYS ROAD - MAYFIELD ROAD: TURNING MOVEMENTS	SCALE 1 : 500 REV. A3 DRAWING NUMBER 0085-03

4.3 Site Access and Parking

Access to the site is proposed to be from Mayfield Road, near the eastern boundary of Lot 7 DP665615 (approximately 140m west of Humphreys Road and 120m east of the existing site access). It is recommended that the access be designed as a typical rural property access, capable of accommodating vehicles up to and including B-Doubles, in line with the requirements of Section 7.2.3 of the *Austroads Guide to Road Design Part 4: Intersections and Crossings – General*. An example of this is shown in the RMS (TfNSW) Model Drawing – Typical Rural Property Access Standards (Figure 2 – Articulated Vehicles), a copy of which is included below.

The property access will connect to an internal access road network which gives access to the feedlot (approximately 1.8km north of Mayfield Road). This will be a private road, capable of supporting vehicles up to and including B-Doubles. Vehicles will be able to manoeuvre within the site via the access road network, park where necessary and turn as required, permitting forward entry to and exit from the site onto the road network.

In general on-site parking requirements will be limited. Trucks delivering or removing sheep will stand near the holding yards or pens, with feed trucks able to stand near the feed mill. As there will only be 2-3 per week of each type, and their movement can be managed to minimise the chance of arriving at similar times, the access and parking arrangements for trucks is considered adequate.

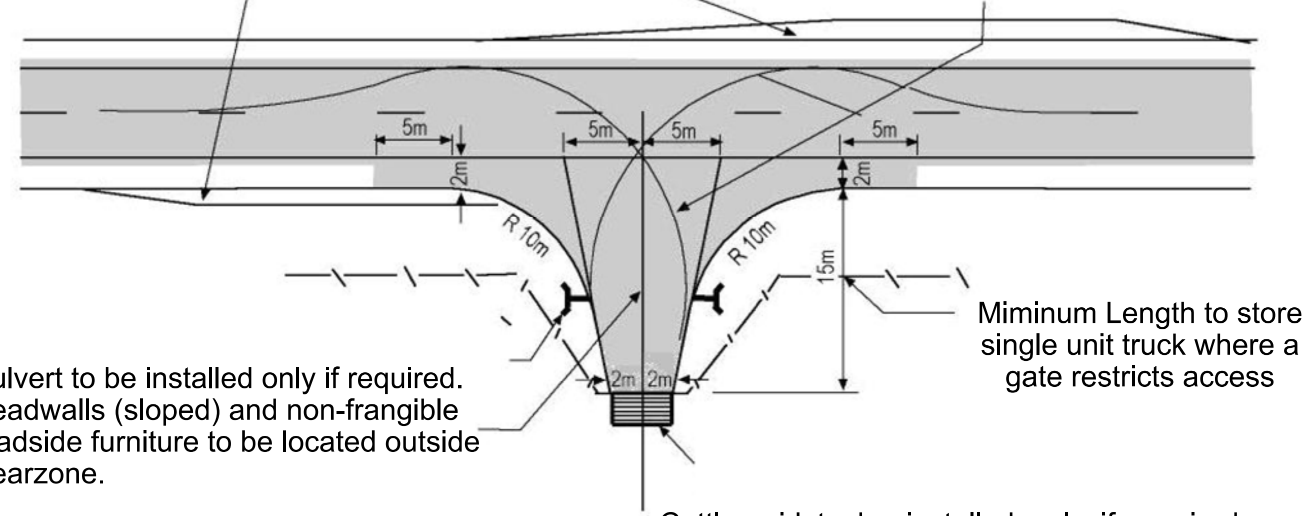
Other parking requirements include staff parking and servicing or delivery vehicles. Staff will be able to park in locations appropriate to where they will be working (for example, near the handling yards, feed mill or sheep pens) without obstructing other vehicles. Service and delivery vehicles will be able to do likewise.

It is concluded that the proposed development provides adequate off-street parking spaces and manoeuvring areas to meet the anticipated demand, without any adverse effect on the surrounding road network.

4.4 Pedestrian and Cyclist Impact

It is not proposed to make any change to pedestrian or cyclist infrastructure in the vicinity of the site. Therefore it is not anticipated that there would be any significant impact on pedestrians or cyclists as a result of the proposed development.

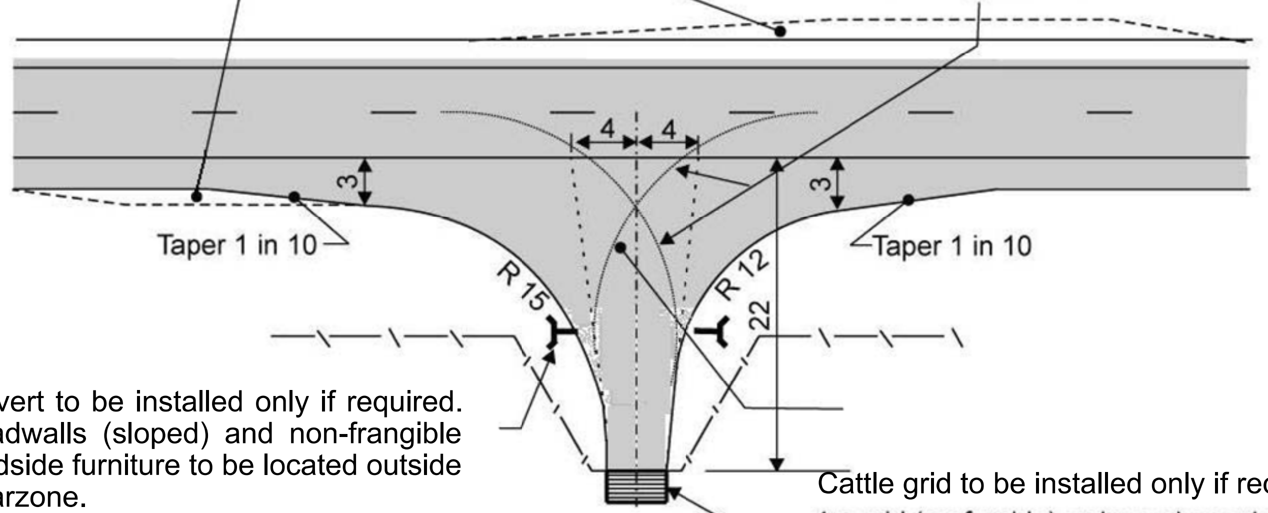
Typical Rural Property Access Standards



Culvert to be installed only if required. Headwalls (sloped) and non-frangible roadside furniture to be located outside clearzone.

Access to be constructed with approved compacted roadbase material and sealed as per Council specifications and requirements.

Cattle grid to be installed only if required. An inward opening 3.6m gate set back 15m from edge line is an alternative if access point is to be used by single unit vehicles 12.5m long or less.



Culvert to be installed only if required. Headwalls (sloped) and non-frangible roadside furniture to be located outside clearzone.

Access to be constructed with approved compacted roadbase material and sealed as per Council specifications and requirements.

Cattle grid to be installed only if reqired. 4m grid (preferable) or inward opening 3.6m gate.

Where road train access is required, the desirable width of 8 m should be provided (minimum width is 6 m).

1. Single Unit Truck

2. Articulated Vehicles

Access Driveway Sight Distance
(AS2890.1)

Speed Limit km/h	Sight Distance (rounded to nearest 5m)
50	70
60	85
70	100
80	110
90	125
100	140
110	155

NOTES:

A: Council may require work to be undertaken to Auspec standards www.natspec.com.au

B: All ongoing maintenance to rural propety access is the responsibility of the property owner.

No.	Amendment Description	Initials	Date

A3 original | This sheet may be prepared using colour and may be incomplete if copied | Co-ordinate System: MGA Zone 56 | Height Datum: A.H.D.

SCALES: NOT TO SCALE

Transport Roads & Maritime Services

DESIGNED. ....

REVIEWED. ....

ROADS AND MARITIME SERVICES

MODEL DRAWINGS

TYPICAL RURAL PROPERTY ACCESS STANDARDS

FILE No.

DRAWING 27/02/2015

PRINTED DATE

SHEET No.

REGISTRATION NUMBER

PRODUCED: $DATE$ AT $TIME$ $USER$
FILE PATH: $FILE$
PLOT DRIVER: $PLTDRVL$
PEN TABLE: $PENTBL$

5 CONCLUSIONS AND RECOMMENDATIONS

It is concluded that:

- Traffic surveys and analysis of key roads in the vicinity of the site (including Humphreys Road, the Riverina Highway and Bungowannah Road) shows that the roads currently carry low levels of traffic, and operate at an excellent Level of Service (LOS A, the highest level);
- The proposed development is anticipated to generate an additional 2 vehicle trips per hour in the peak period, and a total of 7 vehicle trips per day, which will not have a significant impact on the performance of the surrounding road network;
- The site and proposed development allows vehicles to enter and exit the site in a forward direction, with adequate room available on site to park anticipated vehicles; and
- There is no significant impact of the proposed development on pedestrians and cyclists.

It is recommended that:

- The intersection of the Riverina Highway and Humphreys Road be upgraded to incorporate Rural BAR (Basic Right Turn) and Rural BAL (Basic Left Turn) treatments, capable of accommodating vehicles up to and including a B-Double;
- The intersection of Humphreys Road and Mayfield Road (including approaches) be upgraded to allow vehicles up to and including a B-Double to safely negotiate the turn, including possible removal and/or trimming of some trees;
- Mayfield Road be gazetted for travel by B-Doubles between Humphreys Road and the proposed site access (approximately 140m west of Humphreys Road); and
- Access into the site be designed as a typical rural property access (as detailed in Section 7.2.3 of the *Austroads Guide to Road Design Part 4: Intersections and Crossings – General* and shown in RMS (TfNSW) Model Drawing – Typical Rural Property Access Standards (Figure 2 – Articulated Vehicles).

APPENDIX E:

Vegetation Assessment

Hamilton Environmental Services
ABN: 89 108 410 911

TEST OF SIGNIFICANCE – 'CULVERLEY RISE', BUNGOWANNAH

blueprint PLANNING & DEVELOPMENT

Test of Significance – 'Culverley Rise', Bungowannah

Submitted to: Bungowannah Pastoral Company Pty. Ltd.
c/o James Laycock
Blueprint Planning
3/576 Kiewa Street
ALBURY NSW 2640

Phone: 02 6023 6844
Mobile: 0427 090 149
Email: james@blueprintplanning.com.au

Submitted by: Steve Hamilton
Hamilton Environmental Services
2345 Benalla-Tatong Rd.
TATONG VIC 3673

Phone: 03 5767 2358
Mobile: 0409 356 331
Email: steve.hamilton@hamiltonenvironmental.com.au
ABN: 89 108 410 911

Version 2, 1st June 2020

Cover Photo: Looking across the proposed feedlot area.

TABLE OF CONTENTS

1. INTRODUCTION

Bungowannah Pastoral Company Pty. Ltd. is seeking to obtain development consent from Greater Hume Council (GHC) for a 3,750 head sheep feedlot. The proposed Culverley Rise Feedlot will be located on the property known as 'Culverley Rise' at 198 Humphreys Road, Bungowannah, which is approximately 21 km north-west of Albury.

In January 2020, Hamilton Environmental Services (HES) was engaged by Bungowannah Pastoral Company Pty. Ltd. (the landholder), through Blueprint Planning, to undertake a Biodiversity Assessment of the proposed development areas; assessment indicated that a Biodiversity Assessment Development Report was not required, and a Test of Significance assessment has been produced according to Part 7 Division 1 Section 7.3 of the *Biodiversity Conservation Act 2016.*

Field assessment of the proposed development site was conducted on the 26th March 2020 by Dr. Steve Hamilton, and this report presents these findings.

2. BACKGROUND

2.1 Consultant Background

Steve Hamilton (Dr.)

AssocDipAppBiol, BAppSc(AppBiol), MAppSc (RMIT), PhD (University of Melbourne), BAM accredited Assessor (DPIE NSW), Vegetation Quality Assessment Certified (DSE/DEPI/DELWP Victoria),Bush Broker Assessor (DELWP Victoria), Certificate IV in Training and Assessment.

Steve is an ecologist specialising in flora and fauna inventory, auditing, monitoring and surveying, as well as soil typing, analysis and mapping. He has 12 years consulting experience, associated with a range of ecological evaluations and monitoring processes across all of Victoria, and southern and western New South Wales, which includes assessing and mapping vegetation condition, vegetation type, targeted threatened species surveys, habitat quality assessment (in Victoria, Habitat Hectares assessment and 'Net Loss and Gain' evaluations), across the range of terrestrial, riparian and wetland ecosystems.

He has vast experience in the assessment of native vegetation and species, and habitat loss assessment, for irrigation, residential, infrastructure and mining (including sand, rock and ore extraction) developments, and the successful negotiation of the appropriate legislative, regulatory and statutory frameworks across the three levels of Government to provide suitable outcomes for clients across both States to allow developments to proceed. In Victoria, this involves the production of Net Loss Reports, Vegetation Offset Management Plans and Work Plans, and in NSW, reporting for potential native vegetation/habitat losses and threatened species threats in Development Applications (DAs), and in more detailed situations where Director General Requirements (or Secretary's Environmental Assessment Requirements; SEARs) are specified, Environmental Impact Statements (EISs) or Reviews of Environmental Factors (REFs).

Beyond statutory requirements and reporting, Steve is often called upon to provide technical reporting into particular issues, such as research/survey investigations into vegetation-soil-fauna management issues in natural areas or for development proposals, such as weed management surveys and strategies, kangaroo survey and management, potential mining pollution impacts, sustainability of timber resources, soil mapping and land capability assessment, ecosystem restoration, or revegetation design.

Prior to consulting, Steve spent 20 years as a senior teaching/research academic, and has more than 30 peer-reviewed papers and many technical reports, most focussing on the impacts of disturbance on the ecology and floristics of woodlands and grasslands.

2.2 Location and Description

The proposed development area is located approximately 7.8 km west of the Howlong township (Fig. 2-1), and 21 km north-west of Albury.

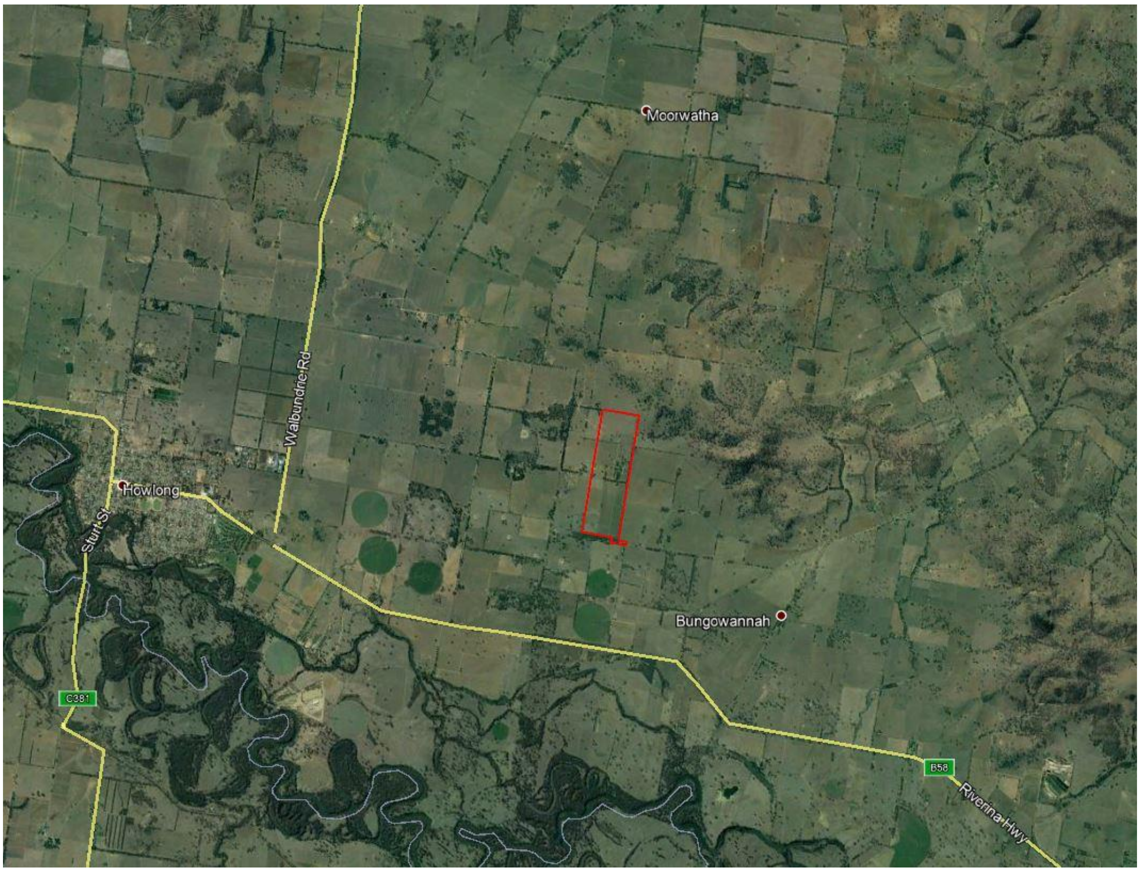


Figure 2-1 Aerial image of the general location of the assessed parcels, outlined in red (Google Earth 2020).

2.2.1 Development location and description

The proposed feedlot development will occur over parcels Lot 7 DP665615, Lot 7 DP665616, Lot 74 DP753749, and Lot 75 DP753749, with some impact on the northern road reserve of Mayfield Road where it is intersected by the south-eastern corner of Lot 7 DP665615, and at the intersection of Mayfield and Humphries Roads; these road reserve impacts are due to the development of suitable access for B-double trucks entering and leaving the feedlot development (James Laycock pers. comm. 2020, Michael Dunn pers. comm. 2020).

These parcels are fully fenced for stock, and have been almost wholly cleared of woody vegetation, and have clearly been used for cropping and grazing for an extended period based on the predominantly introduced species ground layer. There are some scattered individuals of mature Yellow Box (*Eucalyptus melliodora*), Grey Box (*E. microcarpa*) or White Box (*E. albens*) found near the boundary of these land parcels, and there have been numerous linear plantations of a mixture of indigenous, exotic and non-indigenous native trees and shrubs planted along fence lines in all parcels.

The northern Mayfield Road reserve does contain some small patches and scattered individuals of mature Grey Box trees, with a predominantly introduced species ground layer.

An access road of a proposed 2.55 km length to the feedlot development will align along the eastern boundary of Lot 75 DP753749 and Lot 7 DP665615 (see Figures 2-2 and 2-3), and as indicated will exit on to Mayfield Road where it is intersected by the south-eastern corner of Lot 7 DP665615; the access road will have a maximum width of 20 m (Michael Dunn pers. comm. 2020).

2.2.2 Pivot irrigator development

The development of three proposed pivot irrigator sites (see Fig. 2-2) associated with the feedlot development on parcels Lot 7 DP665615, Lot 7 DP665616 and Lot 74 DP753749, required the removal of four living and two standing dead mature Yellow Box trees, and the loss of some trees within plantations; permission for clearance was negotiated with Local Land Services (LLS).

The removal of the two standing dead trees and the removal of any plantation trees were permitted without the need for approval as ‘Allowable Activity’ under the *Local Land Services Act 2013*; the trees within these plantations were not planted with the assistance of public funding, which enabled this approval.

‘Culverley Rise’ was calculated by LLS as having greater than 10 % Category 2 – Regulated Land. The four living Yellow Box trees were considered Category 2 – Regulated Land (paddock tree areas) and therefore required approval to clear via notification under Part 5 Division 1 of the Land Management Code. The landholder was authorised to clear these four trees via Notification Event Number LMC02480 under Part 5 Division 1 of the Land Management Code on the 2nd April 2020.

2.2.3 Feedlot development

As indicated previously, Bungowannah Pastoral Company Pty. Ltd. is seeking to obtain development consent from Greater Hume Council (GHC) for a 3,750 head sheep feedlot. Bungowannah Pastoral Company may seek to expand the facilities in the future; however, this development will be limited to 3,750 sheep with the current proposal.

Thee feedlot development is across parcels Lot 74 DP753749 and Lot 75 DP753749, and will occupy approximately 22.8 ha of these parcels.

The facility would contain the following features (after EnviroAg Australia 2020):

- Holding pens;
- Sheep processing yard;
- Truck parking area;
- Workshop;
- Laydown area;
- Feed shed;
- Waste disposal facilities;
- Weighbridge;
- Stock dam;
- Wastewater irrigation areas;
- On site bores;
- Tail water / contaminated agriculture runoff dam(s);

- Sediment basin;
- Holding pond;
- Suitable drainage structures;
- Manure storage area; and,
- Water storage tanks.

The Site Layout for the proposed feedlot development is shown in Figures 2-2 and 2-3, and the Turning movements plan for B-doubles at the intersection of Mayfield and Humphreys Road is shown in Fig. 2-4.

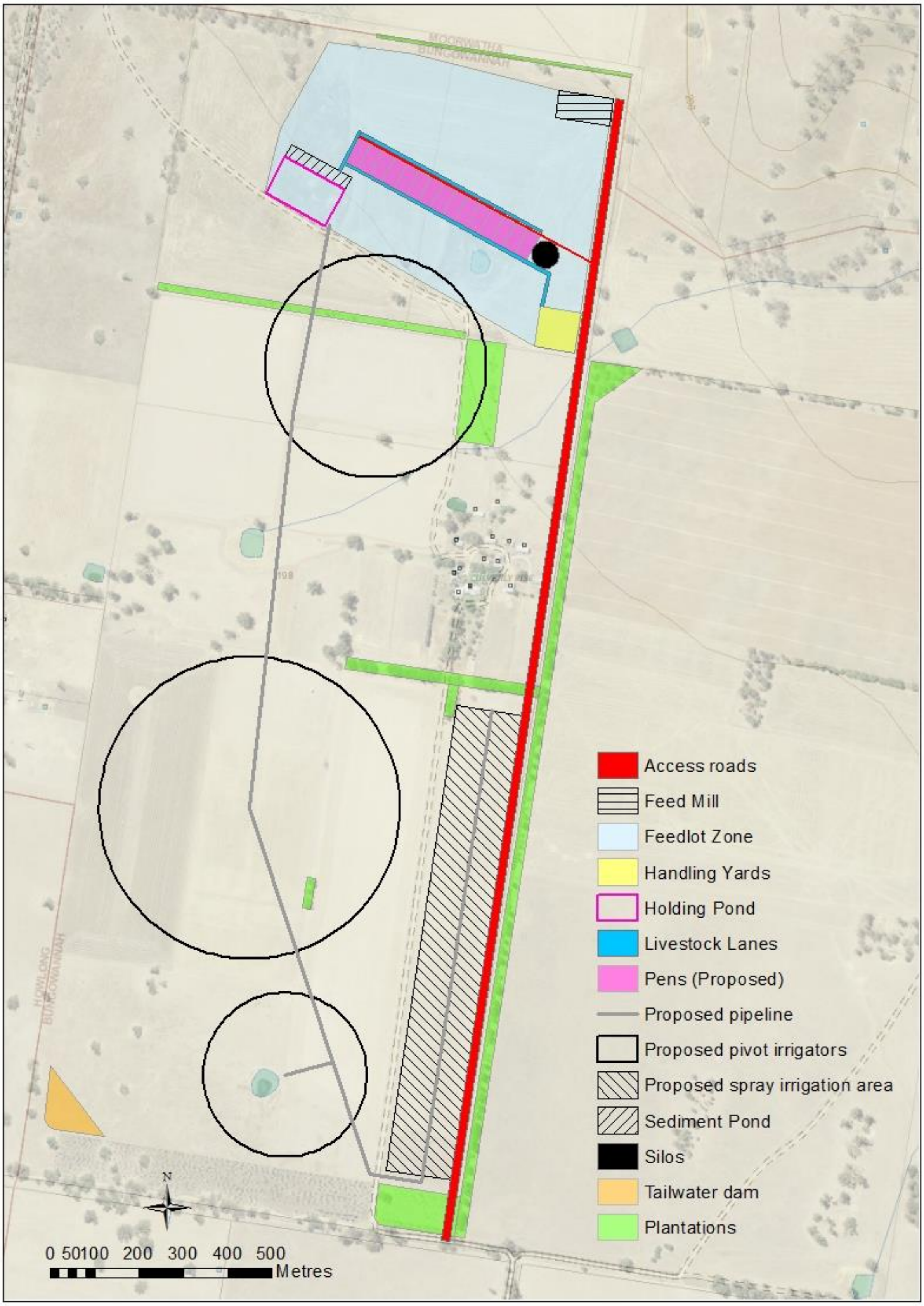


Figure 2-2 Aerial image of the proposed feedlot layout at 'Culverley Rise', Bungowannah (Image copyright NSW Land and Property Information 2020).

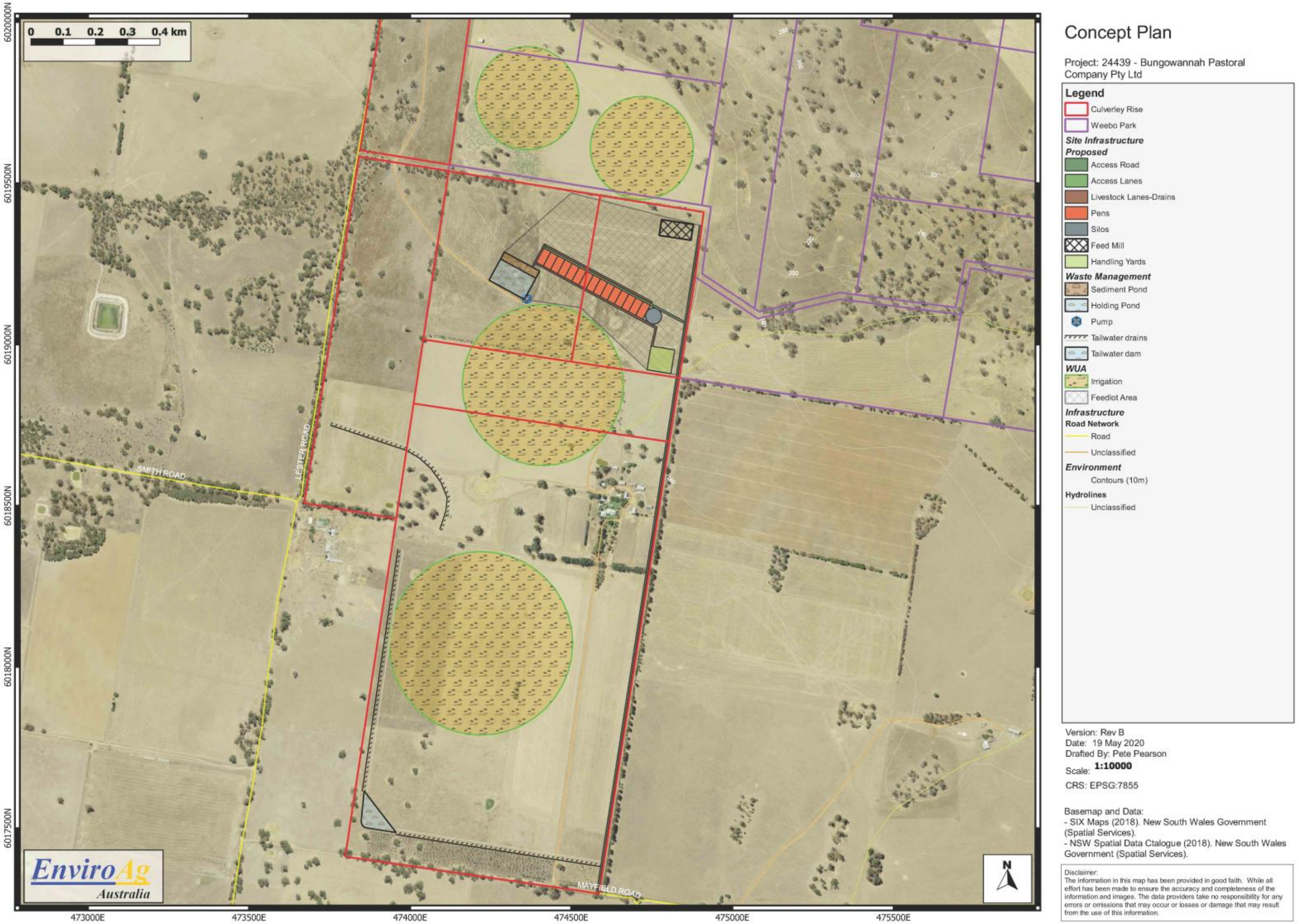


Figure 2-3 **Site Layout for the proposed feedlot development at 'Culverley Rise', Bungowannah (EnvironAg Australia dated 19/5/20).**

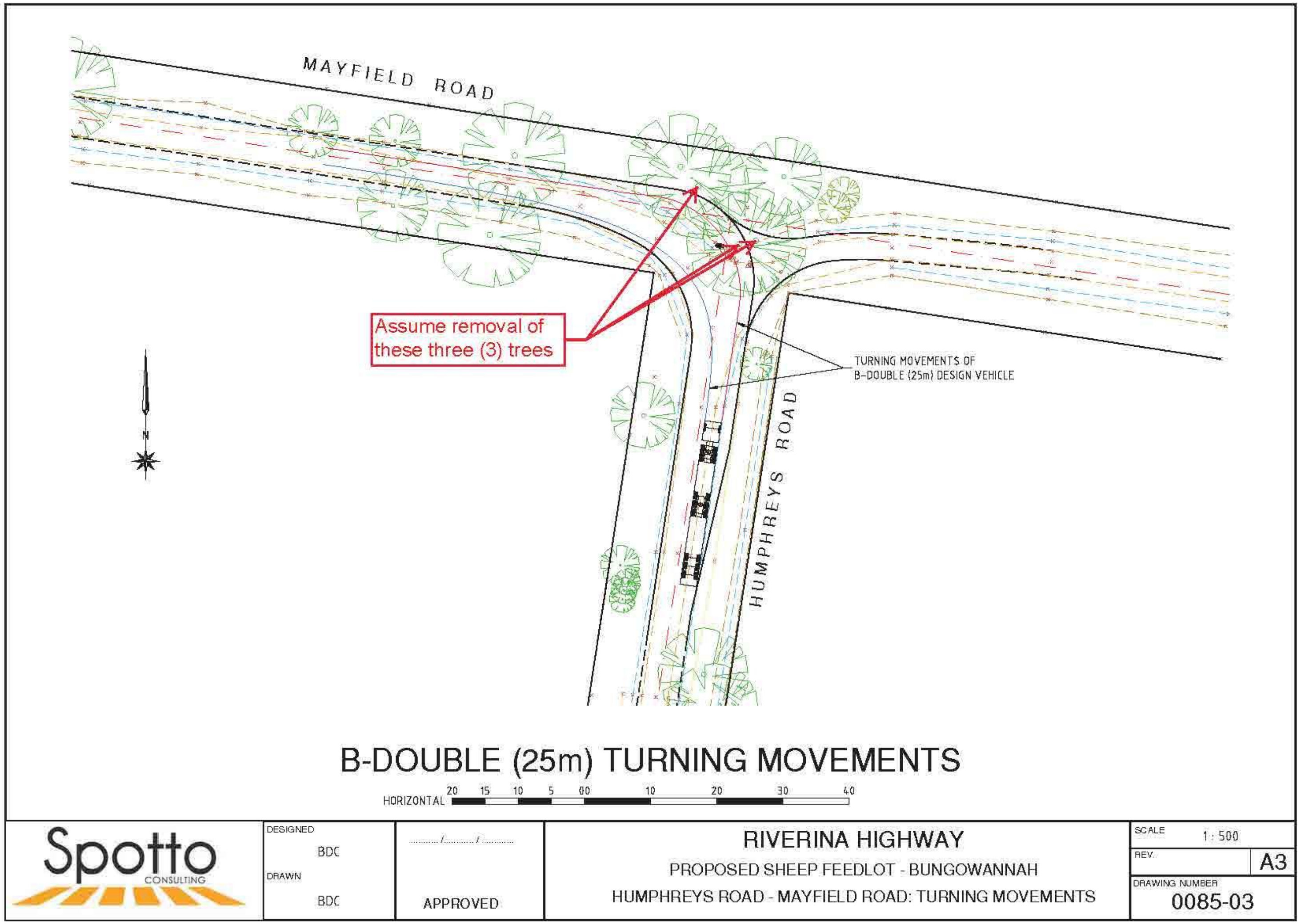


Figure 2-4 Turning movements plan for B-doubles at the intersection of Mayfield and Humphreys Road (Spotto Consulting dated 17/4/20).

3. METHODOLOGY

3.1 Desktop Review

The following desktop information was gathered prior to field assessment:

- Aerial imagery and base map from Land and Property Information New South Wales;
- Determination of a general species list for the area (Department of Planning, Industry and Environment [DPIE] 2020a);
- Matters of National Significance reporting for the 20 km radius around the property (Department of Agriculture, Water and Environment [DAWE] 2020);
- Flora, fauna and threatened species lists, sighting records and information for the district was obtained from *BioNet – Website of the Atlas of NSW Wildlife* (DPIE 2020b).

3.2 General Site Assessment

On the 26th March 2020, Dr. Steve Hamilton (BAAS 18106) visited the property and the adjacent area to undertake the assessment. On this day, air temperatures were between 16 and 24°C, the sky was clear, and winds were calm (Bureau of Meteorology 2020).

The proposed development area was traversed by vehicle and/or foot, and continuous active searching was conducted over a total period of 2 hours.

In a general sense, the following assessments were undertaken in each zone:

- Vascular plant species were identified and noted according to zone, with an overall cover/abundance value recorded for each species in each zone completed post-field assessment (see Table 3-1);
- The species, location, diameter, health and basic hollow characteristics of all assessed tree individuals was recorded, and an image of the tree taken;
- Opportunistic recording of any fauna;
- Digital images across the site taken.

One hundred and twelve (112) images were taken across the proposed development area during the assessment to facilitate identification and to provide context to the description.

3.3 Taxonomy

3.3.1 Flora

Vascular plants that could not be identified in the field, specimens and images were collected for identification using the *Flora of New South Wales* (Harden 1990, 1991, 1992, 1993), and *PlantNet Flora On-line* (Royal Botanic Gardens Sydney 2020).

3.3.2 Fauna

Any fauna observed were recorded, with the nomenclature based variously on the compilations of Hero *et al.* (1991), Menkhorst (1995), Cogger (1996) and Simpson and Day (1998), utilising Triggs (1996) for identification using indirect methods, such as the presence of scats or tracks.

Table 3-1 Modified Braun-Blanquet scale applied to assessment to each vascular plant species identified.

Visual assessment of cover/abundance	
Symbol	*Description*
+	rare, cover < 5%
1	Uncommon, cover < 5 %
2	Very common, cover < 5 % or cover 5-25 % with any number of individuals
3	Cover 25-50 % with any number of individuals
4	Cover 50-75 % with any number of individuals
5	Cover 75-100 % with any number of individuals

4. EXISTING ENVIRONMENT

4.1 Vegetation

The inventory of species noted across the parcels and pertinent areas is recorded in Appendix A.

A total of 33 vascular plant species were recorded across the proposed development area, road reserves and in pertinent plantations; 27 of these species were introduced, and 6 were indigenous (Table 4-1; Appendix A).

Table 4-1 The number of indigenous and introduced species across the designated zones across the proposed development area, road reserves and in pertinent plantations.

Zone	Introduced species	Indigenous species	Total species
Feedlot site	10		10
Track alignment	11	1	12
Plantation H & road reserve	17	6	22
Intersection	9	1	10
Total	**27**	**6**	**33**

There were no rare or threatened species observed (after DPIE 2020a).

As indicated, parcels are fully fenced for stock, and have been almost wholly cleared of woody vegetation, and have clearly been used for cropping and grazing for an extended period. The ground layer in all areas of the proposed development is dominated by introduced species.

There are some scattered individuals of mature Yellow Box, Grey Box or White Box found near the boundary of these land parcels, and there have been numerous linear plantations of a mixture of indigenous, exotic and non-indigenous native trees and shrubs planted along fence lines in all parcels. None of these plantations were established with public funds (Michael Dunn pers. comm. 2020). These plantations have slightly different compositions, as indicated below (see Fig. 4-1):

- Plantation A. This was composed of Peppercorn Tree, Long-leaved Box, Swamp Mallet and Southern Mahogany. This plantation will have been cleared without a permit as an 'Allowable Activity' in the establishment of the pivot irrigators;
- Plantation B. This single row plantation is composed of Red Ironbark, Yellow Box, Southern Mahogany and Silver Wattle. Part of this plantation will have been cleared without a permit as an 'Allowable Activity' in the establishment of the pivot irrigators;

- Plantation C. This plantation is composed of Red Ironbark, Yellow Box, Southern Mahogany and Silver Wattle. Part of this plantation will have been cleared without a permit as an 'Allowable Activity' in the establishment of the pivot irrigators;
- Plantation D. The composition of this long linear plantation is variable, but throughout its length contains Red Ironbark, Spotted Gum, Yellow Box, River Red Gum, White Cedar, English Elm, Southern Mahogany, and Small-flowered Honey-myrtle.
- Plantation E. Composed wholly of mature and sucker-recruited English Elm;
- Plantation F. Composed wholly of mature and sucker-recruited English Elm;
- Plantation G. A single row plantation that has experienced considerable mortality composed of Yellow Box, River Red Gum and Silver Wattle;
- Plantation H. A wide plantation composed of River Red Gum, Gold-dust Wattle, River She-oak, Argyle Apple and Small-flowered Honey-myrtle.

The proposed feedlot site has a wholly introduced species ground layer, including species such as Capeweed, Great Brome, Toowoomba Canary Grass, Common Storksbill, Paterson's Curse, Hensbit, Small-flowered Mallow and Subterranean Clover (80 % projective foliage cover counting cured annual plant material). There were no indigenous ground layer species observed in this area (Appendix A).

The northern section of the proposed access road is within the same parcel as the feedlot site. While the alignment passes through both Plantation E and H in its transit to Mayfield Road, the intervening cleared areas adjacent to Plantation D in the southern sections of its alignment are dominated by a range of introduced species, including Capeweed, Great Brome, Toowoomba Canary Grass, Common Heliotrope, Water Couch, Common Storksbill, Paterson's Curse, Hensbit, Small-flowered Mallow and Subterranean Clover (90 % projective foliage cover counting cured annual plant material). Blown Grass was the only indigenous ground layer species observed in this area (< 1 % projective foliage cover; Appendix A).

The far eastern section of Plantation H and the immediately adjacent section of the northern Mayfield Road reserve will be impacted by the access road alignment. As indicated, this plantation contains planted River Red Gum, Gold-dust Wattle, River She-oak, Argyle Apple and Small-flowered Honey-myrtle, and is dominated at ground level by a range of introduced species, such as Great Brome, Toowoomba Canary Grass, Common Heliotrope, Wimmera Ryegrass, Barley Grass, Wireweed, Onion-grass, Water Couch, Common Storksbill, Paterson's Curse and Hensbit (90 % projective foliage cover counting cured annual plant material). Blown Grass and Wood Sorrel are the only indigenous ground layer species observed in this area (5 % projective foliage cover; Appendix A).

The northern reserve on the intersection of Mayfield Road and Humphries Road is dominated by mature Grey Box, but at ground level, it is dominated by introduced species, including Century Plant, Wild Oat, Great Brome, Barley Grass, Shepherd's Purse, Soursob, Montpellier Broom, Plantain and Small-flowered Mallow (90 % projective foliage cover counting cured annual plant material). There were no indigenous ground layer species observed in this area (Appendix A).

Based on the evidence provided by the remnant vegetation (remnant trees), it is likely that the higher elevations of the proposed development area (i.e. the feedlot site and the upper elevations of the access road) was former *White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion* (NSW Plant Community Type (PCT) 266; Environment and Heritage 2012 and DPIE 2020d), while the lower elevations of the area (i.e. the access road and the Mayfield Road reserve) were former *Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions* (NSW PCT 76; Environment and Heritage 2012 and DPIE 2020d).

Plate 4-1 **Views across the proposed feedlot development area: from the south-eastern corner looking north-west (top left), from the north-eastern corner looking south-west (top right), from the north-western corner looking south-east (bottom left), and from the south-western corner looking north-east (bottom right).**

4.2 Remnant Trees

A total of 27 tree individuals were assessed across the proposed development sites, and the details on all of these individuals can be viewed in the table in Appendix C.

The location of all assessed trees can be seen across Figures 4-1 to 4-6.

Tree 8 is a naturalised exotic Peppercorn.

Trees 1 to 6 are Yellow Box (four living and two standing dead mature trees). As explained earlier, the removal of the two standing dead trees was permitted without the need for approval as 'Allowable Activity' under the *Local Land Services Act 2013*; while the landholder was authorised to clear the four living trees via Notification Event Number LMC02480 under Part 5 Division 1 of the Land Management Code on the 2nd April 2020.

Trees 8 to 16 – a mixture of mature Yellow and White Box - are all found around the perimeter of the parcel where the feedlot development is to occur.

Trees 17 and 18 are mature Yellow Box in proximity to the proposed alignment of the access track.

Plate 4-2 **Views across the proposed access road alignment: from north of the alignment looking south (top left), from the south-eastern corner of the proposed feedlot looking north (top right), from the south-eastern corner of the proposed feedlot looking south (middle left), in the southern half of the alignment looking north towards Plantation E (middle right), looking south towards Plantation H adjacent to Mayfield Road (bottom left), and looking north towards Plantation H from Mayfield Road (bottom right). Alignment boundaries are shown as red lines, and pertinent tree and plantation identifiers are shown as white numbers or letters.**

Trees 19 to 22 are all Grey Box found on the northern Mayfield Road reserve in the vicinity of the proposed exit of the access road to Mayfield Road. Trees 19, 20 and 21 are mature hollow-bearing individuals with hollows, with Trees 19 and 20 being standing dead trees, and Tree 22 an immature individual (25 cm dbh). All four trees are proposed losses as a consequence of the establishment of the access road.

Plate 4-3 **Views of the proposed trees for removal on the northern Mayfield Road reserve: Trees 19 and 22 at the exit point of the access road from freehold (top left), Trees 20 and 21 at the exit point of the access road from freehold (top left), and Trees 24 to 27 at the Mayfield and Humphries Road intersection (bottom). Pertinent tree identifiers are shown as white numbers.**

Trees 23 to 27 are all mature Grey Box found on the northern reserve at the intersection of Mayfield and Humphries Road; Trees 23, 26 and 27 are mature hollow-bearing trees, with Trees 23 and 25 being standing dead trees. To ensure that the turning circle for B-double trucks accessing the feedlot is safe, it is proposed that Trees 23, 24 and 25 be removed.

Plate 4-4 Views of the various plantations within the proposed development area: Plantation D (top left), Plantation E (middle), and within Plantation H (bottom).

Construction projects that involve earthworks or soil disturbance can cause indirect losses of native vegetation that are retained during construction due to root damage and soil modification within the zone where roots occur. Of particular concern is the longer-term impact of soil compaction and excavation (e.g. trenching for pipelines) close to trees and the effects of this on immediate and longer-term tree health. Standards Australia (2009) has provided guidance and clarity on this issue, and has defined an acceptable distance for tree retention in order to prevent indirect losses of native vegetation during and after construction activities as a guiding principle. These designated Tree Protection Zones (TPZs) should be implemented for the duration of construction activities (Standards Australia 2009) as part of the development conditions.

A TPZ is a specific area above and below the ground, with a radius 12 times the Diameter at Breast Height (dbh; 1.3 m) of any individual tree; the TPZ of trees should be no less than 2 m or greater than 15 m, and it is recommended that physical barriers be erected to delineate the TPZs of retained trees during construction activities. Should a development impinge on the TPZ area for > 10 % of its area, the tree shall be considered a loss, and will have to be offset (Standards Australia 2009).

In regards to TPZs of trees within vicinity of the proposed development (Trees 7 to 27):

- Trees 8 to 16 on the periphery of the feedlot development and the associated section of the proposed access road in that section, do not have their TPZs impinged, and will be retained (see Fig. 4-2);
- Trees 17 and 18 are on opposite sides of the proposed access road, with the alignment not impinging the TPZ of Tree 17, and impinging the TPZ of Tree 18 by less than 10 % of its area. Both trees will be retained;
- Trees 19 to 22 found on the northern Mayfield Road reserve in the vicinity of the proposed exit of the access road to Mayfield Road will all have their TPZs impinged by more than 10 %, and will be lost (see Figures 4-4 and 4-5);
- Trees 23 to 27 are found on the northern reserve at the intersection of Mayfield and Humphries Road. Trees 23, 24 and 25 are all proposed losses to ensure that the turning circle for B-double trucks accessing the feedlot is safe. The TPZs of Trees 26 and 27 will be impinged by < 10 %, and will be retained (see Figures 4-4 and 4-6).

In summary:

- There will be no losses of indigenous trees on the freehold land where the proposed feedlot is to be developed – all peripheral trees to the development are to be retained with their TPZs not impinged, or by < 10 % of its area;
- Seven indigenous trees found on the northern road reserve of Mayfield Road (Trees 19 to 25) are proposed losses. Trees 19, 20, 21 and 23 are mature hollow-bearing trees, and Trees 19, 20, 23 and 25 are standing dead trees;
- The extent of the native vegetation loss proposed (effectively, the border of the canopies of the proposed seven trees for loss, and intervening areas according to canopy separation ratio) is 0.08 ha;
- The freehold land and road reserve does not contain any significant indigenous ground layer vegetation to be impacted by the development.

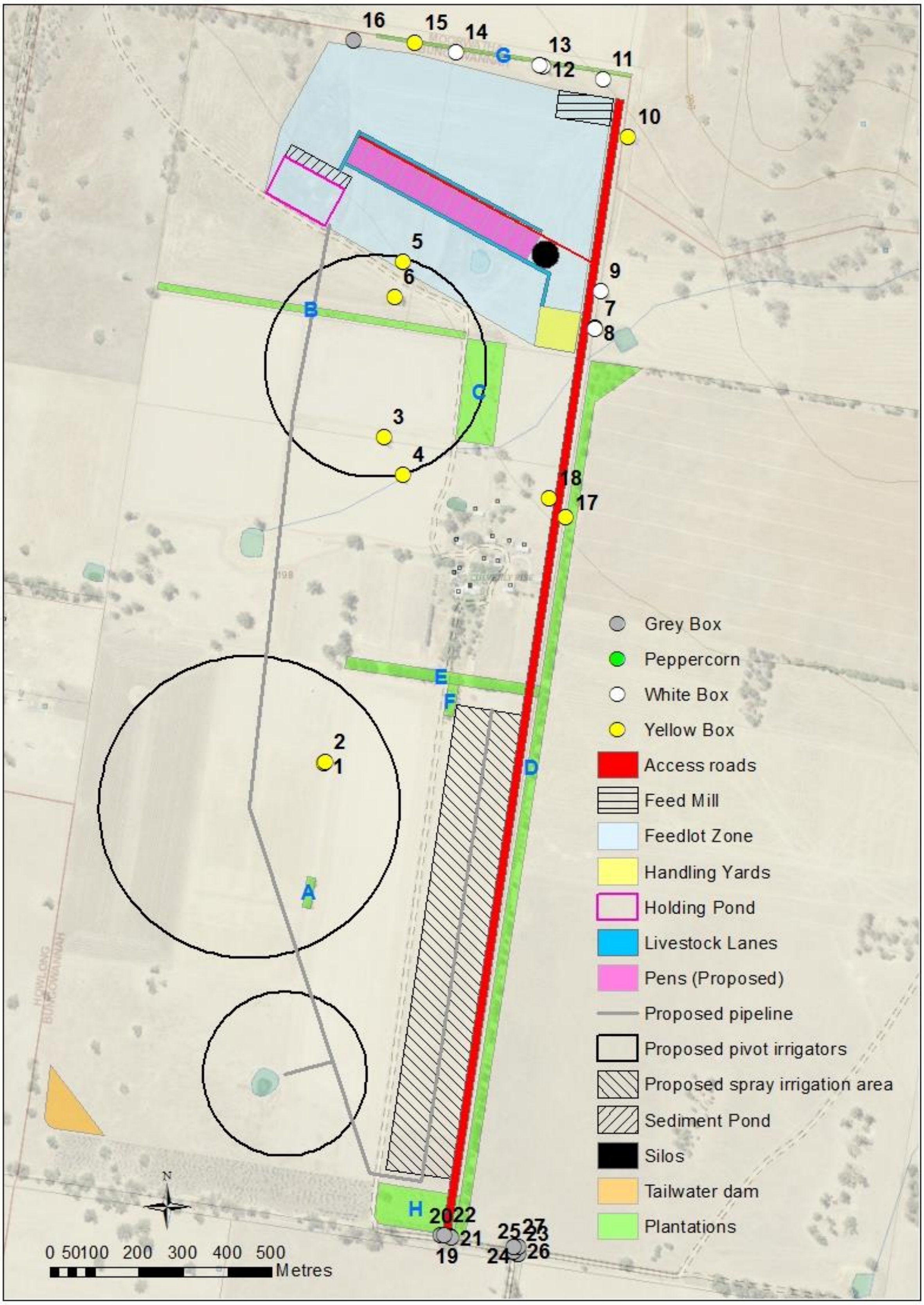


Figure 4-1 **Aerial image of the proposed feedlot layout at 'Culverley Rise', Bungowannah, showing the location of indigenous trees; numbers are tree identifiers in the table in Appendix C (Image copyright NSW Land and Property Information 2020).**

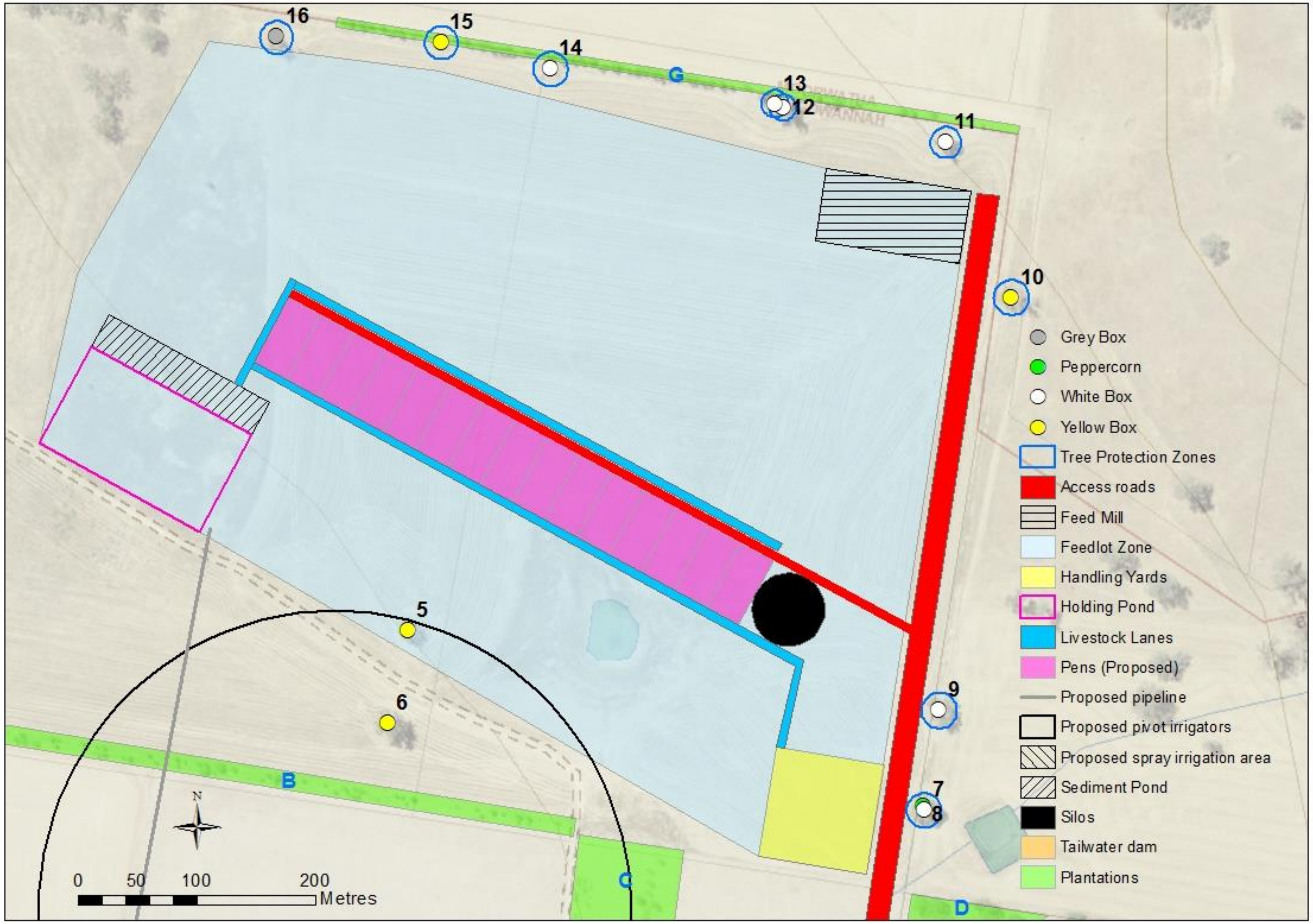


Figure 4-2 Aerial image of the proposed feedlot at 'Culverley Rise', Bungowannah, showing the location of indigenous trees; numbers are tree identifiers in the table in Appendix C. Tree Protection Zones are also shown (Image copyright NSW Land and Property Information 2020).

Figure 4-3 **Aerial image of the central section of the proposed access road to the feedlot at 'Culverley Rise', Bungowannah, showing the location of indigenous trees; numbers are tree identifiers in the table in Appendix C. Tree Protection Zones are also shown (Image copyright NSW Land and Property Information 2020).**

Figure 4-4 **Aerial image of the southern section of the proposed access road to the feedlot at 'Culverley Rise', Bungowannah, and its exit on to Mayfield Road, showing the location of indigenous trees; numbers are tree identifiers in the table in Appendix C. Tree Protection Zones are also shown (Image copyright NSW Land and Property Information 2020).**

Figure 4-5 **Aerial image of the southern section of the proposed access road to the feedlot at 'Culverley Rise', Bungowannah, and its exit on to Mayfield Road, showing the location of indigenous trees; numbers are tree identifiers in the table in Appendix C. Tree Protection Zones are also shown (Image copyright NSW Land and Property Information 2020).**

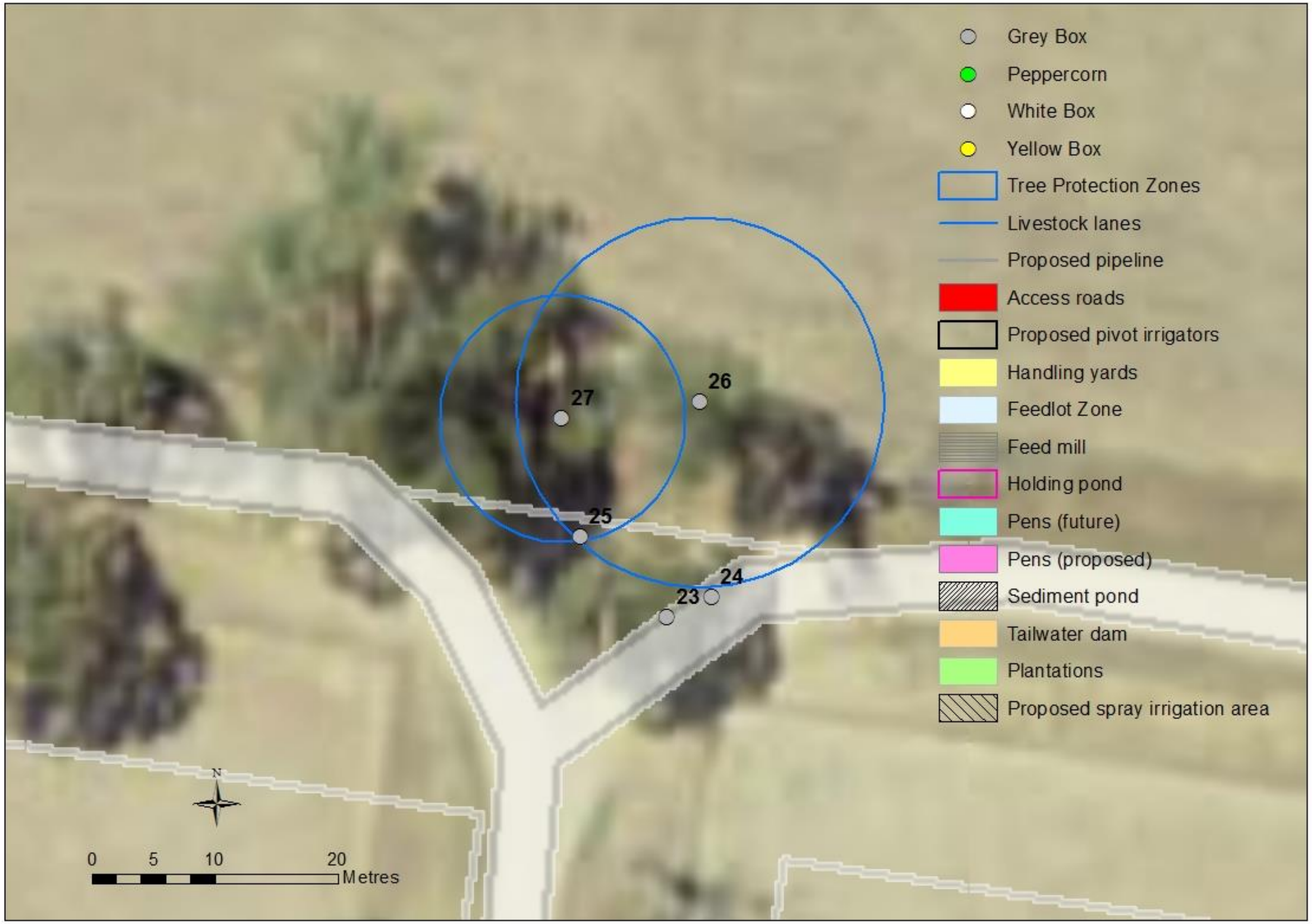


Figure 4-6 **Aerial image of the intersection of Mayfield and Humphries Roads, showing the location of indigenous trees; numbers are tree identifiers in the table in Appendix C. Tree Protection Zones are also shown (Image copyright NSW Land and Property Information 2020).**

4.3 Fauna

There were 6 species of fauna observed (all birds), all of which are indigenous.

Details of those species noted or inferred over the assessment period are detailed in Appendix B.

There were no rare or threatened species observed at the site (DPIE 2020a).

As indicated previously, the majority of the proposed development site has been cleared of all indigenous woody vegetation, and the ground layer substantially modified, with the indigenous flora largely replaced by exotics.

Not surprisingly, the indigenous fauna observed across the mostly cleared parcel and road reserve environments is typically of those observed in such modified/cleared-rural environments, such as the indigenous Australian Magpie, Galah, Magpie-lark, Sulphur-crested Cockatoo, Red-rumped Parrot and Noisy Miner.

The lack of observed species diversity across the majority of the assessed area is not surprising, given:

- except for some scattered trees, small patches of trees and some plantations, the lack of woody vegetation across the site, with particular reference to the wholly cleared areas as a result of the substantive clearing and disturbance, would considerably limit mammal, reptile, bat and bird species residency;
- the lack of fallen timber, which would considerably limit mammal, reptile, bat and bird species residency;
- domination of the ground layer vegetation by introduced species across much of the property;
- the likely presence of feral animal populations such as foxes and feral cats, which would actively predate any ground-dwelling or near ground-dwelling species heavily.

On this basis, across the majority of the property, there are relatively few opportunities for fauna occupation of the proposed development sites, in terms of a simplified vegetation structure (i.e. little shrub or emerging tree layer, meaning fewer opportunities for food collection and shelter/protection), and a relative lack of food sources (e.g. lack of indigenous nectar producing plants, etc.).

The Murray River corridor is the closest native vegetation block to the site, and is 3.5 km south of Mayfield Road, but there is no continuous vegetation (tree) cover to this corridor. There is partially cleared woodland in the hills to the immediate north-east of the proposed feedlot area, some of which has recently been registered as a Biodiversity Stewardship site (Michael Dunn pers. comm. 2020). Notwithstanding this adjacent modified woodland, the proposed development area is quite disconnected from larger areas of native vegetation and has low connectivity within the landscape.

On this basis, it is reasonable to assume that fauna are unlikely to utilise the scattered trees within proximity to the parcels.

4.4 Threatened Species and Communities

4.4.1 Threatened community likelihood

As stated previously, based on the evidence provided by the remnant vegetation (remnant trees), it is likely that the higher elevations of the proposed development area (i.e. the feedlot site and the upper elevations of the access road) was former *White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion* (NSW Plant Community Type (PCT) 266; Environment and Heritage 2012 and DPIE 2020d), while the lower elevations of the area (i.e. the access road and the Mayfield Road reserve) were former *Western Grey Box tall grassy woodland on* *alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions* (NSW PCT 76; Environment and Heritage 2012 and DPIE 2020d).

Threatened Ecological Communities (TECs) are listed in the schedules of the *Biodiversity Conservation Act 2016*; *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions,* the *Allocasuarina luehmannii Woodland in the Riverina and Murray-Darling Depression Bioregions,* the *Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes Bioregions,* and *White Box-Yellow Box-Blakely's Red Gum Woodland* are listed as *Endangered* under the Act (DPIE 2020b).

Matters of National Environmental Significance searching reveals that the nationally critically endangered *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* community*, Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains*, and *Natural Grasslands of the Murray Valley Plains* community, and the nationally endangered *Grey Box Grassy Woodlands and Derived Native Grasslands of South-eastern Australia, Weeping Myall Woodlands* and the *Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions* communities occur within the Murray Catchment (DAWE 2020).

As indicated, it is likely that the higher elevations of the proposed development area (i.e. the feedlot site and the upper elevations of the access road) are former *White Box-Yellow Box-Blakely's Red Gum Woodland* or *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* community , while the lower elevations of the area (i.e. the access road and the Mayfield Road reserve are former *Inland Grey Box Woodland in the Riverina* or *Grey Box Grassy Woodlands and Derived Native Grasslands of South-eastern Australia*; as indicated, the proposed development area has been mostly cleared of indigenous trees except for some scattered trees, small patches of trees and some plantations, with these threatened communities now only represented by these few scattered mature tree individuals and patches on the fence lines of parcels.

The critically endangered Grassy Box Gum Woodland (formally referred to as the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland) is characterised by a species-rich understorey of native tussock grasses, herbs and scattered shrubs, and the dominance, or prior dominance, of White Box, Yellow Box and Blakely's Red Gum trees (Department of Environment, Heritage, Water and the Arts [DEHWA] 2006).

As previously detailed, remnants of an overstorey of Yellow Box – White Box exists, but there is no indigenous understorey. According to DEHWA (2006), areas in which an overstorey exists without a substantially native understorey are degraded and are no longer a viable part of the ecological community. Although some indigenous species may remain, in most of these areas the indigenous understorey is effectively irretrievable, and in order for an area to be included in the listed ecological community, a patch must have a predominantly indigenous understorey (DEHWA 2006).

Therefore, the area of the proposed development should not be included within the listed *Grassy Box Gum Woodland* critically endangered ecological community on this basis.

Furthermore, according to the decision-making flowchart to ascertain whether a site is a patch of potential *Grey Box Grassy Woodlands or derived native grasslands* of sufficient quality for national listing, DEHWA (2012), indicates that the site is no longer a viable part of this threatened ecological community based on the low tree cover, the lack of ground layer indigenous species diversity, and the abundance of ground layer exotic species. Although some indigenous species may remain, in most of these areas the indigenous understorey is effectively irretrievable, and in order for an area to be included in the listed ecological community, a patch must have a predominantly indigenous understorey (DEHWA 2012).

Again, the area of the proposed development should therefore not be included within the listed *Grey Box Grassy Woodlands and Derived Native Grasslands of South-eastern Australia* endangered ecological community on this basis.

4.4.2 Threatened species likelihood

There were no rare or threatened species under the *Biodiversity Conservation Act 2016* observed at the property (DPIE 2020a).

The likelihood of presence for all recorded threatened species within a 20 km radius of the site has been considered (DPIE 2020a).

BioNet – Website of the Atlas of NSW Wildlife and *Matters of National Environmental Significance* searches revealed that there were records or predicted occurrences of twelve (12) threatened fauna species within a 20 km radius of the site (DPIE 2020a, DAWE 2020; Appendix D).

BioNet – Website of the Atlas of NSW Wildlife and *Matters of National Environmental Significance* revealed that there were four (4) records or predicted occurrences of threatened flora species within a 20 km radius of the site (DPIE 2020a, DAWE 2020; Appendix D).

The likelihood of the presence of these species and their likelihood of utilisation of the proposed development area was considered, and rated based on the prevailing habitat and habitat quality of the site, the low landscape connectivity, known records for species, and the habitat and habitat quality preferences of the species (Appendix D).

Of these species, all threatened fauna and all threatened flora species were not likely to occur on the property or to utilise it because of the following issues (or combination of them):

- the lack of a suitable community/habitat type (e.g. Floating Swamp Wallaby-grass, Rigid Spider-orchid, Plains-wanderer, Sloane's Froglet, Southern Bell Frog,);
- the almost complete loss of connectivity of the sites through clearing of habitat to areas of known occurrence (e.g. Regent Honeyeater, Squirrel Glider, Koala, Swift Parrot, Superb Parrot);
- disturbance to, and simplification of the site (e.g. Sturdy Leek-orchid, Pink-tailed Worm-lizard, Small Purple-pea);
- the length of time since the last record (e.g. Spotted-tailed Quoll).

4.4.3 Assessment of Significance

Part 7 Division 1 Section 7.3 of the *Biodiversity Conservation Act 2016* sets out five parameters that a determining authority must consider in deciding whether an activity is likely to have a significant effect on threatened species, populations, or ecological communities, or their habitats.

As indicated, the parcels where development is proposed are fully fenced for stock, and have been almost wholly cleared of woody vegetation, and have clearly been used for cropping and grazing for an extended period. The ground layer in all areas of the proposed development is dominated by introduced species. There are some scattered individuals of mature Yellow Box, Grey Box or White Box found near the boundary of these land parcels, and there have been numerous linear plantations of a mixture of indigenous, exotic and non-indigenous native trees and shrubs planted along fence lines in all parcels.

There is no effective native vegetation on any of the proposed areas for development, and no native vegetation will be impacted on the areas of development on the freehold land. However, seven indigenous trees found on the northern road reserve of Mayfield Road (Trees 19 to 25) are proposed losses, four of these are mature hollow-bearing trees, and four are standing dead trees.

Six threatened communities, four threatened species of flora and twelve species of fauna have been recorded within a 20 km radius of the site (DPIE 2020a), or are known or predicted to occur within 20 km of the site (DAWE 2020)(Appendix D).

After likelihood assessment, no representative threatened communities or threatened flora or fauna are considered likely to occur in the area, and it is considered that the proposed development will have no impact on any of these species and populations, or their habitats.

On this basis, the application of the five parameters of Section 7.3 of the *Biodiversity Conservation Act 2016* was not required for any species or community

5. AVOIDANCE AND MINIMISATION OF NATIVE VEGETATION

There is no effective native vegetation on any of the proposed areas for development, and no native vegetation will be impacted on the areas of development on the freehold land due to careful design of the development layout to avoid and minimise any native vegetation loss.

There is the likely loss of some planted vegetation in a number of plantations across the site; none of these plantations were established using public funding.

However, seven indigenous trees found on the northern road reserve of Mayfield Road (Trees 19 to 25) are proposed losses to ensure the safety of vehicles accessing the feedlot - four of these are mature hollow-bearing trees, and four are standing dead trees.

The generation of a Biodiversity Offset Scheme Entry Threshold Report (BOSET Report) (DPIE 2020f) reveals that the minimum Lot Size for the road reserve area is 100 ha, and that the Area Clearing Threshold required to enter the Biodiversity Offset Scheme (BOS), and for a Biodiversity Development Assessment Report (BDAR) to be completed, is 1 ha.

Therefore, for development to avoid entering the BOS and requiring a BDAR to be undertaken, native vegetation clearance must be < 1 ha on the road reserve.

The extent of the native vegetation loss proposed (effectively, the border of the canopies of the seven trees for loss, and intervening areas according to canopy separation ratio) is 0.08 ha.

6. RECOMMENDATION

The parcels where development is proposed are not in a declared area of outstanding biodiversity value, the proposed development area is not mapped as *Vulnerable or Sensitive Regulated Land* according to the *State Environmental Planning Policy (Vegetation) 2017*, and are also not mapped as areas of Biodiversity Value (DPIE 2020e).

There is no effective native vegetation on any of the proposed areas for development, and no native vegetation will be impacted on the areas of development on the freehold land.

As indicated, the generation of BOSET Report for the northern Mayfield Road reserve reveals that the minimum Lot Size is 100 ha, and that the Area Clearing Threshold required to enter the BOS, and for a BDAR to be completed, is 1 ha.

Therefore, for development to avoid entering the BOS and requiring a BDAR to be undertaken, native vegetation clearance must be 1 ha on each parcel; the extent of the native vegetation loss proposed (effectively, the border of the canopies of the seven trees for loss, and intervening areas according to canopy separation ratio) is 0.08 ha, clearly well below this threshold.

Therefore, this proposal is not required to enter the Biodiversity Offset Scheme, and a BDAR is not required.

The proposed development area has been evaluated and subjected to a Test of Significance under Part 7 Division 1 Section 7.3 of the *Biodiversity Conservation Act 2016*, and it is concluded that the removal of the seven trees on the northern reserve of Mayfield Road as a consequence of the proposed development, there will not be any significant impacts on any threatened species or community.

7. REFERENCES

Bureau of Meteorology, 2020. Albury climate data for the 26th March 2020. Retrieved 21st May 2020 from: http://www.bom.gov.au/climate/dwo/202003/html/IDCJDW2002.202003.shtml

Department of Agriculture, Water and Environment (DAWE), 2020. *Species Profile and Threats Database*. Accessed on the 25th March 2020 from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

Department of Environment, Heritage, Water and the Arts (DEHWA), 2006. Yellow Box-Red Gum Grassy Woodland Amendment to the List of Ecological Communities under the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*. Department of Environment, Heritage, Water and the Arts, Canberra.

Department of Environment, Heritage, Water and the Arts (DEHWA), 2012. *Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia: A guide to the identification, assessment and management of a nationally threatened ecological community. Environment Protection and Biodiversity Conservation Act 1999*. Department of Environment, Heritage, Water and the Arts, Canberra.

EnviroAg Australia, 2020. *Briefing Note. Culverley Rise, Bungowannah – Proposed Sheep Feedlot*. Dated 4/3/20. Prepared for Bungowannah Pastoral Company Pty. Ltd. by EnvironAg Australia, Armidale, NSW.

Harden, G.J. (ed) 1990. *Flora of New South Wales*: Volume 1, NSW University Press, Kensington.

Harden, G.J. (ed) 1991. *Flora of New South Wales*: Volume 2, NSW University Press, Kensington.

Harden, G.J. (ed) 1992. *Flora of New South Wales*: Volume 3, NSW University Press, Kensington.

Harden, G.J. (ed) 1993. *Flora of New South Wales*: Volume 4, NSW University Press, Kensington.

Hero, J., Littlejohn, M. & Marantelli, G., 1991. *Frogwatch Field Guide to Victorian Frogs*. Department of Natural Resources and Environment, Melbourne.

Hnatiuk, R.J., 1990. *Census of Australian Vascular Plants. Australian Flora and Fauna Series Number 11.* Bureau of Flora and Fauna, Canberra.

Menkhorst, P. (ed.), 1995. *Mammals of Victoria. Distribution, Ecology and Conservation*. Oxford University Press, Melbourne.

New South Wales Office of Environment and Heritage (Environment and Heritage), 2012. *The VIS Plant Community Type Identification Tool Version 1.0.0.0*. New South Wales Office of Environment and Heritage, Sydney.

New South Wales Office of Environment and Heritage (Environment and Heritage), 2017. *Biodiversity Assessment Method*. Office of Environment and Heritage for the NSW Government, Sydney.

New South Wales Office of Environment and Heritage (Environment and Heritage), 2018. *BMAT tool user guide. A step-by-step guide to using the Biodiversity Values Map and Threshold tool*. Office of Environment and Heritage for the NSW Government, Sydney.

New South Wales Department of Planning, Industry and Environment (DPIE), 2020a. *The website for the Atlas of NSW Wildlife*. Accessed on the 25th March 2020 from: http://www.bionet.nsw.gov.au/

New South Wales Department of Planning, Industry and Environment (DPIE), 2020b. *Threatened Species Profile search*. Accessed on the 25th March 2020 from: http://www.environment.nsw.gov.au/threatenedSpeciesApp/

New South Wales Department of Planning, Industry and Environment (DPIE), 2020c. *Biodiversity Offset and Agreement Management System* (BOAMS). Accessed on the 25th March 2020 from: https://customer.lmbc.nsw.gov.au/assessment/

New South Wales Department of Planning, Industry and Environment (DPIE), 2020d. *State Vegetation Type Map (SVTM).* Accessed on the 25th March 2020 from: https://www.environment.nsw.gov.au/vegetation/state-vegetation-type-map.htm

New South Wales Department of Planning, Industry and Environment (DPIE), 2020e. *Native Vegetation Regulatory Map.* Accessed on the 25th March 2020 from: https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=NVRMap

New South Wales Department of Planning, Industry and Environment (DPIE), 2020f.*Biodiversity Values Map and Threshold Viewer.* Accessed on the 25th March 2020 from: https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap

Royal Botanic Gardens Sydney, 2020. *PlantNet. New South Wales Flora On-line*. http://plantnet.rbgsyd.nsw.gov.au/

Simpson, K. and Day, N., 1998. *The Claremont Field Guide to the Birds of Australia*, 5th edition. Penguin Books, Sydney.

Standards Australia, 2009. *Australian Standard AS 4970-2009. Protection of trees on development sites*. Standards Australia, Sydney.

Triggs, B., 1996. *Tracks, Scats and Other Traces: a Field Guide to Australian Mammals*. Oxford University Press, Melbourne.

7.1 Personal communications

Dunn, Michael (2020). Land owner, 'Culverley Rise', Bungowannah.

Laycock, James (2020). Blueprint Planning, Albury.

APPENDIX A FLORA INVENTORY FOR ‘CULVERLEY RISE’ BUNGOWANNAH

Recorded vascular plant species for the proposed development sites and the adjacent roadside. Vascular flora have been recorded for presence using a cover-abundance scale that is outlined in Table 3-1.

An asterisk denotes an introduced species.

Common name	Scientific name	Feedlot site	Track alignment	Plantation H/ road reserve	Intersection
Gold-dust Wattle (planted)	*Acacia acinacea*			1	
Century Plant	*Agave americana**				2
Capeweed	*Arctotheca calendula**	2	1		
Wild Oat	*Avena fatua**				1
Great Brome	*Bromus diandrus**	2	2	2	2
Shepherd's Purse	*Capsella bursa-pastoris**				+
River She-oak (planted)	*Casaurina cunninghamii**			+	
Paterson's Curse	*Echium plantigineum**	2	2	+	
Common Storksbill	*Erodium cicutarium**	1	2	1	
River Red Gum (planted)	*Eucalyptus camaldulensis*			2	
Argyle Apple (planted)	*Eucalyptus cinerea**			+	
Grey Box	*Eucalyptus microcarpa*			2	2
Montpellier Broom	*Genista monspessulana**				+
Common Heliotrope	*Heliotropium europeum**		2	1	
Barley Grass	*Hordeum leporinum**			2	2
Blown Grass	*Lachnagrostis avenacea*		2	2	
Henbit	*Lamium amplexicaule**	1	3	2	
Wimmera Ryegrass	*Lolium rigidum**			2	
Small-flowered Mallow	*Malva parvifolium**	1	1		1
Small-flowered Honey-myrtle (planted)	*Melaleuca parvistaminea**			1	
Wood Sorrel	*Oxalis perennans*			+	
Soursob	*Oxalis pes-caprae**				+

Common name	Scientific name	Feedlot site	Track alignment	Plantation H/ road reserve	Intersection
Water Couch	*Paspalum distichum**		1	2	
Toowoomba Canary Grass	*Phalaris aquatica**	2	1	2	
Plantain	*Plantago lanceolata**				1
Wireweed	*Polygonum aviculare**			1	
Onion-grass	*Romulea rosea**			2	
Curled Dock	*Rumex crispus**			+	
Variegated Thistle	*Silybum marianum**	+			
Blackberry Nightshade	*Solanum nigrum**			+	
Subterranean Clover	*Trifolium subterraneum**	1	2		
Bathurst Burr	*Xanthium spinosum**	1	1	1	
Indigenous species projective foliage cover (%)		0	< 1	5	0
Introduced species projective foliage cover (%)		20	75	30	90
Litter cover (%)		60	15	60	0
Bare earth (%)		20	10	5	10

APPENDIX B OBSERVED FAUNA OF ‘CULVERLEY RISE’ BUNGOWANNAH

Observed or inferred fauna at the sites and surrounds between 11.00 am and 1.00 pm on the 26th March 2020.

An asterisk denotes an introduced species.

Common name	Scientific name	Mode of observation[1]
Birds		
Australian Magpie	*Gymnorhina tibicen*	A,V
Galah	*Eolophus roseicapillus*	A,V
Magpie-lark	*Grallina cyanoleuca*	A,V
Noisy Miner	*Manorina melanocephala*	A,V
Red-rumped Parrot	*Psephotus haematonotus*	A,V
Sulphur-crested Cockatoo	*Cacatua galerita*	A,V

1. Identification method: A = audible call; V = visual; N = distinctive nest; S = scat.

APPENDIX C ASSESSED TREES

Tree number	Common name	Scientific name	Diameter[1]	Health[2]	Hollows[3]	Tree location[4]	
						Easting	*Northing*
1	Yellow Box	*Eucalyptus melliodora*	75	0	S,L	474357	6018160
2	Yellow Box	*Eucalyptus melliodora*	110	0	S,L	474358	6018170
3	Yellow Box	*Eucalyptus melliodora*	150	3	S,L	474463	6018760
4	Yellow Box	*Eucalyptus melliodora*	135	3	S,L	474500	6018690
5	Yellow Box	*Eucalyptus melliodora*	140	3	S,L	474497	6019070
6	Yellow Box	*Eucalyptus melliodora*	160	3	S,L	474483	6019010
7	White Box	*Eucalyptus albens*	140	4	S,L	474849	6018950
8	Peppercorn	*Schinus molle**				474848	6018960
9	White Box	*Eucalyptus albens*	150	3	S,L	474859	6019020
10	Yellow Box	*Eucalyptus melliodora*	160	4	S,L	474907	6019300
11	White Box	*Eucalyptus albens*	110	3	S,L	474862	6019410
12	White Box	*Eucalyptus albens*	90	3	S,L	474751	6019430
13	White Box	*Eucalyptus albens*	95	3	S,L	474746	6019430
14	White Box	*Eucalyptus albens*	120	0	S,L	474593	6019450
15	Yellow Box	*Eucalyptus melliodora*	130	0	S,L	474518	6019470
16	Grey Box	*Eucalyptus microcarpa*	140	3	S,L	474406	6019480
17	Yellow Box	*Eucalyptus melliodora*	100	3	S,L	474796	6018610
18	Yellow Box	*Eucalyptus melliodora*	120	3	S,L	474766	6018650
19	Grey Box	*Eucalyptus microcarpa*	75	0	S,L	474571	6017310
20	Grey Box	*Eucalyptus microcarpa*	50/25	0	S,L	474588	6017310
21	Grey Box	*Eucalyptus microcarpa*	55/50/45/25/25/25	3	S,L	474590	6017300
22	Grey Box	*Eucalyptus microcarpa*	25	4	A	474578	6017310
23	Grey Box	*Eucalyptus microcarpa*	140	0	S,L	474711	6017270
24	Grey Box	*Eucalyptus microcarpa*	45	3	S	474714	6017270
25	Grey Box	*Eucalyptus microcarpa*	55	0	S	474705	6017280

Tree number	Common name	Scientific name	Diameter[1]	Health[2]	Hollows[3]	Tree location[4]	
						Easting	*Northing*
26	Grey Box	*Eucalyptus microcarpa*	140/75	3	S	474713	6017290
27	Grey Box	*Eucalyptus microcarpa*	80	3	S	474704	6017290

1. Diameter at breast height over bark in cm (at 1.30 m above ground);
2. Health: 0 = Dead; 1 = 1-20 % projective foliage cover (pfc); 2 = 21-40 % pfc; 3 = 41-60 % pfc; 4 - 61-80 % pfc; 5 = 81-100 % pfc;
3. Hollows: A = absent; S = small hollows present; L = large hollows present;
4. Location data are northings and eastings of MGAz55 coordinates.

APPENDIX D THREATENED COMMUNITY AND SPECIES LIKELIHOOD OF PRESENCE

List of threatened communities, and flora and fauna species recorded by the BioNet - Atlas of NSW Wildlife and by Matters of National Environmental Significance search of a 20 km radius from the proposed development site, their status, and their likelihood of occurrence on the site (DPIE 2020b; DAWE 2020).

Common Name	Scientific name	Conservation Status (NSW)[1]	Conservation Status (Comm)[2]	Likelihood of Occurrence[3]	Five Part Test
Vegetation community					
Allocasuarina luehmannii Woodland in the Riverina and Murray-Darling Depression Bioregions (Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions)		e	E	While this TEC is represented within the district, It is likely that the majority of the parcel is former *White Box-Yellow Box-Blakely's Red Gum Woodland* or *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland - Grassy Box Gum Woodland*. **Likelihood: Not present**	No
Forb-rich Speargrass-Windmill Grass-White Top grassland of the Riverina (Natural Grasslands of the Murray Valley Plains)		e	CE	While this TEC is represented within the district, It is likely that the majority of the parcel is former *White Box-Yellow Box-Blakely's Red Gum Woodland* or *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland - Grassy Box Gum Woodland*. **Likelihood: Not present**	No
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions (Grey Box Grassy Woodlands and Derived Native Grasslands of South-eastern Australia)		e	E	It is likely that the lower slopes of the proposed development area is former *White Box-Yellow Box-Blakely's Red Gum Woodland* or *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland - Grassy Box Gum Woodland*; however, within the parcel this community is now only represented by mostly mature tree individuals, and the remnant vegetation does not meet the quality threshold to be considered a remnant of this community. **Likelihood: Not present**	No
White Box-Yellow Box-Blakely's Red Gum Woodland (White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland - Grassy Box Gum Woodland)		e	CE	It is likely that the upper slopes of the proposed development area is former *White Box-Yellow Box-Blakely's Red Gum Woodland* or *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland - Grassy Box Gum Woodlan*d; however, within the parcel this community is now only represented by mostly mature tree individuals, and the remnant vegetation does not meet the quality threshold to be considered a remnant of this community. **Likelihood: Not present**	No
Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions		e		While this TEC is represented within the district, It is likely that the majority of the parcel is former *White Box-Yellow Box-Blakely's Red Gum Woodland* or *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland - Grassy Box Gum Woodland.* **Likelihood: Not present**	No
Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions (Weeping Myall Woodlands)		e	E	While this TEC is represented within the district, It is likely that the majority of the parcel is former *White Box-Yellow Box-Blakely's Red Gum Woodland* or *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland - Grassy Box Gum Woodland*. **Likelihood: Not present**	No
Flora					
Floating Swamp Wallaby-grass	*Amphibromus fluitans*	v	V	Wetland/riparian plant. There is no suitable habitat within the proposed development area. Four records within 20 km, all along the Murray River in 2002. **Likelihood: Highly unlikely to be present**	No
Rigid Spider-orchid	*Caladenia tensa*		E	This species grows mostly in light soils on sand-hills and sand plains. Little information in now known of its NSW distribution, and the only known populations are in Victoria and South Australia. Such habitat is not found on site. No records of the species within 20 km of the site. **Likelihood: Highly unlikely to be present**	No
Sturdy Leek-orchid	*Prasophyllum validum*		V	*Prasophyllum validum* occurs across inland Victoria and in South Australia in the Flinders Ranges in drier woodland habitats. While it may have been found in suitable habitats in NSW, there are no records for the species in NSW or within 20 km. **Likelihood: Highly unlikely to be present**	No

Common Name	Scientific name	Conservation Status (NSW)[1]	Conservation Status (Comm)[2]	Likelihood of Occurrence[3]	Five Part Test
Small Purple-pea	*Swainsona recta*	e	E	Grassland and Grassy Woodland plant in sites prone to seasonal inundation. While sections of the development site may have once been suitable habitat, it is unlikely the species would be found because of the extent of disturbance to the site, and there are no records within 20 km. **Likelihood: Unlikely to be present**	No
Fauna					
Corben's Long-eared Bat	*Nyctophilus corbeni*	v	V	Occurs in intact Buloke, mallee, Cypress-pine, ironbark and box woodlands and forests, and adjacent agricultural land. While sections of the development site may have once been suitable habitat, it is unlikely the species would be found because of the extent of disturbance to the site, and there is no connectivity to known locations. Not recorded within 20 km of the site. **Likelihood: Unlikely to be present**	No
Grey-headed Flying-fox	*Pteropus poliocephalus*	v	V	Australia's only endemic flying-fox and occurs in a coastal belt from south-eastern Queensland to Melbourne, Victoria. It is a canopy-feeding frugivore and nectivore, which utilises vegetation communities including rainforests, open forests, closed and open woodlands, Melaleuca swamps and Banksia woodlands. Site is not suitable habitat, and species not recorded within 20 km. **Likelihood: Highly unlikely to be present**	No
Koala	*Phascolarctus cinereus*	v	V	Inhabit eucalypt woodlands and forests. Spend most of their time in trees, but will descend and traverse open ground to move between trees. While sections of the development site may have once been suitable habitat, it is unlikely the species would be found because of the extent of disturbance to the site, and there is no connectivity to known locations. Not recorded within 20 km of the site. **Likelihood: Highly unlikely to be present**	No
Pink-tailed Legless Lizard	*Aprasia parapulchella*	v	V	Occurs in intact high quality and undisturbed grassy woodlands and grasslands. No such habitat occurs on or near the subject site. Not recorded within 20 km of the site. **Likelihood: Highly unlikely to be present**	No
Plains-wanderer	*Pedionomus torquatus*	e	CE	Occurs in extensive quality riparian grasslands and plains woodlands, and adjacent agricultural land. Site is not suitable habitat. No records within 20 km. **Likelihood: Highly unlikely to be present**	No
Regent Honeyeater	*Anthochaera phrygia*	ce	CE	Occurs in woodlands, and adjacent agricultural land. While sections of the development site may have once been suitable habitat, it is unlikely the species would be found because of the extent of disturbance to the site, and the lack of connectivity to known locations, 100 km to the east. Not recorded within 20 km of the site. **Likelihood: Highly unlikely to be present**	No
Sloane's Froglet	*Crinia sloanei*	v		Sloane's Froglet has been recorded from widely scattered sites in the floodplains of the Murray-Darling Basin, with the majority of records in the Darling Riverine Plains, NSW South Western Slopes and Riverina bioregions in New South Wales. It is typically associated with periodically inundated areas in grassland, woodland and disturbed habitats. There is no such habitat within the proposed development area. One record within 20 km – an observation near Dight's Creek 10 km to the SE of the site in 2013. **Likelihood: Unlikely to be present**	No
Southern Bell Frog	*Litoria raniformis*	e	V	In NSW the species was once distributed along the Murray and Murrumbidgee Rivers and their tributaries, the southern slopes of the Monaro district and the central southern tablelands as far north as Tarana, near Bathurst. Currently, the species is known to exist only in isolated populations in the Coleambally Irrigation Area, the Lowbidgee floodplain and around Lake Victoria. There is no suitable habitat within the proposed development area., and there are no records within 20 km. **Likelihood: Highly unlikely to be present**	No

Common Name	Scientific name	Conservation Status (NSW)[1]	Conservation Status (Comm)[2]	Likelihood of Occurrence[3]	Five Part Test
Spotted-tailed Quoll	*Dasyurus maculatus*	v	E	The Spot-tailed Quoll has a preference for mature wet forest habitat, especially in areas with rainfall 600 mm/year. Unlogged forest or forest that has been less disturbed by timber harvesting is also preferable. The range of the Spotted-tailed Quoll has contracted considerably since European settlement, and it is now found only in eastern NSW; two records of the species within 20 km – at Howlong and Corowa - are both more than 100 years old. Species is considered regionally extinct. **Likelihood: Highly unlikely to be present**	No
Squirrel Glider	*Petaurus norfolcensis*	v		Prefers extensive intact woodlands with significant shrub and litter layers in blocks or along roadsides. No such habitat occurs on or near the proposed development area, and there is no connectivity to this known location. One record within 20 km – at Bungowannah 8 km to the east of the site. **Likelihood: Unlikely to be present**	No
Superb Parrot	*Polytelis swainsonii*	v	V	Occurs in riparian woodlands and forest, and adjacent woodlands and agricultural land. No such habitat occurs on or near the subject site, and there is no connectivity to known locations. Numerous records within 20 km – one close to Corowa that is 2 km west of the site, but most are near Howlong. **Likelihood: Unlikely to be present**	No
Swift Parrot	*Lathamus discolor*	e	CE	Occurs in extensive riparian forests and woodlands, and adjacent agricultural land. While sections of the development site may have once been suitable habitat, it is unlikely the species would be found because of the extent of disturbance to the site, and there is poor connectivity to known locations. Five records within 20 km – all along the Riverina Highway or south to the Murray River up to 2017. **Likelihood: Unlikely to be present**	No

1. x = presumed extinct in NSW; e = endangered in NSW; v = vulnerable in NSW; ce = critically endangered in NSW (from DPIE 2020b).
2. V = vulnerable nationally; E = endangered nationally; CE = critically endangered nationally (DAWE 2020).

APPENDIX E BIODIVERSITY OFFSET SCHEME ENTRY THRESHOLD (BOSET) TOOL REPORT

NSW GOVERNMENT

Biodiversity Offset Scheme (BOS) Entry Threshold Map

692.6 | 0 | 346.32 | 692.6 Metres

WGS_1984_Web_Mercator_Auxiliary_Sphere

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

THIS MAP IS NOT TO BE USED FOR NAVIGATION

Legend

- Biodiversity Values that have been mapped for more than 90 days
- Biodiversity Values added within last 90 days

Notes

Biodiversity Values Map and Threshold Report

Results Summary

Date of Calculation	21/05/2020 9:31 PM	**BDAR Required***
Total Digitised Area	0.33 ha	
Minimum Lot Size Method	LEP	
Minimum Lot Size	100 ha	
Area Clearing Threshold	1 ha	
Area clearing trigger Area of native vegetation cleared	Unknown #	Unknown #
Biodiversity values map trigger Impact on biodiversity values map(not including values added within the last 90 days)?	no	no
Date of the 90 day Expiry	N/A	

*If BDAR required has:

- at least one 'Yes': you have exceeded the BOS threshold. You are now required to submit a Biodiversity Development Assessment Report with your development application. Go to https://customer.lmbc.nsw.gov.au/assessment/AccreditedAssessor to access a list of assessors who are accredited to apply the Biodiversity Assessment Method and write a Biodiversity Development Assessment Report
- 'No': you have not exceeded the BOS threshold. You may still require a permit from local council. Review the development control plan and consult with council. You may still be required to assess whether the development is '"likely to significantly affect threatened species' as determined under the test in s. 7.3 of the Biodiversity Conservation Act 2016. You may still be required to review the area where no vegetation mapping is available.

Where the area of impact occurs on land with no vegetation mapping available, the tool cannot determine the area of native vegetation cleared and if this exceeds the Area Threshold. You will need to work out the area of native vegetation cleared - refer to the BOSET user guide for how to do this.

On and after the 90 day expiry date a BDAR will be required.

Disclaimer

This results summary and map can be used as guidance material only. This results summary and map is not guaranteed to be free from error or omission. The State of NSW and Office of Environment and Heritage and its employees disclaim liability for any act done on the information in the results summary or map and any consequences of such acts or omissions. It remains the responsibility of the proponent to ensure that their development application complies will all aspects of the *Biodiversity Conservation Act 2016.*

The mapping provided in this tool has been done with the best available mapping and knowledge of species habitat requirements. This map is valid for a period of 30 days from the date of calculation (above).

Acknowledgement

I as the applicant for this development, submit that I have correctly depicted the area that will be impacted or likely to be impacted as a result of the proposed development.

Signature___________________________ Date: 21/05/2020 09:31 PM

APPENDIX F:

Aboriginal Due Diligence Assessment

View east across north edge of survey area 4 and survey area 5 of study area.

ABORIGINAL DUE DILIGENCE ASSESSMENT REPORT

CULVERLEY RISE FEEDLOT, BUNGOWANNAH

GREATER HUME LOCAL GOVERNMENT AREA, NSW

JUNE 2020

Report prepared by

OzArk Environment & Heritage

for Blueprint Planning on behalf of

Bungowannah Pastoral Company Co. Pty Ltd

OzArk
Environment & Heritage

145 Wingewarra St
(PO Box 2069)
Dubbo NSW 2830

Phone: (02) 6882 0118
Fax: (02) 6882 0630
enquiry@ozarkehm.com.au
www.ozarkehm.com.au

This page has intentionally been left blank.

DOCUMENT CONTROLS

Proponent	Bungowannah Pastoral Company Co. Pty Ltd	
Client	Blueprint Planning	
Document Description	Aboriginal Due Diligence Assessment Report: Culverley Rise Feedlot, Bungowannah	
File Location	OzArk Job No.	
S:\OzArk EHM Data\Clients\Blueprint Planning\Sheep feedlot, Culverley Rise, Bungowannah March 2020\Due diligence report	2620	
Document Status: **V3.0 FINAL**		Date 30 June 2020
Draft V1.0 Author to editor OzArk 1st internal (Series V1 = OzArk internal edits)		V1.0 AC author 29/6/20 V1.1 BC edit 29/6/20 V1.2 AC edit 30/6/20
Draft V2.0 Report Draft for release to client (Series V2 = OzArk and client edits)		V2.0 OzArk to client 30/6/20
FINAL V3.0 = Final report		V3.0 OzArk finalise & to client 30/6/20
Prepared For		Prepared By
James Laycock Blueprint Planning		Dr Alyce Cameron Senior Archaeologist OzArk Environment & Heritage 145 Wingewarra Street (PO Box 2069) Dubbo NSW 2830 P: 02 6882 0118 F: 02 6882 6030 alyce@ozarkehm.com.au

Acknowledgement

OzArk acknowledge Traditional Owners of the area on which this assessment took place and pay respect to their beliefs, cultural heritage and continuing connection with the land. We also acknowledge and pay respect to the post-contact experiences of Aboriginal people with attachment to the area and to the elders, past and present, as the next generation of role models and vessels for memories, traditions, culture and hopes of local Aboriginal people.

EXECUTIVE SUMMARY

OzArk Environment & Heritage (OzArk) has been engaged by Blueprint Planning (the client), on behalf of Bungowannah Pastoral Company Co. Pty Ltd (the proponent) to complete an Aboriginal Due Diligence heritage assessment for the Culverley Rise sheep feedlot (the proposal).

The assessment was started in March 2020 to satisfy the requirements of an *Aboriginal Cultural Heritage Assessment Report* (ACHAR) including following the guidelines established in the *Aboriginal cultural heritage consultation requirements for proponents* (ACHCRs, DECCW 2010a). Following the field survey of the study area (see **Section 2.3.6**) the proponent elected to cease consultation following the ACHCRs and report the results of the assessment using a due diligence report rather than an ACHAR as an *Aboriginal Heritage Impact Permit* (AHIP) was not required.

The visual inspection of the study area was undertaken by OzArk Senior Archaeologist, Dr Alyce Cameron, on 3 June 2020. Andom Rendell, a representative from Albury and District Local Aboriginal Land Council, participated in the field survey. No Aboriginal objects or areas of potential archaeological deposits were recorded during the pedestrian survey of the study area.

The undertaking of the Due Diligence process resulted in the conclusion that the proposed works will have an impact on the ground surface, however, no Aboriginal objects or intact archaeological deposits will be harmed by the proposal. This moves the proposal to the following outcome:

> *AHIP application not necessary. Proceed with caution. If any Aboriginal objects are found, stop work and notify Heritage NSW* (131 555 or info@environment.nsw.gov.au)*. If human remains are found, stop work, secure the site and notify NSW Police and Heritage NSW.*

To ensure the greatest possible protection to the area's Aboriginal cultural heritage values, the following recommendations are made:

1) The proposed work may proceed at Culverley Rise without further archaeological investigation under the following conditions:
    a) All land and ground disturbance activities must be confined to within the study area, as this will eliminate the risk of harm to Aboriginal objects in adjacent landforms. Should the parameters of the proposal extend beyond the assessed areas, then further archaeological assessment may be required.
    b) All staff and contractors involved in the proposed work should be made aware of the legislative protection requirements for all Aboriginal sites and objects.
2) This assessment has concluded that there is a low likelihood that the proposed work will adversely harm Aboriginal cultural heritage items or sites. However, during works, if

Aboriginal artefacts or skeletal material are noted, all work should cease and the procedures in the *Unanticipated Finds Protocol* (**Appendix 3**) should be followed;

3) Work crews should undergo cultural heritage induction to ensure they recognise Aboriginal artefacts (see **Appendix 4**) and are aware of the legislative protection of Aboriginal objects under the *National Parks and Wildlife Act 1974* and the contents of the *Unanticipated Finds Protocol.*

4) The information presented here meets the requirements of the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales*. It should be retained as shelf documentation for five years as it may be used to support a defence against prosecution in the event of unanticipated harm to Aboriginal objects.

CONTENTS

FIGURES

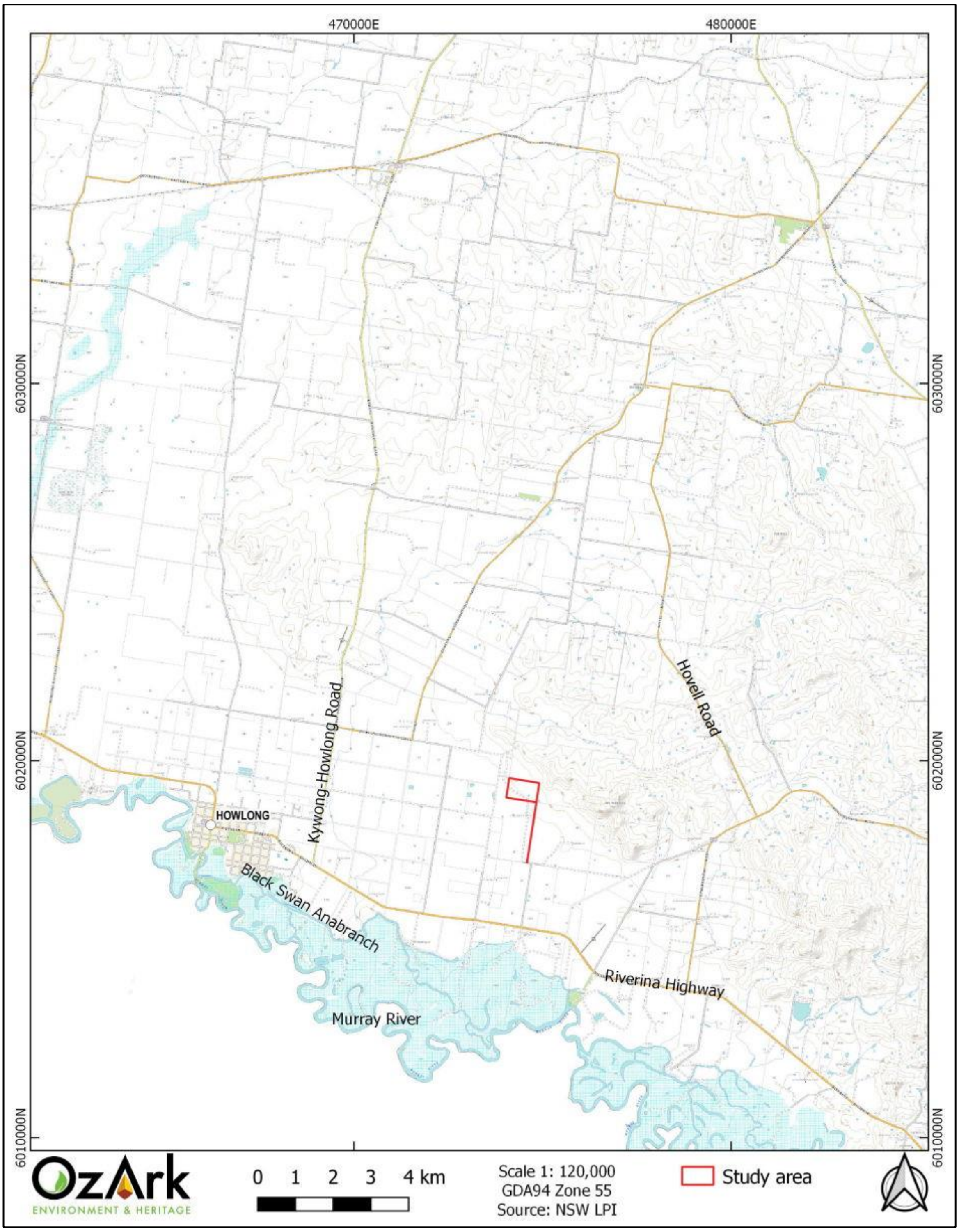
TABLES

1 INTRODUCTION

1.1 BRIEF DESCRIPTION OF THE PROPOSAL

OzArk Environment & Heritage (OzArk) has been engaged by Blueprint Planning (the client), on behalf of Bungowannah Pastoral Company Co. Pty Ltd (the proponent) to complete an Aboriginal Due Diligence heritage assessment for the Culverley Rise sheep feedlot (the proposal). The proposal is in the Greater Hume Local Government Area (LGA) (**Figure 1-1**).

Figure 1-1. Map showing the location of the proposal.



1.2 BACKGROUND

The assessment was started in March 2020 to satisfy the requirements of an *Aboriginal Cultural Heritage Assessment Report* (ACHAR) including following the guidelines established in the *Aboriginal cultural heritage consultation requirements for proponents* (ACHCRs, DECCW 2010a).

On 31 March 2020, an advertisement was placed in the '*The Border Mail*' requesting expressions of interest in being consulted about the proposal. In addition, the following agencies were contacted to identify potential stakeholders for the area: Biodiversity and Conservation Division (BCD) of the Department of Planning, Industry and Environment (now Heritage NSW); Albury and District Local Aboriginal Land Council (LALC); Office of The Registrar: Aboriginal Land Rights Act; National Native Title Tribunal; Native Title Service Corporation (NTSCORP); Greater Hume Council; and Murray Local Land Services. Expressions of interest and Stage 1 of the ACHCRs ended on 1 May 2020.

As a result, three groups or individuals registered to be consulted about the proposal. These groups or individuals constituted the Registered Aboriginal Parties (RAPs) for the proposal:

- Albury and District LALC
- Bundyi Aboriginal Cultural Knowledge
- Yalmambirra.

On the 4 May 2020, a letter and survey methodology was sent to the RAPs initiating Stage 2/3. Stage 2/3 closed on 1 June 2020. Feedback was received from Yalmambirra regarding the survey methodology. Details are provided in **Appendix 2**.

Following the field survey of the study area (see **Section 2.3.6**) the proponent elected to cease consultation following the ACHCRs and report the results of the assessment using a due diligence report rather than an ACHAR as an Aboriginal heritage Impact Permit (AHIP) was not required.

Details of the ACHCRs undertaken (Stage 1, Stage 2/3 and field survey) and the consultation log for the RAPs is provided in **Appendix 2**.

1.3 STUDY AREA

The study area is located approximately 25 kilometres (km) northwest of Albury, NSW and is within the Greater Hume Local Government Area (LGA) (**Figure 1-1**).

The study area consists of:

- The proposed sheep feedlots at Lot 74 and Lot 75 DP753749, approximately 44 hectares (ha) in size
- 1.6 km access road from Mayfield Road to the southeast corner of Lot 75 DP753749.

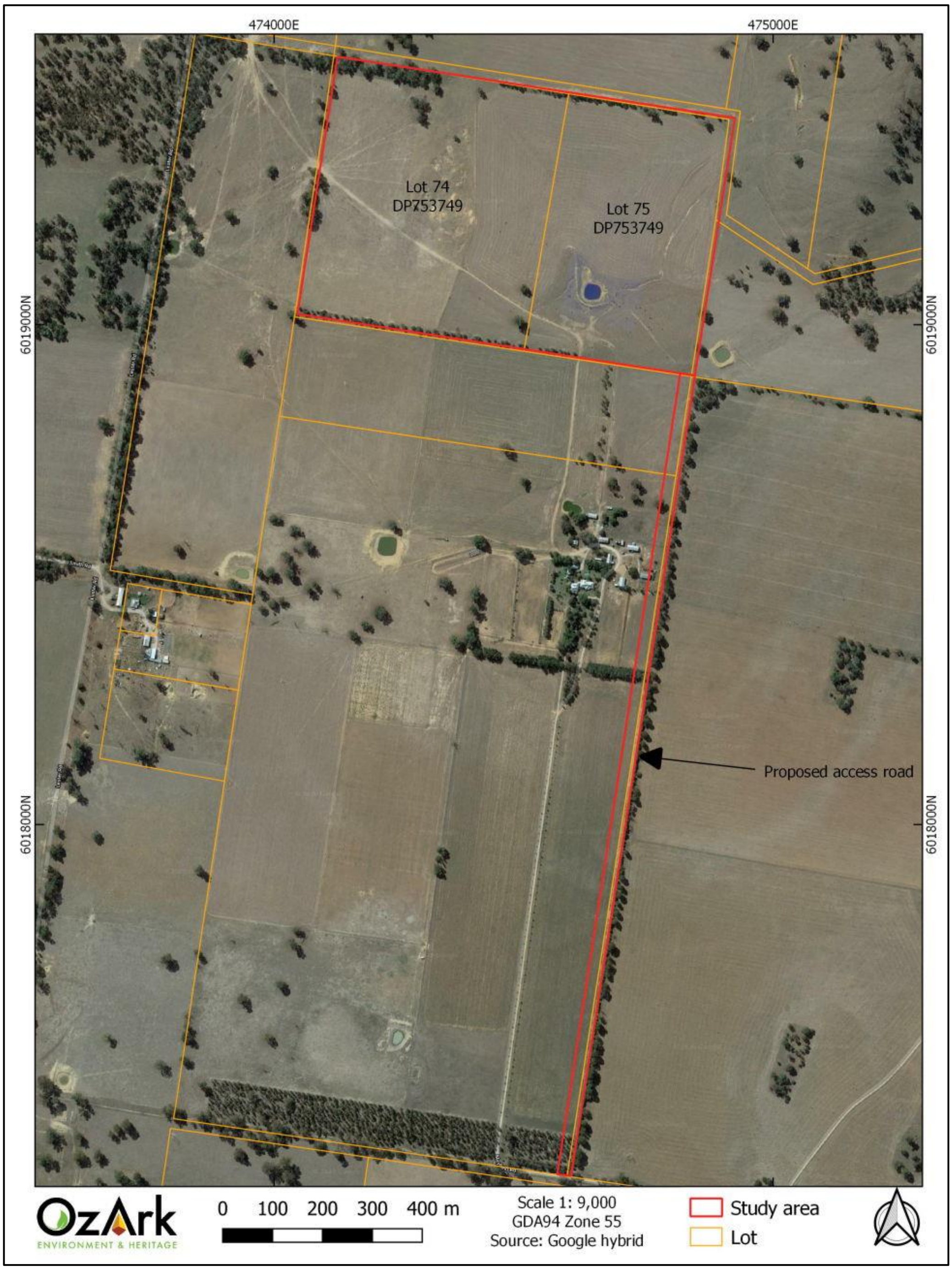
Figure 1-2 shows the study area and access road in relation to lots. The study area is used for agricultural practices, particularly grazing and cropping.

1.4 ASSESSMENT APPROACH

Aboriginal cultural heritage

The desktop and field survey component for the study area follows the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (Due Diligence; DECCW 2010b). The field survey followed the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in New South Wales* (OEH 2011).

Figure 1-2. Aerial showing the study area.



2 ABORIGINAL DUE DILIGENCE ASSESSMENT

2.1 INTRODUCTION

The National Parks and Wildlife Regulation 2009 (NPW Regulation) made under the *National Parks and Wildlife Act 1974* (NPW Act) advocates a Due Diligence process to determining likely impacts on Aboriginal objects. Carrying out Due Diligence provides a defence to the offence of harming Aboriginal objects and is an important step in satisfying Aboriginal heritage obligations in NSW.

2.2 DEFENCES UNDER THE NPW REGULATION 2009

2.2.1 Low impact activities

The first step before application of the Due Diligence process itself is to determine whether the proposed activity is a "low impact activity" for which there is a defence in the NPW Regulation. The exemptions are listed in Section 80B (1) of the NPW Regulation (DECCW 2010b: 6).

The activities of Bungowannah Pastoral Company Co. are not considered a 'low-impact activity'. As such, the Due Diligence process must be applied.

2.2.2 Disturbed lands

Relevant to this process is the assessed levels of previous land-use disturbance.

The NPW Regulation Section 80B (4) (DECCW 2010b: 18) define disturbed land as follows:

> *Land is disturbed if it has been the subject of a human activity that has changed the land's surface, being changes that remain clear and observable.*
>
> *Examples include ploughing, construction of rural infrastructure (such as dams and fences), construction of roads, trails and tracks (including fire trails and tracks and walking tracks), clearing vegetation, construction of buildings and the erection of other structures, construction or installation of utilities and other similar services (such as above or below ground electrical infrastructure, water or sewerage pipelines, stormwater drainage and other similar infrastructure) and construction of earthworks.*

As sections of the proposed work are in previously cleared landforms which contains established farm infrastructure such as stock yards, property fences and ploughed paddocks, it could be considered that the proposed work is occurring in 'disturbed land'. However, sections of the proposed work are not in an area where the land's surface has been changed in a clear and observable manner and the Due Diligence process must be applied.

In summary, it is determined that the proposal must be assessed under the Due Diligence Code. The reasoning for this determination is set out in **Table 2-1**.

Table 2-1: Determination of whether Due Diligence Code applies.

Item	Reasoning	Answer
Is the activity a Part 3A project declared under section 75B of the EP&A Act?	The proposal is assessed under Part 4 of the EP&A Act.	No
Is the activity exempt from the NPW Act or NPW Regulation?	The proposal is not exempt under this Act or Regulation.	No
Do either or both of these apply: Is the activity in an Aboriginal place? Have previous investigations that meet the requirements of this Code identified Aboriginal objects?	The activity will not occur in an Aboriginal place. No previous investigations have been conducted.	No
Is the activity a low impact one for which there is a defence in the NPW Regulation?	The proposal is not a low impact activity for which there is a defence in the NPW Regulation.	No
Is the activity occurring entirely within areas that are assessed as 'disturbed lands'?	The proposal is not entirely within areas of high modification.	No
Due Diligence Code of Practice assessment is required		

2.3 APPLICATION OF THE DUE DILIGENCE CODE OF PRACTICE TO THE PROPOSAL

To follow the generic Due Diligence process, a series of steps in a question/answer flowchart format (DECCW 2010b: 10) are applied to the proposed impacts and the study area, and the responses documented.

2.3.1 Step 1

Will the activity disturb the ground surface or any culturally modified trees?

Yes, the proposal will impact the ground surface and may impact culturally modified trees.

The proposed development includes the construction and operation of a sheep feedlot with a capacity of up to 3,750 head. The facilities will include the following features:

- Holding pens; sheep processing yard; truck parking area; workshop; laydown area; feed shed; waste disposal facilities; weighbridge; stock dam; wastewater irrigation area; on site bore; tail water / contaminated agriculture runoff dam(s); sediment basin; holding pond; suitable drainage structure; manure store area; and water storage tanks.

The stocking density of the facilities will average five square metres (m^2) per sheep, with each 50 metre (m) by 50 m pen housing up to 500 sheep. The facilities will be constructed as a class 1 feedlot under the MLA *National procedures and guidelines for intensive sheep and lamb feeding systems* (2011).

The proposed sheep feedlot will require a development consent from the Greater Hume Council under the *Environmental Planning and Assessment Act 1979*.

The concept plan and design layouts of the sheep feed lot infrastructure are shown in **Figure 2-1** and **Figure 2-2**.

Figure 2-1: Concept Plan of proposal.

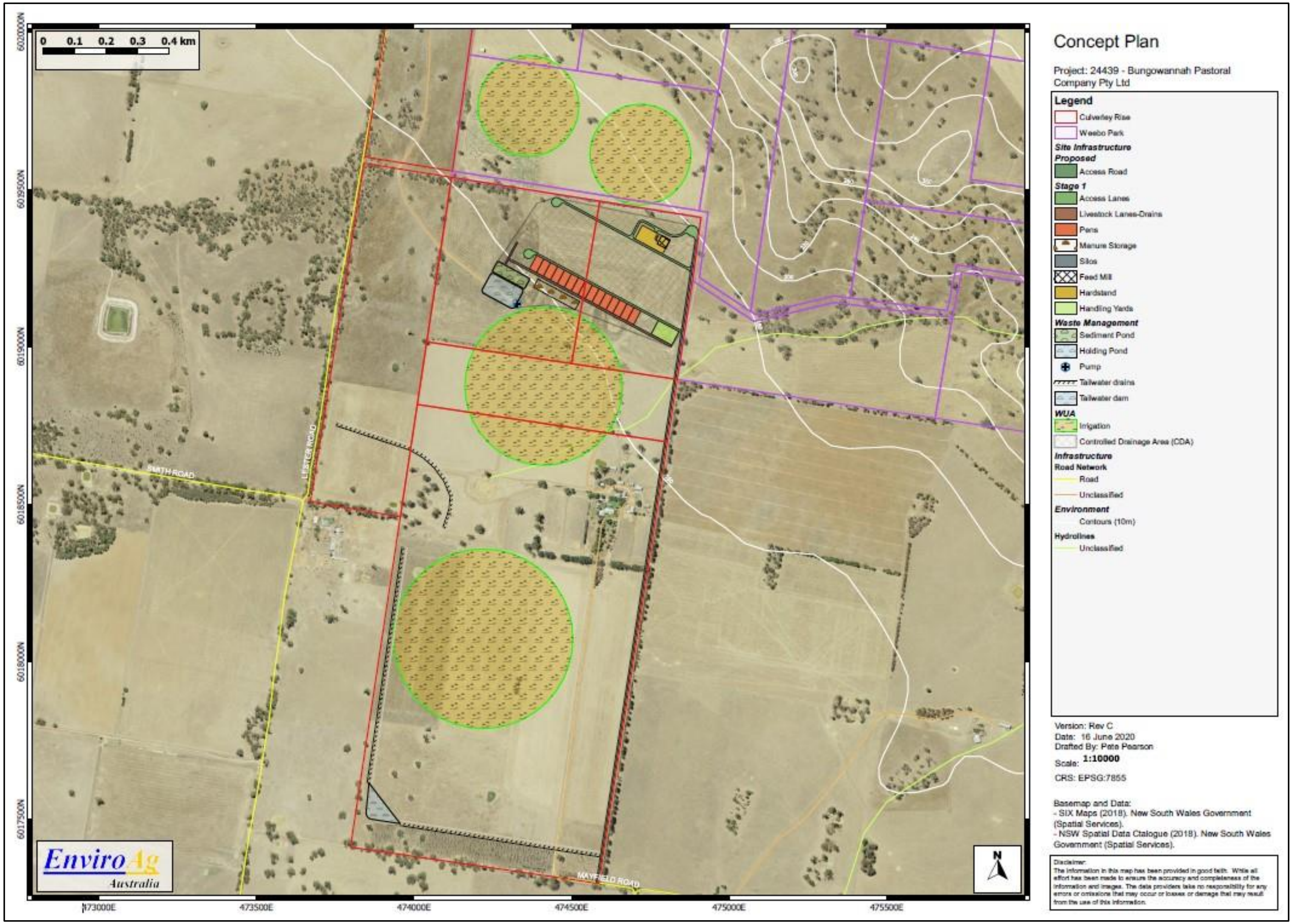
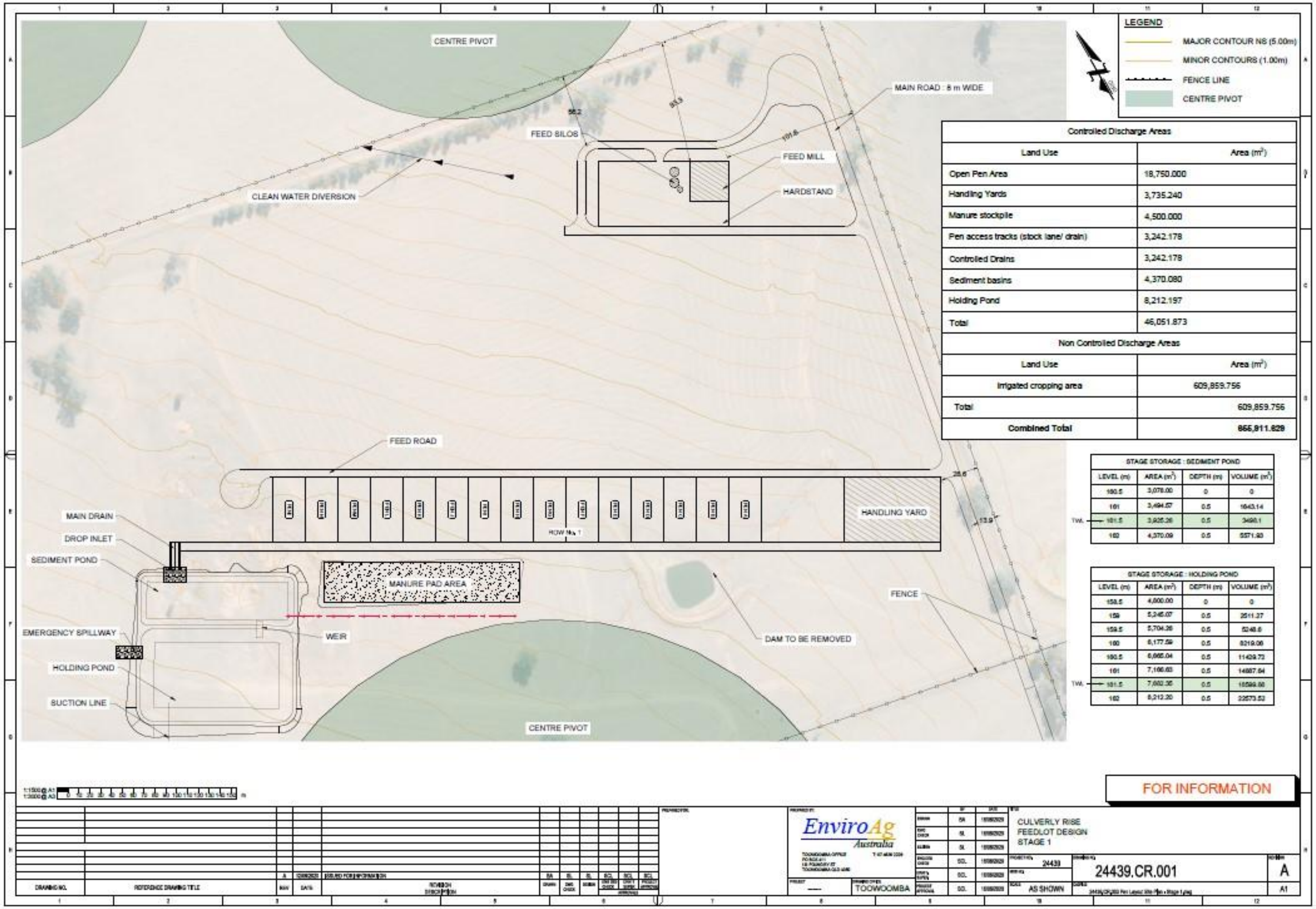


Figure 2-2: Proposed pen layout site plan – Stage 1.



2.3.2 Step 2a

Are there any relevant confirmed site records or other associated landscape feature information on AHIMS?

No, there are no previously recorded sites within the study area.

A search of the Aboriginal Heritage Information Management System (AHIMS) database on 16 April 2020 returned 85 records for Aboriginal heritage sites within a 15 km radius search area over the study area (GDA Zone 55 Eastings: 458938–489726; Northings: 6003821–6034501 with no buffer) (see **Table 2-2** for the site types and frequencies; results mapped in **Figure 2-3**). **Appendix 1** provides a copy of the extensive AHIMS search.

The most frequent site type in the vicinity of the study area is artefact scatters (68%), followed by modified trees (24%) and isolated finds (5%). Other site types, such as an artefact scatter associated with a burial, an artefact scatter associated with a hearth, and an artefact scatter associated with a potential archaeological deposit (PAD), only occur once each.

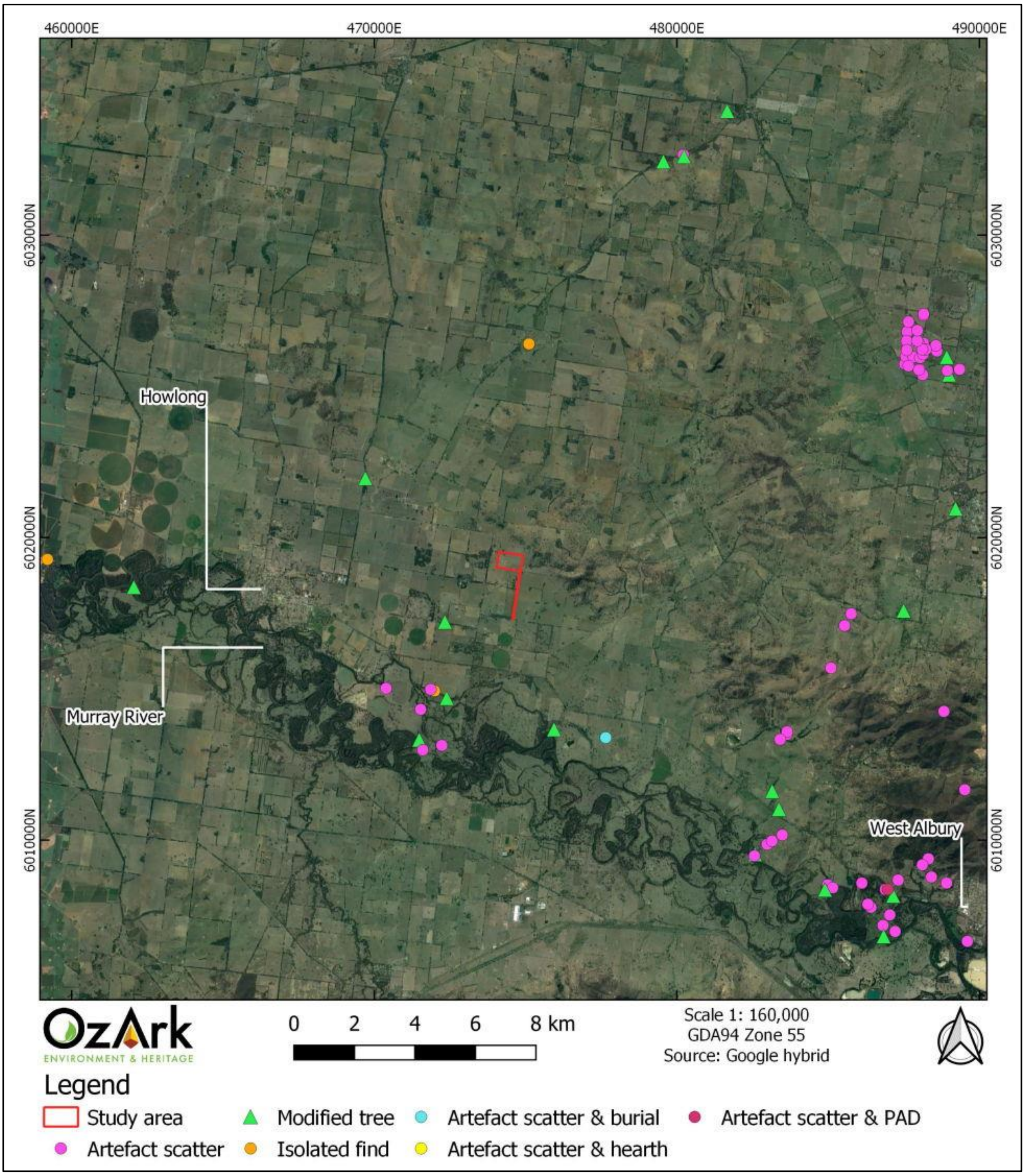
Table 2-2: AHIMS site types and frequencies.

Site Type	Number	% Frequency
Artefact scatter	58	68.2
Modified tree	20	23.5
Isolated find	4	4.7
Artefact scatter & burial	1	1.2
Artefact scatter & hearth	1	1.2
Artefact scatter & PAD	1	1.2
Total	**85**	**100**

The closest recorded site to the study area is #55-6-0019 (WW16; Whittaker Lane) recorded during the assessment for the Wodonga to Wagga Wagga Natural Gas Pipeline (**Section 2.3.3**). The site is a modified tree and is located 2.5 km southwest of the study area.

Based on the AHIMS results, the most likely site types to be found in the study area are artefact scatters or modified trees.

Figure 2-3: Previously recorded sites in relation to the study area.



2.3.3 Step 2b

Are there any other sources of information of which a person is already aware?

No, there are no other sources of information that would indicate the presence of Aboriginal objects in the study area.

The study area has not been previously assessed, however, there are a number of assessments from the broader region which are relevant.

In 1978, Crosby conducted a pedestrian survey of six areas around the Albury region. Crosby recorded seven Aboriginal sites and ten historical sites during the survey. Crosby noted that recordings of scarred trees were associated with the junction between geologically different rocks where water springs were also present. Crosby also noted that quartz was prevalent throughout the survey areas, especially in the form of small pebbles. During the field survey in 1979, all Aboriginal sites recorded by Crosby were scarred trees. Crosby also highlights the lack of surface camp sites in the areas surveyed (Crosby 1979).

Djekic undertook an archaeological survey for a proposed transmission line from Wagga Wagga to Albury in 1978. The proposed transmission line covered approximated 120 km. The assessment resulted in six scarred trees being recorded, as well as artefact scatters. Artefacts included a small grinding stone, a hammer stone, a broken pebble and a small round stone of local material that appeared to have been pecked on both sides. The assessment concluded that the low numbers of sites recorded during the survey was a result of the modification of the land through intensive development of agriculture in the region.

Navin Officer undertook heritage assessments between 1995 and 1997 for a proposed natural gas pipeline between Wodonga and Wagga Wagga (Navin Officer 1996a, 1996b, 1998). The proposed pipeline study area extended for 146 km and a section of the assessed area was located approximately 1.5 km west of the study area. There were several stages of assessment for the pipeline project. The first stage identified 12 artefact scatters, three scarred trees and 10 isolated finds. Further survey identified 17 artefact scatters, six scarred trees, eight PADs and nine isolated finds, in addition to five historic sites. In total, the various surveys for the project identified 51 sites. Most of the artefact scatters identified during the various assessments for the pipeline project were recorded in association with creek lines, wetlands and low gradient spur lines. Scarred trees were recorded on alluvial flats, valley floors, basal slopes and wetland basins.

NGH Environmental completed a heritage assessment for a proposed solar farm at Jindera covering approximately 521 ha (NGH 2019). During the survey seven artefact scatters, four PADs and 15 isolated finds were recorded. Aboriginal community representatives also recorded three cultural trees during the survey. A subsurface test excavation program was undertaken at the four PAD locations (a crest near water and three raised areas along spur landform in proximity to water). 52 test pits were excavated during the test excavation program, with 80 stone artefacts identified from 25 pits. All artefacts were quartz. The results of the subsurface testing program were noted to be characterised by low-density clusters of artefacts interspersed with areas of very low or not artefactual material.

The archaeological investigations which have been conducted in the region surrounding the study area indicate that:

- Stone artefact sites (isolated finds and artefact scatters) are the most commonly recorded site types in the area, followed by culturally modified trees. Other site types, such as grinding grooves and rock shelters are very rare or non-existent
- The predominant raw materials used for stone artefact manufacture are locally sourced quartz and to a lesser extent silcrete
- Excavations generally reveal a low-density of artefacts
- Sites tend to be associated with elevated level ground associated with water sources.

The study area has not been previously assessed and information detailed in **Section 2.3.2** presents the only available information that specifically relates to the study area: an AHIMS search. There are no known cultural values or Aboriginal sites pertaining directly to the location of the proposed work. A representative of the Albury and District LALC accompanied the current visual inspection (see **Section 2.3.6**).

2.3.4 Step 2c

Are there any landscape features that are likely to indicate presence of Aboriginal objects?

No portions of the study area contain landforms with identified archaeological sensitivity.

The study area is in a flat, low lying area, north of the Murray River and southwest of the small range which includes One Tree Hill. The closest water sources are a minor drainage line 1.4 km northeast of the study area, or the Murray River which is 2.1 km south of the study area (**Figure 2-4**). Such an environment is unlikely to have a favoured area for Aboriginal occupation for extended periods of time, and is more likely to have been utilised as an access route between the hills and the river.

The study area has been used historically and is currently used for low-intensity livestock grazing and agricultural cropping.

Knowledge of the environmental contexts of the study area and a desktop review of the known local and regional archaeological record, the following predictions are made concerning the probability of those site types being recorded:

- Isolated finds may be indicative of random loss or deliberate discard of a single artefact, the remnant of a now dispersed and disturbed artefact scatter, or an otherwise obscured or sub-surface artefact scatter. They may occur anywhere within the landscape but are more likely to occur in topographies where open artefact scatters typically occur.
  - As isolated finds can occur anywhere, particularly within disturbed contexts, it is predicted that this site type could be recorded within the study area. It is noted in **Section 2.3.2** that isolated finds have been recorded in the region.
- Open artefact scatters are here defined as two or more artefacts, not located within a rock shelter, and located no more than 50 m away from any other constituent artefact. This site type may occur almost anywhere that Aboriginal people have travelled and may be

associated with hunting and gathering activities, short- or long-term camps, and the manufacture and maintenance of stone tools. Artefact scatters typically consist of surface scatters or sub-surface distributions of flaked stone discarded during the manufacture of tools but may also include other artefactual rock types such as hearth and anvil stones. Less commonly, artefact scatters may include archaeological stratigraphic features such as hearths and artefact concentrations which relate to activity areas. Artefact density can vary considerably between and across individual sites. Small ground exposures revealing low density scatters may be indicative of background scatter rather than a spatially or temporally distinct artefact assemblage. These sites are classed as 'open', that is, occurring on the land surface unprotected by rock overhangs, and are sometimes referred to as 'open camp sites'.

Artefact scatters are most likely to occur on level or low gradient contexts, along the crests of ridgelines and spurs, and elevated areas fringing watercourses or wetlands. Larger sites may be expected in association with permanent water sources.

Topographies which afford effective through-access across, and relative to, the surrounding landscape, such as the open basal valley slopes and the valleys of creeks, will tend to contain more and larger sites, mostly camp sites evidenced by open artefact scatters.

  - Stone artefact distributions of variable artefact densities are the most common Aboriginal object found within the region (see **Section 2.3.2**). A general correlation between different types of watercourses and the nature of the evidence of past Aboriginal occupation is evident. Higher artefact density sites are located near to permanent water sources and low-density artefact distributions are found elsewhere. It is therefore predicted that large, complex sites will be absent from the survey area, though low-density scatters consisting of mostly quartz artefacts are the most likely site type to be present inside the study area.

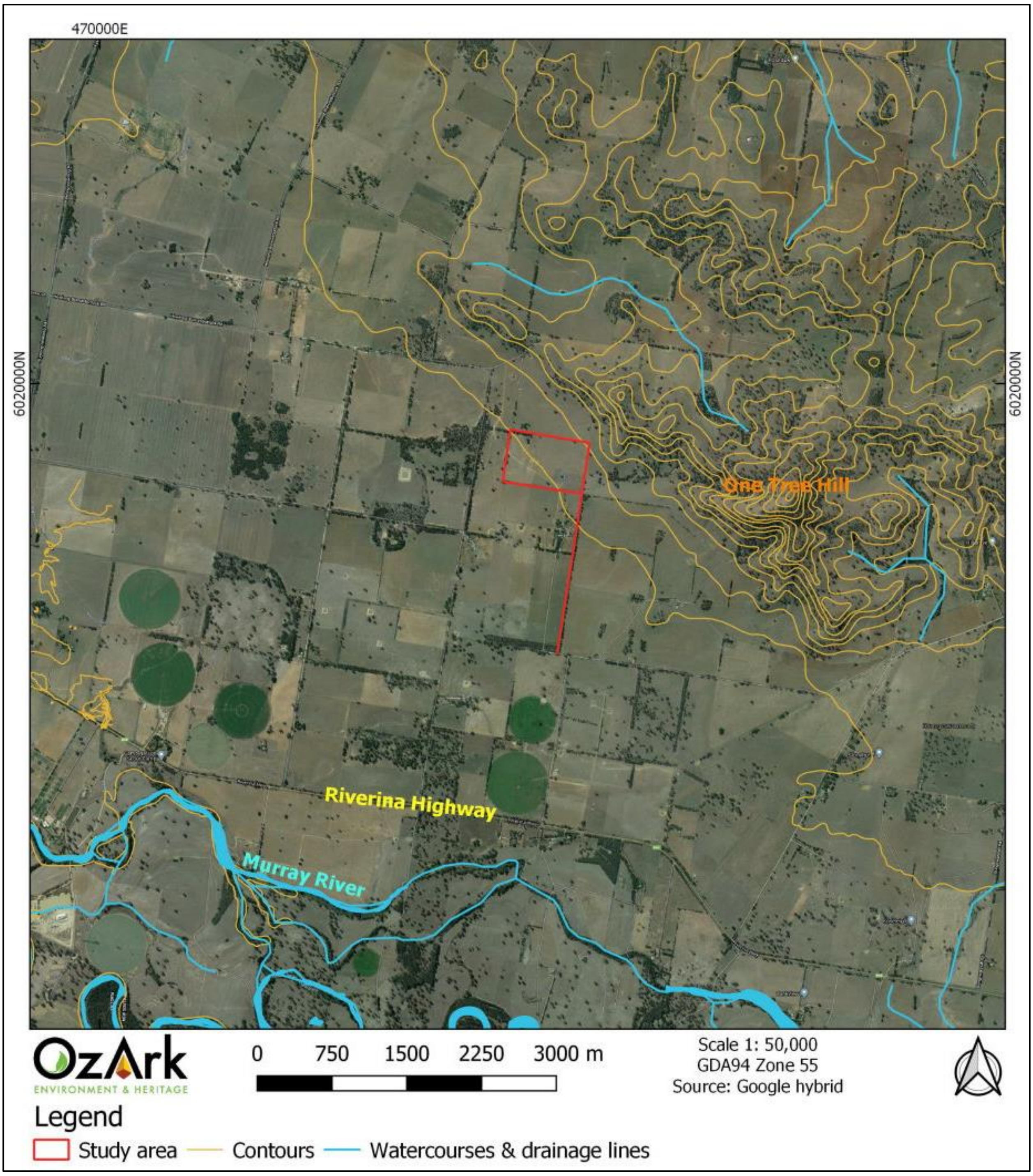
- <u>Aboriginal scarred trees</u> contain evidence of the removal of bark (and sometimes wood) in the past by Aboriginal people, in the form of a scar. Bark was removed from trees for a wide range of reasons. It was a raw material used in the manufacture of various tools, vessels and commodities such as string, water containers, roofing for shelters, shields and canoes. Bark was also removed as a consequence of gathering food, such as collecting wood boring grubs or creating footholds to climb a tree for possum hunting. Due to the multiplicity of uses and the continuous process of occlusion (or healing) following removal, it is difficult to accurately determine the intended purpose for any particular example of bark removal. Scarred trees may occur anywhere old growth trees survive. The identification of scars as Aboriginal cultural heritage items can be problematical because some forms of natural trauma and European bark extraction create similar scars. Many remaining scarred trees probably date to the historic period when bark was removed by Aboriginal people for both their own purposes and for roofing on early European houses. Consequently, the distinction between European and Aboriginal scarred trees may not be clear.

  - The study area is mostly cleared of vegetation; therefore, this site type is not predicted likely to occur. However, it is possible that culturally modified trees may be present in stands of remnant native vegetation if any remains.

- Quarry sites and stone procurement sites typically consist of exposures of stone material where evidence for human collection, extraction and/or preliminary processing has survived. Typically, these involve the extraction of siliceous or fine grained igneous and meta-sedimentary rock types for the manufacture of artefacts. The presence of quarry/extraction sites is dependent on the availability of suitable rock formations.
    - This site type could be recorded within the study area should suitable rock outcroppings be available.
- Grinding grooves are most likely to occur on flat outcrops of coarse-grained sandstone in the vicinity of water sources, however, grinding grooves have been recorded on fine-grained granite outcrops.
    - Given the low prospect of suitable rock exposures being present in the study area, grinding groove sites are unlikely to be present. In addition, the study area does not contain any waterways where such sites are more likely to be located.
- Rock shelters were utilised in the past for both habitation and ceremonial purposes. The term 'rock shelter site' refers to rock shelters/rock overhangs that contain evidence such as stone artefacts and/or bones and/or plant remains (from meals eaten at the site) and/or hearths (fireplaces). Most rock shelter sites are secular in nature, however, those that also contain rock art or engravings are often believed to be non-secular in nature. The term 'rock art site' generally refers to Aboriginal ochre paintings or ochre or charcoal drawings located on a rock slab (generally in a sheltered place like the floor of a cave or rock shelter), boulder, cliff-face, cave or rock shelter wall or roof, or wall of a rock overhang. The majority of rock art sites are found in positions that are sheltered from the elements. This observation, however, is probably biased to some extent, as rock art would not preserve well in open positions. Rock art sites are generally believed to be non-secular in nature.
    - Based on the topography of the study area, rock shelters are not predicted to be present.
- Burials are generally found in soft sediments such as aeolian sand, alluvial silts and rock shelter deposits. In valley floor and plains contexts, burials may occur in locally elevated topographies rather than poorly drained sedimentary contexts. Burials are also known to have occurred on rocky hilltops in some limited areas. Burials are generally only visible where there has been some disturbance of sub-surface sediments or where some erosional process has exposed them.
    - Given the topography, nature of the soils and geology, burials are not predicted to be present in the study area.
- Bora/Ceremonial sites are places which have ceremonial or spiritual connections. Ceremonial sites may comprise of natural landscapes or have archaeological material. Bora sites are ceremonial sites which consist of a cleared area and earthen rings

As the heritage assessment was originally for an ACHAR, a full pedestrian survey of the study area (**Section 2.3.6**) was undertaken.

Figure 2-4. Aerial of the study area showing terrain.



2.3.5 Step 3

<u>Can harm to Aboriginal objects listed on AHIMS or identified by other sources of information and/or can the carrying out of the activity at the relevant landscape features be avoided?</u>

Yes. There are no AHIMS sites or landforms with identified archaeological sensitivity that will be impacted by the proposal.

The study area does not contain any archaeologically sensitive landforms or known Aboriginal sites. The study area is at least 1 km away from any type of permanent water source and unlikely to have been used extensively by Aboriginal people in the past, except for travel and potential hunting between the low range of One Tree Hill and the Murray River.

2.3.6 Step 4

<u>Does a desktop assessment and visual inspection confirm that there are Aboriginal objects or that they are likely?</u>

No. There are no Aboriginal objects within the study area that will be impacted by the proposal.

The pedestrian survey of the study area was undertaken by OzArk Senior Archaeologist, Dr Alyce Cameron, on 3 June 2020. Andom Rendell, a representative from Albury and District LALC, participated in the field survey.

The survey methodology provided to RAPs as part of the ACHCRs for Stage 2/3 was followed during the pedestrian survey (see **Appendix 2**). The survey of the study area followed the *Code of Practice for the Investigation of Aboriginal Objects in New South Wales* (Code of Practice; DECCW 2010c) and the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in New South Wales* (OEH 2011).

Figure 2-5 shows the pedestrian transects of one surveyor during the visual inspection and the survey areas used to classify the study area. The two surveyors were approximately 15 m apart during the survey. The ground surface visibility (GSV) was variable depending on the area. **Table 2-3** summarises the six survey areas in relation to GSV and ground surface exposure (GSE), soils, disturbances and topography. Most of the study area has been previously ploughed and cropped and some survey areas had been recently ploughed. There are also several dirt vehicle tracks throughout the area, as well as a dam between survey area 1 and survey area 2 (see **Figure 2-5**).

No Aboriginal objects or areas of potential archaeological deposits were recorded during the pedestrian survey of the study area. There are some quartz river pebbles and gravels present, primarily along the eastern edge of the study area. None of these quartz pieces had evidence of being artefactual. All of the study area has been previously disturbed, the majority of it through ploughing and cultivation. The access road (survey area 6) is also interspersed with several fence lines as well as planted trees used as windbreaks.

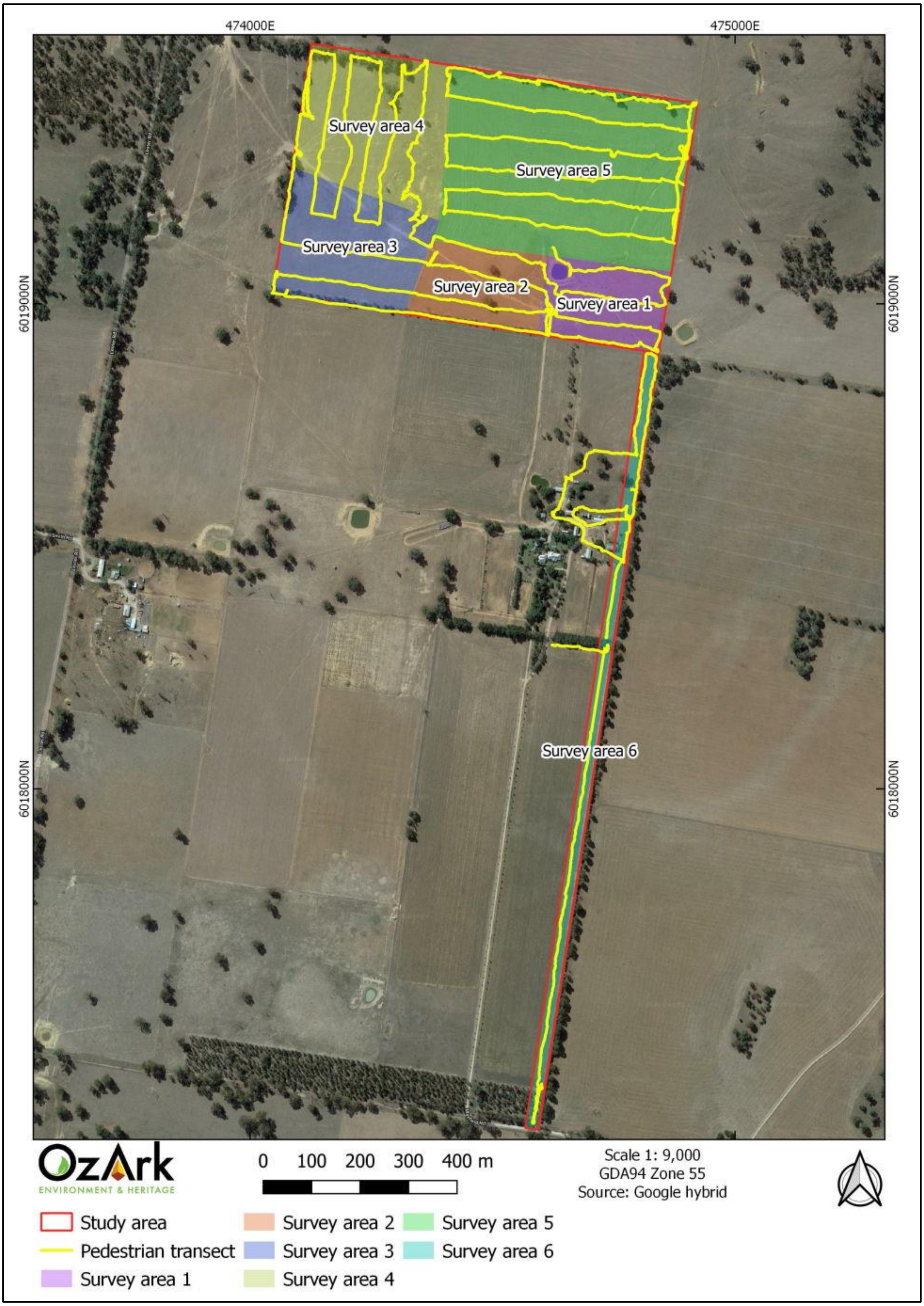
The RAP representative from Albury and District LALC, Andom Rendell, agreed that the study area had low potential for Aboriginal items and sites, and that there were also no PADs in or adjacent to the study area.

Table 2-3: Study area characteristics.

Area	GSV & GSE	Details (soils, disturbances, topography, etc.)	Representative photograph
Survey area 1	GSV: 80% GSE: 70%	Soil is mid brown loamy silt. Flat topography. Has been ploughed recently. More gravels, mostly quartz river pebbles, present through the eastern side of area.	 View east across survey area 1.
Survey area 2	GSV: 70% GSE: 60%	Soil is mid brown loamy silt. Minimal gravels throughout. Trees along southern boundary in aerial imagery have been removed. Flat topography. Frequent erosion scalds. Short grass. Some ploughed areas.	 View east across survey area 2.
Survey area 3	GSV: 80% GSE: 70%	Soil is mid brown / orange sandy silt. Minimal gravels throughout. Has been ploughed recently. Trees in visible in an aerial have been removed. Flat topography.	 View east across survey area 3.

Area	GSV & GSE	Details (soils, disturbances, topography, etc.)	Representative photograph
Survey area 4	GSV: 40% GSE:30%	Soil is mid brown / orange sandy silt. Minimal gravels throughout. Has been ploughed previously and currently covered in short grass. Flat topography. Disturbed portion in the south-eastern corner of survey area where sand quarrying and carcass dumping has occurred.	 View east along the northern boundary of study area and survey area 4.
Survey area 5	GSV: 50% GSE: 30%	Soil is mid brown loamy silt. Has been previously cropped and ploughed over most of the survey area. Tree line along the northern boundary has been planted. Erosion scalds present throughout. Some quartz gravels present. The north-eastern corner of survey area is higher in elevation, with the slope descending very gently towards the southwest.	 View southwest across survey area 5 from the north-eastern corner of the study area.
Survey area 6	GSV: 40% GSE:30%	Soil is mid brown loamy silt. Has been previously cropped and ploughed over most of the survey area. Some parts of survey area include farm fences and holding pens as well as tree lines. Grassed over the majority of the area, though some erosion scalds present.	 View south across southern half of survey area 6.

Figure 2-5: Survey coverage within the study area.



Discussion

No Aboriginal sites or PADs were recorded during the assessment. The study area has been consistently cultivated and grazed, likely since at least the 1870s, when J. Lester of Culverley Rise, Howlong applied for a cattle brand (*Government Gazette*, 28 March 1870, pp.728–737). The lack of archaeological sites within the study area confirms the predictive model (**Section 2.3.4**) which stated the area was unlikely to have been a favoured area for Aboriginal occupation for extended periods of time.

A 'no' answer for Step 4, results in the following outcome (DECCW 2010b):

> *AHIP application not necessary. Proceed with caution. If any Aboriginal objects are found, stop work and notify Heritage NSW* (131 555 or info@environment.nsw.gov.au)*. If human remains are found, stop work, secure the site and notify NSW Police and Heritage NSW.*

2.4 Conclusion

The Due Diligence process has resulted in the outcome that an AHIP is not required. The reasoning behind this determination is set out in **Table 2-4**.

Table 2-4: Due Diligence Process application.

Item	Reasoning	Answer
Will the activity disturb either of the following: • the ground surface where archaeological deposits are likely • mature, native trees that may be culturally modified.	The proposed works will disturb the ground surface through excavation and construction. The study area is assessed as having a low potential for archaeological deposits. The proposal will not impact mature, native vegetation.	No
Are there any relevant records of Aboriginal heritage on site (AHIMS or from other sources), or landscape features that are likely to indicate presence of Aboriginal objects?	AHIMS indicated that there are no Aboriginal sites within the study area. No landscape features in the study area indicate the likely presence of Aboriginal objects.	No
Will the activity impact Aboriginal objects or landforms with archaeological potential?	There are no known Aboriginal objects present in the study area, and landforms with identified archaeological sensitivity are not present.	No
Does the desktop and/or visual assessment confirm that Aboriginal objects will be harmed?	Desktop searches and the visual inspection recorded no known items of Aboriginal heritage in the study area. It is assessed that there is a low likelihood of there being subsurface archaeological deposits within the study area.	No
AHIP not necessary. Proceed with caution.		

3 MANAGEMENT RECOMMENDATIONS

The undertaking of the Due Diligence process resulted in the conclusion that the proposed works will have an impact on the ground surface, however, no Aboriginal objects or intact archaeological deposits will be harmed by the proposal. This moves the proposal to the following outcome:

> *AHIP application not necessary. Proceed with caution. If any Aboriginal objects are found, stop work and notify Heritage NSW* (131 555 or info@environment.nsw.gov.au)*. If human remains are found, stop work, secure the site and notify NSW Police and Heritage NSW.*

To ensure the greatest possible protection to the area's Aboriginal cultural heritage values, the following recommendations are made:

1) The proposed work may proceed at Culverley Rise without further archaeological investigation under the following conditions:
    a) All land and ground disturbance activities must be confined to within the study area, as this will eliminate the risk of harm to Aboriginal objects in adjacent landforms. Should the parameters of the proposal extend beyond the assessed areas, then further archaeological assessment may be required.
    b) All staff and contractors involved in the proposed work should be made aware of the legislative protection requirements for all Aboriginal sites and objects.
2) This assessment has concluded that there is a low likelihood that the proposed work will adversely harm Aboriginal cultural heritage items or sites. However, during works, if Aboriginal artefacts or skeletal material are noted, all work should cease and the procedures in the *Unanticipated Finds Protocol* (**Appendix 3**) should be followed;
3) Work crews should undergo cultural heritage induction to ensure they recognise Aboriginal artefacts (see **Appendix 4**) and are aware of the legislative protection of Aboriginal objects under the NPW Act and the contents of the *Unanticipated Finds Protocol.*
4) The information presented here meets the requirements of the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales*. It should be retained as shelf documentation for five years as it may be used to support a defence against prosecution in the event of unanticipated harm to Aboriginal objects.

REFERENCES

Burke & Smith 2004	Burke, H. and Smith, C. 2004. *The Archaeologist's Field Handbook*, Blackwell, Oxford.
Burra Charter 2013	International Council on Monuments and Sites 2013. *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance*.
Crosby 1978	Crosby E. 1978. *A site survey in the Albury area*. Report to NPWS.
Crosby 1979	Crosby E. 1979. *Aboriginal sites in Albury March-June 1979*. Report to NPWS.
DECCW 2010a	DECCW. 2010. *Aboriginal cultural heritage consultation requirements for proponents.* Department of Environment, Climate Change and Water (now OEH).
DECCW 2010b	DECCW. 2010. *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW*. Department of Environment, Climate Change and Water, Sydney.
DECCW 2010c	DECCW. 2010. *Code of Practice for the Protection of Aboriginal Objects in NSW*. Department of Environment, Climate Change.
Dejkic 1978	Dejkic A. 1978. *An archaeological survey of the Wagga Wagga to Albury transmission line*. Report to NPWS.
Mitchell 2002	Mitchell, Dr. Peter. 2002. *Description for NSW (Mitchell) Landscapes Version 2.* Department of Environment and Climate Change NSW.
Navin Officer 1996a	Navin Officer Heritage Consultants. 1996a. *Wodonga to Wagga Wagga Natural Gas Pipeline EIS Cultural Heritage Assessment*. Report to Sinclair Knight Merz.
Navin Officer 1996b	Navin Officer Heritage Consultants. 1996b. *Wodonga to Wagga Wagga Natural Gas Pipeline Further Archaeological Assessment.* Report to East Australian Pipeline Ltd.
Navin Officer 1998	Navin Officer Heritage Consultants. 1998. *Wodonga-Wagga Wagga Natural Gas Pipeline Archaeological Subsurface testing program.* Report to East Australian Pipeline Ltd.
NGH 2019	NGH Environmental. 2019. *Aboriginal Cultural Heritage Assessment: Jindera Solar Farm*. Report to Jindera Solar Pty Ltd.

OEH 2011 Office of Environment and Heritage. 2011. *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in New South Wales.* Department of Environment, Climate Change and Water, Sydney.

APPENDIX 1: AHIMS SEARCH RESULTS

Office of Environment & Heritage

AHIMS Web Services (AWS)
Extensive search - Site list report

Your Ref/PO Number : Culverley Rise
Client Service ID : 497674

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
60-3-0065	Ring-a-Rah 1	AGD	55	483370	6009990	Open site	Valid	Hearth : 1, Artefact : -		98391
	Contact	Recorders	Joanne Bell					Permits	1417	
55-6-0043	ABP/NSW 4	AGD	55	485430	6016910	Open site	Valid	Artefact : 14		
	Contact	Recorders	Joanne Bell					Permits		
60-3-0066	ABP/NSW 2	AGD	55	483520	6013310	Open site	Valid	Artefact : 16		
	Contact	Recorders	Joanne Bell					Permits		
60-3-0067	ABP/NSW 3	AGD	55	483530	6013400	Open site	Valid	Artefact : 15		
	Contact	Recorders	Joanne Bell					Permits		
60-3-0068	ABP/NSW 1	AGD	55	482870	6009680	Open site	Valid	Artefact : 27		
	Contact	Recorders	Joanne Bell					Permits		
55-6-0081	Riverview IF 2	GDA	55	459201	6019284	Open site	Valid	Artefact : 1		100755
	Contact	Recorders	Total Earth Care Pty Ltd					Permits	2868	
60-3-0105	Negari Mt	AGD	55	471372	6013135	Open site	Valid	Modified Tree (Carved or Scarred) : 1		
	Contact T Russell	Recorders	Mr.Dean Freeman					Permits		
60-3-0114	Wonga Wetlands Scarred Tree	GDA	55	487152	6008163	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Mr.Simon Crocker					Permits		
55-6-0101	Howlong/Brock Rd 1	GDA	55	469706	6021962	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Mr.Mark Saddler					Permits		
55-6-0198	Quat Quatta ST1	GDA	55	462052	6018367	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Ms.Amanda Lavender,Ms.Amanda Lavender,DPIE,DPIE					Permits		
60-3-0148	Bagnalls Lagoon Artefacts Scatter	GDA	55	486892	6008373	Open site	Valid	Artefact : -		
	Contact	Recorders	Jacobs Group (Australia) Pty Ltd - Melbourne,Mrs.Rose Overberg					Permits		
60-3-0154	Nail Can Hill IF 1	GDA	55	488827	6014260	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Matthew Barber,NGH Heritage - Fyshwick					Permits		
60-3-0155	Nail Can Hill AFT 1	GDA	55	489516	6011670	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Matthew Barber,NGH Heritage - Fyshwick					Permits		
60-3-0150	Splitters Creek Artefact Scatter	GDA	55	484983	6008525	Open site	Valid	Artefact : -		
	Contact	Recorders	Jacobs Group (Australia) Pty Ltd - Melbourne,Mrs.Rose Overberg					Permits		
60-3-0151	Milly's rest Artefact Scatter	GDA	55	485149	6008430	Open site	Valid	Artefact : -		

Report generated by AHIMS Web Service on 16/04/2020 for Alyce Cameron for the following area at Datum :GDA, Zone : 55, Eastings : 458938 - 489726, Northings : 6003821 - 6034501 with a Buffer of 0 meters. Additional Info : background. Number of Aboriginal sites and Aboriginal objects found is 85

This information is not guaranteed to be free from error omission. Office of Environment and Heritage (NSW) and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.

Page 1 of 6

Office of Environment & Heritage

AHIMS Web Services (AWS)
Extensive search - Site list report

Your Ref/PO Number : Culverley Rise
Client Service ID : 497674

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
	Contact	Recorders	Jacobs Group (Australia) Pty Ltd - Melbourne,Mrs.Rose Overberg					Permits		
60-3-0057	BP6	AGD	55	483300	6013150	Open site	Valid	Artefact : -	Open Camp Site	100576
	Contact	Recorders	James Leslie Smith					Permits		
55-6-0019	WW16;Whittaker Lane;	AGD	55	472220	6017030	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	98638
	Contact	Recorders	Mr.Kelvin Officer					Permits		
55-6-0020	WW17;Majorn Plain 1;	AGD	55	475000	6026200	Open site	Valid	Artefact : -	Isolated Find	98638
	Contact	Recorders	Mr.Kelvin Officer					Permits		
55-6-0021	WW18;Hollyrood 1;	AGD	55	479440	6032250	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	98638
	Contact	Recorders	Mr.Kelvin Officer					Permits		
55-6-0022	WW19;Hollyrood 2;	AGD	55	480100	6032470	Open site	Valid	Artefact : -	Open Camp Site	98638
	Contact	Recorders	Mr.Kelvin Officer					Permits		
55-6-0023	WW20;Hoolyrood 3;	AGD	55	480120	6032420	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	98638
	Contact	Recorders	Mr.Kelvin Officer					Permits		
55-6-0025	EAPL 1F19;	AGD	55	475000	6026220	Open site	Valid	Artefact : -	Isolated Find	
	Contact	Recorders	Mr.Kelvin Officer					Permits		
55-6-0037	BP 5 (Howlong)	AGD	55	485650	6017300	Open site	Valid	Artefact : -	Open Camp Site	100576
	Contact	Recorders	Laura-Jane Smith					Permits		
55-6-0038	Burrumbuttock Sports Ground;	AGD	55	481550	6033920	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	
	Contact	Recorders	P Saunders,Peter Dowling					Permits		
60-3-0038	Nursery Valley 1;	AGD	55	488800	6008400	Open site	Valid	Artefact : -	Open Camp Site	2808
	Contact	Recorders	Robert Paton					Permits		
60-3-0039	Nursery Valley 2;	AGD	55	488300	6008600	Open site	Valid	Artefact : -	Open Camp Site	2808
	Contact	Recorders	Robert Paton					Permits		
60-3-0040	Nursery Valley 3;	AGD	55	488200	6009200	Open site	Valid	Artefact : -	Open Camp Site	2808
	Contact	Recorders	Robert Paton					Permits		
60-3-0041	Nursery Valley 4;	AGD	55	488000	6009000	Open site	Valid	Artefact : -	Open Camp Site	2808
	Contact	Recorders	Robert Paton					Permits		
60-3-0042	Nursery Valley 5;	AGD	55	487200	6008500	Open site	Valid	Artefact : -	Open Camp Site	2808
	Contact	Recorders	Robert Paton					Permits		

Report generated by AHIMS Web Service on 16/04/2020 for Alyce Cameron for the following area at Datum :GDA, Zone : 55, Eastings : 458938 - 489726, Northings : 6003821 - 6034501 with a Buffer of 0 meters. Additional Info : background. Number of Aboriginal sites and Aboriginal objects found is 85

This information is not guaranteed to be free from error omission. Office of Environment and Heritage (NSW) and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.

Page 2 of 6

Office of Environment & Heritage

NSW Government

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : Culverley Rise

Client Service ID : 497674

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
60-3-0043	Murray Floodplain 1;	AGD	55	486300	6007600	Open site	Valid	Artefact : -	Open Camp Site	2808
	Contact	Recorders	Robert Paton					Permits		
60-3-0044	Murray Floodplain 2;	AGD	55	486700	6007000	Open site	Valid	Artefact : -	Open Camp Site	2808
	Contact	Recorders	Robert Paton					Permits		
60-3-0045	Murray Floodplain 3;	AGD	55	486000	6008400	Open site	Valid	Artefact : -	Open Camp Site	2808
	Contact	Recorders	Robert Paton					Permits		
60-3-0046	Murray Floodplain 4;	AGD	55	486200	6007700	Open site	Valid	Artefact : -	Open Camp Site	2808
	Contact	Recorders	Robert Paton					Permits		
60-3-0047	Murray Floodplain 5;	AGD	55	487100	6006800	Open site	Valid	Artefact : -	Open Camp Site	2808
	Contact	Recorders	Robert Paton					Permits		
60-3-0048	WW2_Morebringer 1;	AGD	55	471420	6014140	Open site	Valid	Artefact : -	Open Camp Site	98639,98640
	Contact	Recorders	Kerry Navin,Mr.Kelvin Officer					Permits		
60-3-0049	WW1 Negari 1;	AGD	55	471490	6012800	Open site	Valid	Artefact : -	Open Camp Site	98639,98640
	Contact	Recorders	Mr.Kelvin Officer					Permits		
60-3-0050	WWIF2;	AGD	55	472120	6012950	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	Recorders	Kerry Navin,Mr.Kelvin Officer					Permits		
60-3-0051	WWIF1	AGD	55	471880	6014750	Open site	Valid	Artefact : -	Isolated Find	
	Contact	Recorders	Kerry Navin,Mr.Kelvin Officer					Permits		
60-3-0052	WW4 Lesters lagoon 2;	AGD	55	472280	6014510	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	98639,98640
	Contact	Recorders	Kerry Navin,Mr.Kelvin Officer					Permits		
60-3-0053	WW3 Lesters Lagoon 1;	AGD	55	471750	6014800	Open site	Valid	Artefact : -	Open Camp Site	98637,98639,98640
	Contact	Recorders	Kerry Navin,Mr.Kelvin Officer					Permits		
60-3-0004	Bungawannah Burial Ground;	AGD	55	477536	6013207	Open site	Valid	Burial : -, Artefact : -	Burial/s,Open Camp Site	1483
	Contact	Recorders	ASRSYS					Permits		
60-3-0012	Dights Hill 1;	AGD	55	483038	6011435	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	276
	Contact	Recorders	ASRSYS					Permits		
60-3-0018	Howlong;Albury;	AGD	55	489487	6006474	Open site	Valid	Artefact : -	Open Camp Site	1464
	Contact	Recorders	ASRSYS					Permits		
60-3-0116	Wonga Wetlands Gate	GDA	55	486969	6008376	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		98041,103203

Report generated by AHIMS Web Service on 16/04/2020 for Alyce Cameron for the following area at Datum :GDA, Zone : 55, Eastings : 458938 - 489726, Northings : 6003821 - 6034501 with a Buffer of 0 meters. Additional Info : background. Number of Aboriginal sites and Aboriginal objects found is 85

Page 3 of 6

Office of Environment & Heritage

NSW Government

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : Culverley Rise

Client Service ID : 497674

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
	Contact	Recorders	Jacobs Group (Australia) Pty Ltd - Melbourne,Mrs.Rose Overberg,Mr.Oliver Brown					Permits		
60-3-0134	Howlong 1	GDA	55	470393	6015022	Open site	Valid	Artefact : -		
	Contact	Recorders	Ms.Jacqui Duncan,Tim Stone Pty. Ltd.					Permits		
60-3-0144	Wonga Drive Scarred Tree	GDA	55	484896	6008363	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Jacobs Group (Australia) Pty Ltd - Melbourne,Mrs.Rose Overberg					Permits		
60-3-0142	Andom's Canoe Tree	GDA	55	484896	6008363	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Jacobs Group (Australia) Pty Ltd - Melbourne,Mrs.Rose Overberg					Permits		
60-3-0143	Uncle Tunny's Tree	GDA	55	486834	6006823	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Jacobs Group (Australia) Pty Ltd - Melbourne,Mrs.Rose Overberg					Permits		
55-6-0129	Jindera 487613	GDA	55	487613	6026809	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Mark Saddler					Permits		
55-6-0114	Jindera 487530	GDA	55	487529	6025742	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Matthew Barber,Mr.Mark Saddler,NGH Heritage - Fyshwick					Permits		
55-6-0115	Jindera 488918	GDA	55	488918	6025967	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Mr.Mark Saddler					Permits		
55-6-0116	Jindera 488995	GDA	55	488995	6025387	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Mr.Mark Saddler					Permits		
55-6-0117	Jindera 488942	GDA	55	488942	6025519	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Matthew Barber,Mr.Mark Saddler,NGH Heritage - Fyshwick					Permits		
55-6-0118	Jindera 487666	GDA	55	487566	6025996	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Matthew Barber,Mr.Mark Saddler,NGH Heritage - Fyshwick					Permits		
55-6-0119	Jindera 487828	GDA	55	487828	6025972	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Mark Saddler					Permits		
55-6-0120	Jindera 487973	GDA	55	488040	6025952	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Matthew Barber,Mr.Mark Saddler,NGH Heritage - Fyshwick					Permits		
55-6-0121	Jindera 488172	GDA	55	488140	6026065	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Matthew Barber,Mr.Mark Saddler,NGH Heritage - Fyshwick					Permits		

Report generated by AHIMS Web Service on 16/04/2020 for Alyce Cameron for the following area at Datum :GDA, Zone : 55, Eastings : 458938 - 489726, Northings : 6003821 - 6034501 with a Buffer of 0 meters. Additional Info : background. Number of Aboriginal sites and Aboriginal objects found is 85

This information is not guaranteed to be free from error omission. Office of Environment and Heritage (NSW) and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.

Page 4 of 6

Office of Environment & Heritage

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : Culverley Rise

Client Service ID : 497674

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
55-6-0122	Jindera 488179	GDA	55	488149	6026428	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Matthew Barber,Mr.Mark Saddler,NGH Heritage - Fyshwick					Permits		
55-6-0123	Jindera 488004	GDA	55	488004	6026417	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Mark Saddler					Permits		
55-6-0124	Jindera 487595	GDA	55	487595	6026504	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Mark Saddler					Permits		
55-6-0125	Jindera 488212 duplicate of 55-6-0126	GDA	55	488150	6027345	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Matthew Barber,Mr.Matthew Barber,Mr.Mark Saddler,NGH Heritage - Fyshwick					Permits		
55-6-0126	Jindera 488156 duplicate of 55-6-0125	GDA	55	488156	6027395	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Mark Saddler					Permits		
55-6-0142	Jindera Scarred Tree	GDA	55	489213	6020956	Open site	Valid	Modified Tree (Carved or Scarred) : 1		
	Contact	Recorders	Mr.Kyle Moffitt					Permits		
55-6-0149	Jindera Solar IF 1	GDA	55	488031	6025567	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Matthew Barber,NGH Heritage - Fyshwick					Permits		
55-6-0150	Jindera Solar IF 2	GDA	55	489344	6025566	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Matthew Barber,NGH Heritage - Fyshwick					Permits		
55-6-0152	Jindera Solar IF 4	GDA	55	488592	6026169	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Matthew Barber,NGH Heritage - Fyshwick					Permits		
55-6-0153	Jindera Solar IF 5	GDA	55	488565	6026351	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Matthew Barber,NGH Heritage - Fyshwick					Permits		
55-6-0154	Jindera Solar IF 6	GDA	55	488225	6026223	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Matthew Barber,NGH Heritage - Fyshwick					Permits		
55-6-0155	Jindera Solar IF 7	GDA	55	488116	6026227	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Matthew Barber,NGH Heritage - Fyshwick					Permits		
55-6-0156	Jindera Solar IF 8	GDA	55	487656	6025679	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Matthew Barber,NGH Heritage - Fyshwick					Permits		
55-6-0157	Jindera Solar IF 9	GDA	55	487601	6026201	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Matthew Barber,NGH Heritage - Fyshwick					Permits		
55-6-0158	Jindera Solar IF 10	GDA	55	487943	6026509	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Matthew Barber,NGH Heritage - Fyshwick					Permits		
55-6-0159	Jindera Solar IF 11	GDA	55	487659	6027137	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Matthew Barber,NGH Heritage - Fyshwick					Permits		
55-6-0160	Jindera Solar AFT 2	GDA	55	488124	6025390	Open site	Valid	Artefact : -		

Report generated by AHIMS Web Service on 16/04/2020 for Alyce Cameron for the following area at Datum :GDA, Zone : 55, Eastings : 458938 - 489726, Northings : 6003821 - 6034501 with a Buffer of 0 meters. Additional Info : background. Number of Aboriginal sites and Aboriginal objects found is 85

Office of Environment & Heritage

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : Culverley Rise

Client Service ID : 497674

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
	Contact	Recorders	Mr.Matthew Barber,NGH Heritage - Fyshwick					Permits		
55-6-0161	Jindera Solar AFT 3	GDA	55	488001	6025549	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Matthew Barber,NGH Heritage - Fyshwick					Permits		
55-6-0162	Jindera Solar AFT 1	GDA	55	487948	6026853	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Matthew Barber,NGH Heritage - Fyshwick					Permits		
60-3-0145	Waterview Road Artefact Scatter	GDA	55	487038	6007532	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Jacobs Group (Australia) Pty Ltd - Melbourne,Jacobs Group (Australia) Pty Ltd - Me					Permits	4429	
60-3-0059	RING A RAH 1	AGD	55	483370	6009990	Open site	Valid	Artefact : -		
	Contact	Recorders	Joanne Bell,M Chamberlain					Permits		
60-3-0060	RING A RAH 2	AGD	55	483030	6009790	Open site	Valid	Artefact : -		
	Contact	Recorders	Joanne Bell,M Chamberlain					Permits		
60-3-0061	RING-A-RAH 3	AGD	55	482470	6009350	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Joanne Bell,M Chamberlain					Permits		
55-6-0039	scholz 1	AGD	55	487380	6017400	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Joanne Bell					Permits		
60-3-0062	MOORANGURY ROAD RESERVE	AGD	55	483260	6010840	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Joanne Bell,M Chamberlain					Permits		
60-3-0063	MOORANGURY 1	AGD	55	484980	6015510	Open site	Valid	Artefact : -		
	Contact	Recorders	Joanne Bell,M Chamberlain					Permits	1417	
60-3-0064	RING-A-RAH 4	AGD	55	482450	6009300	Open site	Valid	Artefact : -		
	Contact	Recorders	Joanne Bell,M Chamberlain					Permits		
60-3-0094	12 mile MT	AGD	55	475828	6013479	Open site	Valid	Modified Tree (Carved or Scarred) : 1		
	Contact Sarah Colley	Recorders	Mr.Dean Freeman					Permits		

Report generated by AHIMS Web Service on 16/04/2020 for Alyce Cameron for the following area at Datum :GDA, Zone : 55, Eastings : 458938 - 489726, Northings : 6003821 - 6034501 with a Buffer of 0 meters. Additional Info : background. Number of Aboriginal sites and Aboriginal objects found is 85

This information is not guaranteed to be free from error omission. Office of Environment and Heritage (NSW) and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.

APPENDIX 2: ABORIGINAL CONSULTATION LOG AND ACHCR DETAILS

Aboriginal Consultation Log - Culverley Rise sheep feedlot			
Date	**Organisation**	**Comment**	**Method**
31.3.20	The Border Mail	Rebecca Hardman (RH) phoned, N/A due to COVID 19	Phone
31.3.20	The Border Mail	RH sent email asking if they cover the Bungowannah area also asking cut-off times and publishing days	Email
31.3.20	The Border Mail	RH received email, paper runs, Monday to Saturday and covers the area	Email
31.3.20	The Border Mail	RH sent advert for proof and quote	Email
31.3.20	BCD	RH sent stage1 agency letter requesting potential stakeholders. Closing date 14.4.20	Email
31.3.20	Albury and District Local Aboriginal Land Council	RH sent stage1 agency letter requesting potential stakeholders. Closing date 14.4.20	Email
31.3.20	Office of The Registrar, ALRA	RH sent stage1 agency letter requesting potential stakeholders. Closing date 14.4.20	Email
31.3.20	National Native Title Tribunal	RH sent stage1 agency letter requesting potential stakeholders. Closing date 14.4.20	Email
31.3.20	NTSCORP	RH sent stage1 agency letter requesting potential stakeholders. Closing date 14.4.20	Email
31.3.20	Greater Hume Shire Council	RH sent stage1 agency letter requesting potential stakeholders. Closing date 14.4.20	Email
31.3.20	Murray Local Land Services	RH sent stage1 agency letter requesting potential stakeholders. Closing date 14.4.20	Email
31.3.20	The Border Mail	RH received proof	Email
31.3.20	The Border Mail	RH asked if can alter advert	Email
31.3.20	The Border Mail	RH received call from Tracey, she misunderstood advertising date.	Email
31.3.20	The Border Mail	RH followed up new booking email	Email
31.3.20	The Border Mail	RH received new booking date and proof	Email
31.3.20	The Border Mail	RH phoned, approved proof, requested tear sheet and paid	Email
31.3.20	The Border Mail	RH received receipt	Email
1.4.20	National Native Title Tribunal	RH received notification *Records held by the National Native Title Tribunal as at 01 April 2020 indicate that the identified parcel appears to be freehold, and freehold tenure extinguishes native title.*	Email
2.4.20	The Border Mail	RH receive tear sheet	Email
2.4.20	BCD	RH received stakeholder list	Email
15.4.20	Yalmambirra	RH sent stage1 EOI Community letter. Registrations close 1.5.20	Email
15.4.20	Mungabareena Aboriginal Corporation	RH sent stage1 EOI Community letter. Registrations close 1.5.20	Post
15.4.20	Denise McGrath	RH sent stage1 EOI Community letter. Registrations close 1.5.20	Email
15.4.20	Leonie McIntosh	RH sent stage1 EOI Community letter. Registrations close 1.5.20	Email
15.4.20	Dan Clegg	RH sent stage1 EOI Community letter. Registrations close 1.5.20	Email
15.4.20	Alice Williams	RH sent stage1 EOI Community letter. Registrations close 1.5.20	Email
15.4.20	Bundyi Aboriginal Cultural Knowledge	RH sent stage1 EOI Community letter. Registrations close 1.5.20	Email
15.4.20	Liz Heta	RH sent stage1 EOI Community letter. Registrations close 1.5.20	Email

Aboriginal Consultation Log - Culverley Rise sheep feedlot			
Date	**Organisation**	**Comment**	**Method**
15.4.20	Miyagan Culture & Heritage	RH sent stage1 EOI Community letter. Registrations close 1.5.20	Email
15.4.20	Albury and District Local Aboriginal Land Council	RH sent stage1 EOI Community letter. Registrations close 1.5.20	Email
15.4.20	Bundyi Aboriginal Cultural Knowledge	RH received email Registering as a RAP and requesting confirmation	Email
16.4.20	Bundyi Aboriginal Cultural Knowledge	RH confirmed registration	Email
17.4.20	Yalmambirra	RH received email with some questions.	Email
19.4.20	Dan Clegg	RH received email will not be registering as a RAP	Email
20.4.20	Dan Clegg	RH thanked Dan for letting her know	Email
20.4.20	Yalmambirra	RH responded to questions from 17.4.20.	Email
20.4.20	Yalmambirra	Registered as a RAP	Email
4.5.20	Bundyi Aboriginal Cultural Knowledge	RH sent Stage 2. Feedback ends 1.6.20	Email
4.5.20	Albury and District Local Aboriginal Land Council	RH sent Stage 2. Feedback ends 1.6.20	Email
4.5.20	Yalmambirra	RH sent Stage 2. Feedback ends 1.6.20	Email
4.5.20	BCD	RH sent notification of RAPs	Email
4.5.20	Albury and District Local Aboriginal Land Council	RH sent notification of RAPs	Email
9.5.20	Yalmambirra	RH received feedback on survey methodology. Forwarded to Alyce Cameron (AC) for response.	Email
11.5.20	Yalmambirra	RH thanked Yal	Email
19.5.20	Albury and District Local Aboriginal Land Council	RH sent invite to fieldwork	Email
21.5.20	Albury and District Local Aboriginal Land Council	RH phoned to follow up invite	Phone
26.5.20	Albury and District Local Aboriginal Land Council	RH phoned to follow up invite	Phone
26.5.20	Albury and District Local Aboriginal Land Council	RH sent follow up email for invite to fieldwork	Email
26.5.20	Albury and District Local Aboriginal Land Council	RH phoned previous site officer to try follow up - N/A	Phone
26.5.20	Albury and District Local Aboriginal Land Council	RH phoned and spoke to Milly, confirmed Andom will attend	Phone
01.06.20	Yalmambirra	AC responded to Yal's comments provided on the survey methodology (9.5.20)	Email
03.06.20	Albury and District Local Aboriginal Land Council	Andom Rendell from Albury & District LALC attended the field survey. No Aboriginal sites, items or potential deposits were recorded during the field survey.	In person
23.6.20	Bundyi Aboriginal Cultural Knowledge	RH sent project update letter informing of proponent ceasing ACHCRs and changing assessment type to due diligence based on field survey results.	Email
23.6.20	Albury and District Local Aboriginal Land Council	RH sent project update letter informing of proponent ceasing ACHCRs and changing assessment type to due diligence based on field survey results.	Email
23.6.20	Yalmambirra	RH sent project update letter informing of proponent ceasing ACHCRs and changing assessment type to due diligence based on field survey results.	Email
24.6.20	Bundyi Aboriginal Cultural Knowledge	RH received email in response to project update letter with questions. Forwarded onto AC for response.	Email
24.6.20	Bundyi Aboriginal Cultural Knowledge	RH thanked Mark and noted she has passed the email to AC.	Email

Aboriginal Consultation Log - Culverley Rise sheep feedlot			
Date	**Organisation**	**Comment**	**Method**
24.6.20	Bundyi Aboriginal Cultural Knowledge	AC responded to Mark's questions around project update letter.	Email
24.6.20	Bundyi Aboriginal Cultural Knowledge	Mark emailed and asked for map of study area and what the ground visibility was like.	Email
25.6.20	Bundyi Aboriginal Cultural Knowledge	AC responded to Mark that ground visibility was moderate overall and attached pdf of map with pedestrian transects.	Email

ACHCRs – Stage 1. Advertisement with the Border Mail.

Expression of Interest

Cultural Heritage Management

OzArk Environment & Heritage has been engaged on behalf of the proponent, (Bungowannah Pastoral Company Co. Pty Ltd) and seeks registration of Aboriginal groups or individuals who are interested in being consulted over an Aboriginal Cultural Heritage Assessment and potential Aboriginal Heritage Impact Permit application (AHIP) for the proposed construction of a sheep feedlot, located on the property known as 'Culverley Rise' at 198 Humphreys Road, Bungowannah, approximately 25 kilometres northwest of Albury, NSW.

This consultation will assist the proponent in preparation of an Aboriginal Cultural Heritage Assessment and potential AHIP application, and to assist the Secretary of the Department of Planning, Industry and Environment in their consideration and determination of the Project.

If you hold cultural knowledge relevant to determining the cultural significance of Aboriginal objects or places in the proposed study area, please register your interest. We will continue to consult with this group.

Registrations can be made by

OzArk EHM
PO Box 2069
Dubbo NSW 2830

email: rebecca@ozarkehm.com.au

or by OzArk on 02 6882 0118.

All submissions should be received no later than Thursday 16 th April 2020.

ACHCRs – Stage 1. Example of letter sent to agencies and potential RAPs.

OzArk Environment & Heritage — ABN 59 104 582 354

Dubbo | T: 02 6882 0118 | 145 Wingewarra St
Queanbeyan | enquiry@ozarkehm.com.au | PO Box 2069
Newcastle | www.ozarkehm.com.au | DUBBO NSW 2830

31 March 2020

Members
Albury and District Local Aboriginal Land Council
PO Box 22
LAVINGTON NSW 2640
ceo@alburydistrictlalc.org

ABORIGINAL CULTURAL HERITAGE ASSESSMENT FOR THE PROPOSED INTENSIVE LIVESTOCK AGRICULTURE FACILITY, 'CULVERLEY RISE', 198 HUMPHREYS ROAD, BUNGOWANNAH, NSW.

Dear Members,

OzArk Environment & Heritage (OzArk) has been engaged by Blueprint Planning, on behalf of the proponent Bungowannah Pastoral Company Co. Pty Ltd (Bungawannah Pastoral) to undertake Aboriginal community consultation as per the '*Aboriginal cultural heritage consultation requirements for proponents 2010*'.

Bungawannah Pastoral are seeking to obtain development consent to construct a 3,750 head sheep feedlot. The proposed project location is on the property known as 'Culverley Rise' at 198 Humphreys Road, Bungowannah, approximately 25 kilometres (km) northwest of Albury, NSW (**Figure 1**).

We are therefore seeking Expressions of Interest from relevant Aboriginal groups and individuals in the local area, to form a consultation group. This consultation is to assist OzArk and the proponent in preparation of an Aboriginal Cultural Heritage Assessment and potential AHIP application, and to assist the Secretary of the Department of Planning, Industry and Environment in their consideration and determination of the Project.

If your organisation can recommend and provide contact details for any known Aboriginal groups or individuals with cultural knowledge relevant to determining the impacts to the cultural significance of the above-mentioned project, please advise our office. We would appreciate it if you could provide any feedback, regarding these Aboriginal stakeholder groups by **Tuesday 14th April 2020**, or sooner if possible.

Once relevant groups and individuals have been identified, they will form part of the formal consultation process for the project.

Kind regards,

Rebecca Hardman
Community Liaison & Administration

Figure 1. Proposed site layout of Culverley Rise Feedlot (proposed assessment area outlined in blue).

ACHCRs – Stage 2/3. Example of letter sent to RAPs and survey methodology.

OzArk Environment & Heritage

ENVIRONMENT & HERITAGE

OzArk Environment & Heritage   ABN 59 104 582 354

Dubbo   T: 02 6882 0118   145 Wingewarra St
Queanbeyan   enquiry@ozarkehm.com.au   PO Box 2069
Newcastle   www.ozarkehm.com.au   DUBBO NSW 2830

4 May 2020

Members
Albury and District Local Aboriginal Land Council
PO Box 22
LAVINGTON NSW 2640
ceo@alburydistrictlalc.org

ABORIGINAL CULTURAL HERITAGE ASSESSMENT FOR THE PROPOSED INTENSIVE LIVESTOCK AGRICULTURE FACILITY, 'CULVERLEY RISE', 198 HUMPHREYS ROAD, BUNGOWANNAH, NSW.

Dear Members,

Thank-you for your registration of interest to become a Registered Aboriginal Party (RAP) for consultation in relation to the proposed 3750 head sheep feedlot on the "Culverley Rise" property at 198 Humphreys Road, Bungowannah, approximately 25 kilometres (km) northwest of Albury, NSW.

The purpose of this letter is to invite you to comment on the enclosed draft methodology for the Aboriginal Cultural Heritage Survey Methodology, Culverley Rise Feedlot, Bungowannah, Greater Hume Local Government Area, NSW, May 2020. This assessment will support a potential AHIP application when lodged with the Secretary of the Department of Planning, Industry and Environment.

In addition to comments on the draft report, if you can share any Aboriginal cultural heritage knowledge relevant to the proposed study area, we welcome this input so as to improve our assessment outcomes and to ensure Aboriginal cultural values are considered. OzArk is required to give you 28 days to supply feedback on the attached documents. This period closes 5pm **on Monday 1st June 2020.** If you need any help supplying feedback, please do not hesitate to contact our office.

Should you have any queries in relation to the enclosed information please do not hesitate to contact our office.

Kind regards,

Rebecca Hardman
Community Liaison & Administration

Aboriginal Cultural Heritage Survey Methodology

Culverley Rise Feedlot, Bungowannah

Greater Hume Local Government Area, NSW

May 2020

Report prepared by
OzArk Environment & Heritage
for Blueprint Planning on behalf of
Bungowannah Pastoral Company Co. Pty Ltd

OzArk
Environment & Heritage
145 Wingewarra St
(PO Box 2069)
Dubbo NSW 2830
Phone: (02) 6882 0118
Fax: (02) 6882 0630
enquiry@ozarkehm.com.au
www.ozarkehm.com.au

This page has intentionally been left blank.

Document Controls

Proponent	Bungowannah Pastoral Company Co Pty Ltd		
Client	Blueprint Planning		
Document Description	*Aboriginal Cultural Heritage Survey Methodology. Culverley Rise Feedlot, Bungowannah, Greater Hume Local Government Area, NSW.*		
File Location	OzArk Job No.		
S:\OzArk EHM Data\Clients\Blueprint Planning\Sheep feedlot, Culverley Rise, Bungowannah March 2020\Survey Methodology	2620		
Document Status **V3.0 FINAL**		Date 4 May 2020	
Draft V1.0 Author to editor OzArk 1st internal (Series V1 = OzArk internal edits)		V1.0 AC author 17/04/20 V1.1 BC edit 20/4/20 V1.2 AC edit 21/4/20	
Draft V2.0 Report Draft for release to client (Series V2 = OzArk and client edits)		V2.0 AC to client 21/4/20 V2.1 Client edits incorporated 21/4/20	
FINAL V3.0 = Final report		V3.0 AC finalise. Send to RAPs 4/5/20	
Prepared For		Prepared By	
James Laycock Blueprint Planning 3/576 Kiewa Street Albury NSW 2640		Dr Alyce Cameron Senior Archaeologist OzArk Environment & Heritage 145 Wingewarra Street (PO Box 2069) Dubbo NSW 2830 P: 02 6882 0118 F: 02 6882 6030 alyce@ozarkehm.com.au	

OzArk Environment & Heritage

Acknowledgement

OzArk acknowledge Traditional Owners of the area on which this assessment took place and pay respect to their beliefs, cultural heritage and continuing connection with the land. We also acknowledge and pay respect to the post-contact experiences of Aboriginal people with attachment to the area and to the elders, past and present, as the next generation of role models and vessels for memories, traditions, culture and hopes of local Aboriginal people.

OzArk Environment & Heritage

CONTENTS

FIGURES

TABLES

OzArk Environment & Heritage

1 Introduction

OzArk Environment & Heritage (OzArk) has been engaged by Blueprint Planning (the client) on behalf of Bungowannah Pastoral Company Co. Pty Ltd (the proponent) to prepare a survey methodology for a proposed sheep feedlot at Culverley Rise (the Project). This methodology is in accordance with Stage 3 of the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (ACHCRs). The Project information provided here also complies with Stage 2 of the ACHCRs.

1.1 Project Overview

The proposed development includes the construction and operation of a sheep feedlot with a capacity of up to 3,750 head. The facilities will include the following features:

- Holding pens; sheep processing yard; truck parking area; workshop; laydown area; feed shed; waste disposal facilities; weighbridge; stock dam; wastewater irrigation area; on site bore; tail water / contaminated agriculture runoff dam(s); sediment basin; holding pond; suitable drainage structure; manure store area; and water storage tanks.

The stocking density of the facilities will average 5 m^2 per sheep, with each 50 m by 50 m pen housing up to 500 sheep. The facilities will be constructed as a class 1 feedlot under the MLA *National procedures and guidelines for intensive sheep and lamb feeding systems* (2011).

The proposed sheep feedlot will require a development consent from the Greater Hume Council under the *Environmental Planning and Assessment Act 1979*.

1.2 The study area

The study area is located approximately 25 kilometres (km) northwest of Albury, NSW and is within the Greater Hume Local Government Area (LGA) (**Figure 1-1**).

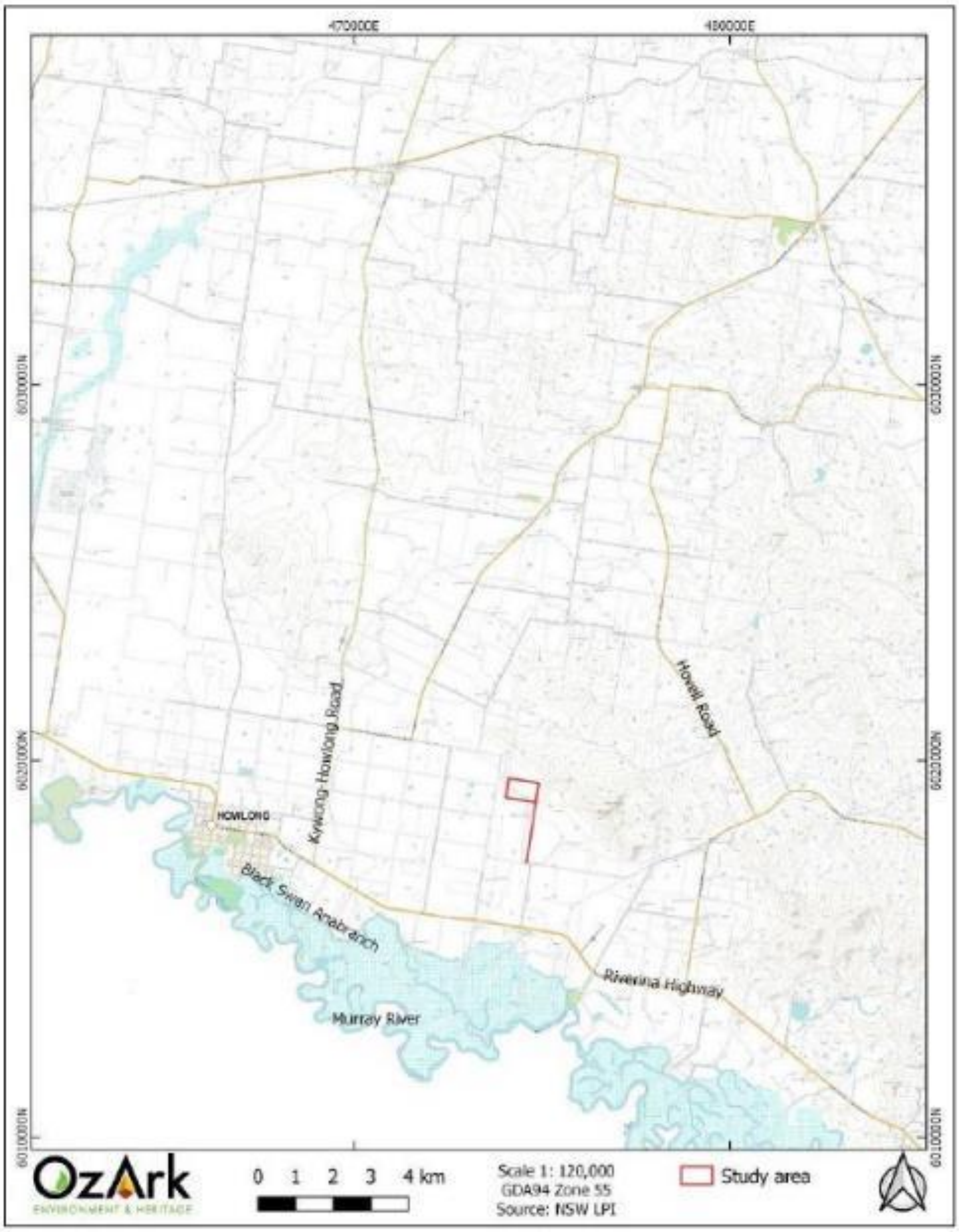
The study area consists of:

- The proposed sheep feedlots at Lot 74 and Lot 75 DP753749, approximately 44 hectares (ha) in size
- 1.6 km access road from Mayfield Road to the southeast corner of Lot 75 DP753749.

Figure 1-2 shows the study area and access road in relation to lots. The study area is used for agricultural practices, particularly grazing and cropping.

OzArk Environment & Heritage

Figure 1-1. Location of the Project.



Aboriginal Cultural Heritage Survey Methodology. Sheep feedlot, Culverley Rise, NSW 2

OzArk Environment & Heritage

Figure 1-2. The study area.

OzArk Environment & Heritage

1.3 CONSULTATION ON THIS METHODOLOGY

Consultation for this proposal has followed the guidelines established in the *Aboriginal cultural heritage consultation requirements for proponents* (ACHCRs, DECCW 2010) whereby an advertisement was placed in the local press and relevant agencies were contacted to ascertain if they were aware of groups or individuals who may have cultural knowledge of the region containing the Project.

On 31 March 2020 an advertisement was placed in the 'The Border Mail' requesting expressions of interest in being consulted about the Project. In addition, the following agencies were contacted to identify potential stakeholders for the area: Biodiversity and Conservation Division (BCD) of the Department of Planning, Industry and Environment; Albury and District Local Aboriginal Land Council; Office of The Registrar: Aboriginal Land Rights Act; National Native Title Tribunal; Native Title Service Corporation (NTSCORP); Greater Hume Council; and Murray Local Land Services.

As a result, the groups or individuals listed in **Table 1-1** registered to be consulted about the Project. These groups or individuals constitute the Registered Aboriginal Parties (RAPs) for the Project.

Table 1-1: Registered Aboriginal Parties.

RAPs	
Bundyi Aboriginal Cultural Knowledge	Albury and District Local Aboriginal Land Council
Yalmambirra	

OzArk Environment & Heritage

2 ARCHAEOLOGICAL CONTEXT

2.1 REGIONAL ARCHAEOLOGICAL CONTEXT

The Aboriginal occupation of Australia begins prior to 40,000 BP (years before present) and possibly earlier than 50,000 BP. Dates exceeding 20,000 years occur in almost all parts of Australia resulting in the expectation that most areas should have a Pleistocene (>12,000 BP) occupational signature. However, such dates remain relatively rare due to a range of factors, both behavioural and post-depositional. These factors include a possible low density of occupation in the Pleistocene period, poor preservation of archaeological materials (particularly dateable organic materials) and significant coastline change over the past 18,000 years.

2.1.1 A site survey in the Albury Area (Crosby 1978) and Archaeological surveys for the Albury-Wodonga Development Corporation (Crosby 1979)

In 1978, Crosby conducted a pedestrian survey of six areas around the Albury region. Crosby recorded seven Aboriginal sites and ten historical sites during the survey. Crosby noted that recordings of scarred trees were associated with the junction between geologically different rocks where water springs were also present. Crosby also noted that quartz was prevalent throughout the survey areas, especially in the form of small pebbles. During the field survey in 1979, all Aboriginal sites recorded by Crosby were scarred trees. Crosby also highlights the lack of surface camp sites in the areas surveyed (Crosby 1979).

2.1.2 Archaeological survey of the Wagga Wagga to Albury transmission line (Djekic 1978)

Djekic undertook an archaeological survey for a proposed transmission line from Wagga Wagga to Albury in 1978. The proposed transmission line covered approximated 120 km. The assessment resulted in six scarred trees being recorded, as well as artefact scatters. Artefacts included a small grinding stone, a hammer stone, a broken pebble and a small round stone of local material that appeared to have been pecked on both sides. The assessment concluded that the low numbers of sites recorded during the survey was a result of the modification of the land through intensive development of agriculture in the region.

2.1.3 Wodonga to Wagga Wagga Natural Gas Pipeline (Navin Officer 1996a, 1996b and 1998)

Navin Officer undertook heritage assessments between 1995 and 1997 for a proposed natural gas pipeline between Wodonga and Wagga Wagga. The proposed pipeline study area extended for 146 km and a section of the assessed area was located approximately 1.5 km west of the study area. There were several stages of assessment for the pipeline project. The first stage identified 12 artefact scatters, three scarred trees and 10 isolated finds. Further survey identified 17 artefact scatters, six scarred trees, eight potential archaeological deposits (PADs) and nine isolated finds, in addition to five historic sites. In total, the various surveys for the project identified 51 sites. Most of the artefact scatters identified during the various assessments for the pipeline project were recorded in association with creek lines, wetlands and low gradient spur lines. Scarred trees were recorded on alluvial flats, valley floors, basal slopes and wetland basins.

2.1.4 Jindera Solar Farm (NGH Environmental 2019)

NGH Environmental completed a heritage assessment for a proposed solar farm at Jindera covering approximately 521 ha. During the survey seven artefact scatters, four PADs and 15 isolated finds were recorded. Aboriginal community representatives also recorded three cultural trees during the survey. A subsurface test excavation program was undertaken at the four PAD locations (a crest near water and three raised areas along spur landform in proximity to water). 52 test pits were excavated during the test excavation program, with 80 stone artefacts identified from 25 pits. All artefacts were quartz. The results of the subsurface testing program were noted to be characterised by low-density clusters of artefacts interspersed with areas of very low or not artefactual material.

2.2 Local Archaeological Context

A search of the Aboriginal Heritage Information Management System (AHIMS) database on 16 April 2020 returned 85 records for Aboriginal heritage sites within a 15 km radius search area over the study area (GDA Zone 55 Eastings: 458938–489726; Northings: 6003821–6034501 with no buffer) (see **Table 2-1** for the site types and frequencies; results mapped in **Figure 2-1**).

The most frequent site type in the vicinity of the study area is artefact scatters (68%), followed by modified trees (24%) and isolated finds (5%). Other site types, such as an artefact scatter associated with a burial, an artefact scatter associated with a hearth, and an artefact scatter associated with a PAD, only occur once each.

Table 2-1: AHIMS site types and frequencies.

Site Type	Number	% Frequency
Artefact scatter	58	68.2
Modified tree	20	23.5
Isolated find	4	4.7
Artefact scatter & burial	1	1.2
Artefact scatter & hearth	1	1.2
Artefact scatter & PAD	1	1.2
Total	**85**	**100**

The closest recorded site to the study area is #55-6-0019 (WW16; Whittaker Lane) recorded during the assessment for the Wodonga to Wagga Wagga Natural Gas Pipeline (**Section 2.1.3**). The site is a modified tree and is located 2.5 km southwest of the study area.

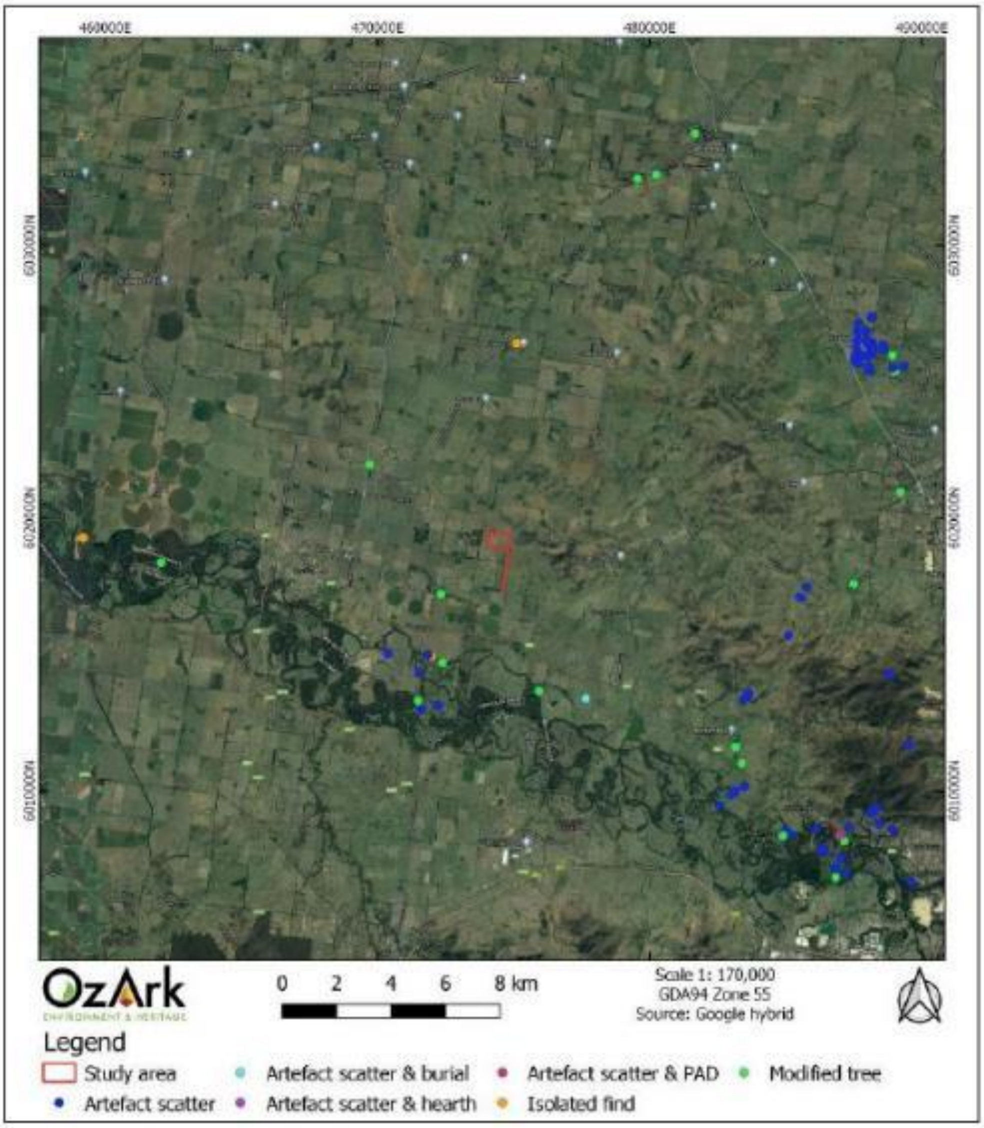
2.3 ARCHAEOLOGICAL CONTEXT: CONCLUSION

The archaeological investigations which have been conducted in the region surrounding the study area (**Section 2.1**) indicate that:

- Stone artefact sites (isolated finds and artefact scatters) are the most commonly recorded site types in the area, followed by culturally modified trees. Other site types, such as grinding grooves and rock shelters are very rare or non-existent
- The predominant raw materials used for stone artefact manufacture are locally sourced quartz and to a lesser extent silcrete
- Excavations generally reveal a low-density of artefacts
- Sites tend to be associated with elevated level ground associated with water sources.

OzArk Environment & Heritage

Figure 2-1. AHIMS sites in relation to the study area.



Aboriginal Cultural Heritage Survey Methodology, Sheep feedlot, Culverley Rise, NSW 8

OzArk Environment & Heritage

3 Predictive Model

3.1 Landform modelling

The study area is in flat low lying area, north of the Murray River and southwest of the small hill range which includes One Tree Hill. The closest water sources are a minor drainage line 1.4 km northeast of the study area, or the Murray River which is 2.1 km south of the study area (**Figure 3-1**). Such an environment is unlikely to have a favoured area for Aboriginal occupation for extended periods of time, and is more likely to have been utilised as an access route between the hills and the river.

The study area has been used historically and is currently used for low-intensity livestock grazing and agricultural cropping.

Figure 3-1. Aerial of the study area showing terrain.

OzArk Environment & Heritage

3.2 Predictive model for the Survey Area

Across Australia, numerous archaeological studies in widely varying environmental zones and contexts have demonstrated a high correlation between the permanence of a water source and the permanence and/or complexity of Aboriginal occupation. Site location is also affected by the availability of and/or accessibility to a range of other natural resources including: plant and animal foods; stone and ochre resources and rock shelters; as well as by their general proximity to other sites/places of cultural/mythological significance. Consequently, sites tend to be found along permanent and ephemeral water sources, along access or trade routes or in areas that have good flora/fauna resources and appropriate shelter.

In formulating a predictive model for Aboriginal archaeological site location within any landscape it is also necessary to consider post-depositional influences on Aboriginal material culture. In all but the best preservation conditions very little of the organic material culture remains of ancestral Aboriginal communities survives to the present. Generally, it is the more durable materials such as stone artefacts, stone hearths, shell, and some bones that remain preserved in the current landscape. Even these however may not be found in their original depositional context since these may be subject to either (a) the effects of wind and water erosion/transport—both over short- and long-time scales—or (b) the historical impacts associated with the introduction of colonial farming practices. Scarred trees, by their nature, may survive for up to several hundred years but rarely beyond.

The archaeological studies undertaken in the vicinity of study area provide an insight into the nature and distribution of archaeological sites within the area. However, the location of sites can only reflect what has been identified, usually as a result of infrastructure/development-driven projects, thus presenting the site data as clustered or on linear alignments. Generally, sites have been recorded in proximity to a recognised water source, in locations that have been subject to reduced landform disturbance, and on gentle, elevated landforms. However, landform disturbance may also explain why Aboriginal objects become revealed on the ground surface, such as within modified and disturbed landforms.

Knowledge of the environmental contexts of the study area and a desktop review of the known local and regional archaeological record, the following predictions are made concerning the probability of those site types being recorded:

- Isolated finds may be indicative of: random loss or deliberate discard of a single artefact, the remnant of a now dispersed and disturbed artefact scatter, or an otherwise obscured or sub-surface artefact scatter. They may occur anywhere within the landscape but are more likely to occur in topographies where open artefact scatters typically occur.
    - As isolated finds can occur anywhere, particularly within disturbed contexts, it is predicted that this site type could be recorded within the study area. It is noted in **Section 2** that isolated finds have been recorded in the region.

OzArk Environment & Heritage

- Open artefact scatters are here defined as two or more artefacts, not located within a rock shelter, and located no more than 50 m away from any other constituent artefact. This site type may occur almost anywhere that Aboriginal people have travelled and may be associated with hunting and gathering activities, short- or long-term camps, and the manufacture and maintenance of stone tools. Artefact scatters typically consist of surface scatters or sub-surface distributions of flaked stone discarded during the manufacture of tools but may also include other artefactual rock types such as hearth and anvil stones. Less commonly, artefact scatters may include archaeological stratigraphic features such as hearths and artefact concentrations which relate to activity areas. Artefact density can vary considerably between and across individual sites. Small ground exposures revealing low density scatters may be indicative of background scatter rather than a spatially or temporally distinct artefact assemblage. These sites are classed as 'open', that is, occurring on the land surface unprotected by rock overhangs, and are sometimes referred to as 'open camp sites'.

  Artefact scatters are most likely to occur on level or low gradient contexts, along the crests of ridgelines and spurs, and elevated areas fringing watercourses or wetlands. Larger sites may be expected in association with permanent water sources.

  Topographies which afford effective through-access across, and relative to, the surrounding landscape, such as the open basal valley slopes and the valleys of creeks, will tend to contain more and larger sites, mostly camp sites evidenced by open artefact scatters.

  - Stone artefact distributions of variable artefact densities are the most common Aboriginal object found within the region (see **Section 2.2**). A general correlation between different types of watercourses and the nature of the evidence of past Aboriginal occupation is evident. Higher artefact density sites are located near to permanent water sources and low-density artefact distributions are found elsewhere. It is therefore predicted that large, complex sites will be absent from the survey area, though low-density scatters consisting of mostly quartz artefacts are the most likely site type to be present inside the study area.

- Aboriginal scarred trees contain evidence of the removal of bark (and sometimes wood) in the past by Aboriginal people, in the form of a scar. Bark was removed from trees for a wide range of reasons. It was a raw material used in the manufacture of various tools, vessels and commodities such as string, water containers, roofing for shelters, shields and canoes. Bark was also removed as a consequence of gathering food, such as collecting wood boring grubs or creating footholds to climb a tree for possum hunting. Due to the multiplicity of uses and the continuous process of occlusion (or healing) following removal, it is difficult to accurately determine the intended purpose for any particular example of bark removal. Scarred trees may occur anywhere old growth trees survive. The identification of scars as Aboriginal cultural heritage items can be problematical because some forms of natural trauma and European bark extraction create similar scars. Many remaining scarred trees probably date to the historic period when bark was removed by Aboriginal people for both their own purposes and for roofing on early European houses. Consequently, the distinction between European and Aboriginal scarred trees may not be clear.

OzArk Environment & Heritage

- The study area is mostly cleared of vegetation; therefore, this site type is not predicted likely to occur. However, it is possible that culturally modified trees may be present in stands of remnant native vegetation if any remains.

- Quarry sites and stone procurement sites typically consist of exposures of stone material where evidence for human collection, extraction and/or preliminary processing has survived. Typically, these involve the extraction of siliceous or fine grained igneous and meta-sedimentary rock types for the manufacture of artefacts. The presence of quarry/extraction sites is dependent on the availability of suitable rock formations.
  - This site type could be recorded within the study area should suitable rock outcroppings be available.
- Grinding grooves are most likely to occur on flat outcrops of coarse-grained sandstone in the vicinity of water sources, however, grinding grooves have been recorded on fine-grained granite outcrops.
  - Given the low prospect of suitable rock exposures being present in the study area, grinding groove sites are unlikely to be present. In addition, the study area does not contain any waterways where such sites are more likely to be located.
- Rock shelters were utilised in the past for both habitation and ceremonial purposes. The term 'rock shelter site' refers to rock shelters/rock overhangs that contain evidence such as stone artefacts and/or bones and/or plant remains (from meals eaten at the site) and/or hearths (fireplaces). Most rock shelter sites are secular in nature, however, those that also contain rock art or engravings are often believed to be non-secular in nature. The term 'rock art site' generally refers to Aboriginal ochre paintings or ochre or charcoal drawings located on a rock slab (generally in a sheltered place like the floor of a cave or rock shelter), boulder, cliff-face, cave or rock shelter wall or roof, or wall of a rock overhang. The majority of rock art sites are found in positions that are sheltered from the elements. This observation, however, is probably biased to some extent, as rock art would not preserve well in open positions. Rock art sites are generally believed to be non-secular in nature.
  - Based on the topography of the study area, rock shelters are not predicted to be present.
- Burials are generally found in soft sediments such as aeolian sand, alluvial silts and rock shelter deposits. In valley floor and plains contexts, burials may occur in locally elevated topographies rather than poorly drained sedimentary contexts. Burials are also known to have occurred on rocky hilltops in some limited areas. Burials are generally only visible where there has been some disturbance of sub-surface sediments or where some erosional process has exposed them.
  - Given the topography, nature of the soils and geology, burials are not predicted to be present in the study area.
- Bora/Ceremonial sites are places which have ceremonial or spiritual connections. Ceremonial sites may comprise of natural landscapes or have archaeological material. Bora sites are ceremonial sites which consist of a cleared area and earthen rings.

OzArk Environment & Heritage

- This site type does not necessarily follow landform predictability and are more likely to be identified by local Aboriginal people, rather than through archaeological evidence. These sites are generally identified through consultation with the Aboriginal community.

OzArk Environment & Heritage

4 SURVEY METHODOLOGY

4.1 ASSESSMENT APPROACH

The Aboriginal cultural heritage assessment of the study area will follow the *Code of Practice for the Investigation of Aboriginal Objects in New South Wales* (Code of Practice; DECCW 2010b). The field inspection will follow the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in New South Wales* (OEH 2011).

4.2 SURVEY AIMS

The aim of any archaeological survey is not to locate each artefact in a landscape but to undertake investigations so that the archaeological potential and archaeological characteristics of all landforms within a study area are known. Therefore, the aims of the survey will be to:

- Conduct pedestrian transects across the study area, so that the archaeological potential can be determined
- Evaluate whether the predictive model set out in **Section 3.2** is valid
- Determine if any landforms of the study area require test excavation to understand the archaeological potential at a particular location
- Undertake sufficient assessment in order to satisfy Sections 2.2, 2.4, 2.5, 2.6, and 2.7 in the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in New South Wales* (OEH 2011)
- Collecting sufficient data so that the results can be presented in an ACHAR as set out in Section 3 in the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in New South Wales* (OEH 2011)
- Undertaking survey and record keeping satisfying Requirements 1–13 of the Code of Practice.

4.3 SURVEY METHODOLOGY

Standard archaeological field survey and recording methods will be employed in this assessment (Burke & Smith 2004) and will follow the Code of Practice.

As highlighted in **Section 2**, greater Aboriginal archaeological potential tends to exist on landforms within 200 m of permanent and ephemeral water sources, along access or trade routes, and areas with suitable flora/fauna and shelter. Archaeological potential is generally reduced on steep landforms unsuitable for camping, and landforms disturbed by erosion and historical impacts (e.g. farming and infrastructure installation). The study area will be assessed using full pedestrian survey within surveyors spaced approximately 15–30 m apart. All trees deemed to be of sufficient maturity to contain cultural modification will be inspected, as will any areas with outcropping rock (if present).

OzArk Environment & Heritage

In the field, OzArk staff will identify, record and evaluate physical (i.e. archaeological) evidence. Site recording will capture all the information required to complete current AHIMS site recording forms (e.g. site location, site boundary, site plan, representative photographs, artefact recording and feature recording).

All survey will be undertaken with the assistance of a Registered Aboriginal Party (RAP) representative. Apart from their valuable experience in recognising and recording archaeological sites, the RAP representative will be able to acquaint themselves with the study area in order to inform the cultural values assessment.

The area for assessment is 44 hectares of the 200 ha project area with the remining areas being low impact irrigation areas. Assessment also includes the 1.6 km access road. It is estimated that full survey of this area will be undertaken in one and a half days. As per the Code of Practice, all landform types within the study area will be sampled.

4.4 TEST EXCAVATION

It is possible that the survey may identify landforms where test excavation under the Code of Practice (Requirements 14–17) is required. Should such landforms be identified during the survey, the test excavation methodology will be prepared as a separate document that will be circulated to all RAPs for review and comment.

4.5 CULTURAL VALUES

Any cultural values relating to the study area will be captured by the OzArk archaeologist (if such information is provided by a RAP during the survey) and included in the *Aboriginal Cultural Heritage Assessment Report* (ACHAR).

In addition, should any RAPs have knowledge of cultural values regarding the study area that they wish to share or that may affect this survey methodology, OzArk invites them to contact us so that these values can be recorded and / or responded to in this methodology.

OzArk Environment & Heritage

REFERENCES

Burke & Smith 2004	Burke, H. and Smith, C. 2004. *The Archaeologist's Field Handbook*, Blackwell, Oxford.
DECCW 2010	DECCW. 2010. *Aboriginal cultural heritage consultation requirements for proponents*. Department of Environment, Climate Change and Water (now OEH).
DECCW 2010b	DECCW. 2010. *Code of Practice for the Protection of Aboriginal Objects in NSW*. Department of Environment, Climate Change.
Crosby 1978	Crosby E. 1978. *A site survey in the Albury area*. Report to NPWS.
Crosby 1979	Crosby E. 1979. *Aboriginal sites in Albury March-June 1979*. Report to NPWS.
Dejkic 1978	Dejkic A. 1978. *An archaeological survey of the Wagga Wagga to Albury transmission line*. Report to NPWS.
Navin Officer 1996a	Navin Officer Heritage Consultants. 1996a. *Wodonga to Wagga Wagga Natural Gas Pipeline EIS Cultural Heritage Assessment*. Report to Sinclair Knight Merz.
Navin Officer 1996b	Navin Officer Heritage Consultants. 1996b. *Wodonga to Wagga Wagga Natural Gas Pipeline Further Archaeological Assessment*. Report to East Australian Pipeline Ltd.
Navin Officer 1998	Navin Officer Heritage Consultants. 1998. *Wodonga-Wagga Wagga Natural Gas Pipeline Archaeological Subsurface testing program*. Report to East Australian Pipeline Ltd.
OEH 2011	Office of Environment and Heritage. 2011. *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in New South Wales*. Department of Environment, Climate Change and Water, Sydney.

RAP invitation to field survey.

OzArk Environment & Heritage
ABN 59 104 582 354
Dubbo T: 02 6882 0118 145 Wingewarra St
Queanbeyan enquiry@ozarkehm.com.au PO Box 2069
Newcastle www.ozarkehm.com.au DUBBO NSW 2830

19 May 2020

Members
Albury and District Local Aboriginal Land Council
PO Box 22
LAVINGTON NSW 2640
ceo@alburydistrictlalc.org

ABORIGINAL CULTURAL HERITAGE ASSESSMENT FOR THE PROPOSED INTENSIVE LIVESTOCK AGRICULTURE FACILITY, 'CULVERLEY RISE', 198 HUMPHREYS ROAD, BUNGOWANNAH, NSW

Dear Members,

Bungowannah Pastoral Company Co. Pty Ltd (Bungawannah Pastoral) are proposing to construct a 3,750 head sheep feedlot. The proposed project location is on the property known as 'Culverley Rise' at 198 Humphreys Road, Bungowannah, approximately 25 kilometres (km) northwest of Albury, NSW.

OzArk would like to invite you to provide one (1) site officer to participate in the one and a half (1 1/2) days field work, scheduled for Wednesday 3rd and Thursday 4th June 2020.

FIELD WORK DATE:	Wednesday 3rd (Full day) and Thursday 4th (Half day) June 2020
TIME TO MEET:	8am
LOCATION TO MEET:	On Site Intersection of Mayfield and Humphreys Road Bungowannah NSW 2640 (**Figure 1**)
DURATION:	One and a half (1.5) days
FEE OFFER:	The fee offered is [redacted] for the full day and [redacted] for the half day of participation in the fieldwork for the experienced Site Officer (excl. GST). This fee is all inclusive of travel, travel time, fuel, accommodation, meal expenses and participation in the field work. Breaks are not paid.
OZARK FIELD DIRECTOR:	Alyce Cameron 0430 586 040
INVOICES:	Invoices are to be addressed to: OzArk Environment & Heritage C/- Rebecca Hardman PO Box 2069 Dubbo, NSW 2830 rebecca@ozarkehm.com.au

OzArk Environment & Heritage

PLEASE NOTE: THE ABOVE FIELDWORK MAY BE CANCELLED AT SHORT NOTICE DUE TO CIRCUMSTANCES OUTSIDE OUR CONTROL. SHOULD THIS HAPPEN WE WILL CONTACT YOU AS SOON AS POSSIBLE AND ATTEMPT TO RESCHEDULE FOR A LATER DATE.

COVID-19 REQUIREMENT: YOUR SITE OFFICER WILL BE REQUIRED TO FILL IN AND SIGN THE ATTACHED FORM PRIOR TO ENTERING THE WORK SITE. PLEASE ENSURE THAT YOUR SITE OFFICER WILL BE ABLE TO ANSWER 'NO' TO THE QUESTIONS ON THIS FORM.

You must ensure that you or your representative has enough water and snacks / lunch for the duration of the fieldwork.

Personal Protective Equipment (PPE) – your site officer will need:

- Long pants and long sleeve shirt
- High visibility safety shirt / vest
- Enclosed, sturdy footwear
- Water / Sunscreen / Hat.

You or your representative must be physically fit and will need to identify if you have any medical conditions / allergies that should be known to other people participating in the fieldwork in the event of an emergency. The OzArk field director will send home anyone who they determine to be 'unfit for work' or who may pose a WH&S risk to themselves or others.

Please note, if you are a sending a representative who has any underlying medical conditions or severe allergies, it is important that they have on their person appropriate treatment such as asthma inhalers or EpiPens and notify us accordingly.

Due to NSW WH&S legislation we need to have on record current Workers Compensation insurances before going into the field. Unfortunately, we will **NOT** be able to allow participation in the fieldwork without seeing your **current Workers Compensation Certificate of Currency**. We currently have on file a copy of your workers compensation. Please note that if you are unable to send a representative from your organisation, we will proceed with the fieldwork with the OzArk archaeologist only.

<u>Please advise our office by **Monday 25th May 2020**, if you are available as well as the name and contact number of the site officer who will participate in the fieldwork</u>. After this date, if we have not heard from you, we will either proceed with the survey with the OzArk archaeologist only or offer this position to other relevant groups.

If you have any feedback or relevant cultural heritage knowledge that you would like to offer, please discuss with the archaeologist during the fieldwork or contact our office.

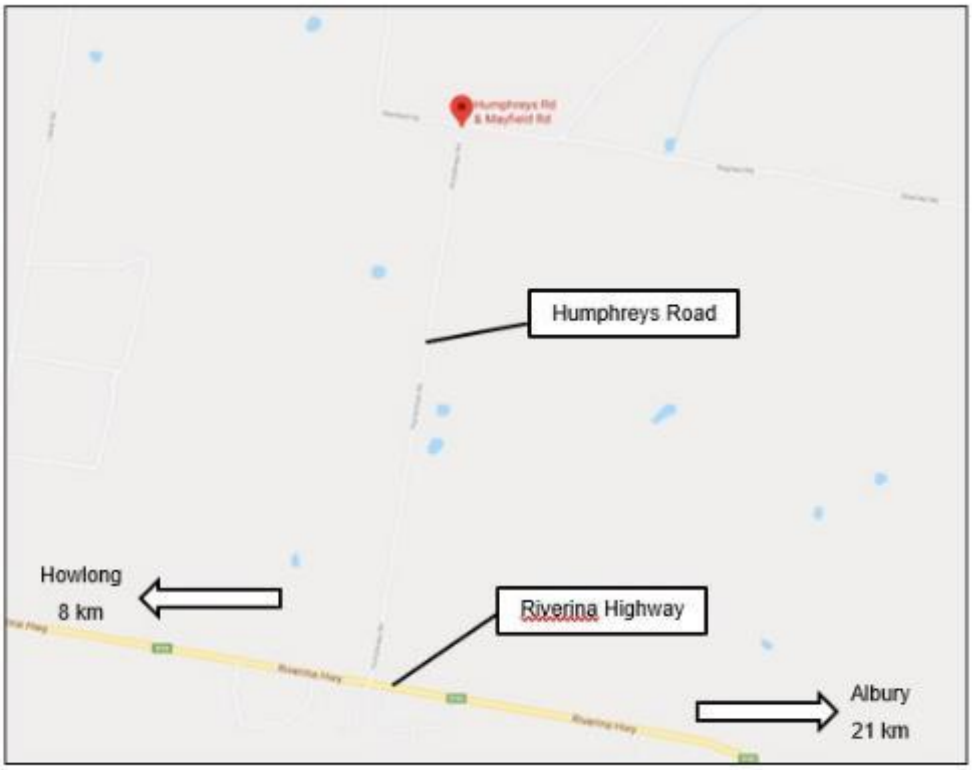
Should you have any queries in relation to the enclosed information please do not hesitate to contact our office.

Kind regards,

Rebecca Hardman
Consultation Officer

OzArk Environment & Heritage

Figure 1. Meeting Location



- All workers will be required to fill in and sign this form on the morning of the fieldwork. OzArk will bring copies of the form on the day. The form is reproduced here so that it is understood what will be required, **on acceptance of this fieldwork, please confirm you will be able to complete this form and answer 'no'**.

OzArk Environment & Heritage — ABN 59 104 582 354

Dubbo, Queanbeyan, Newcastle — T: 02 6882 0118 — enquiry@ozarkehm.com.au — www.ozarkehm.com.au — 145 Wingewarra St, PO Box 2069, DUBBO NSW 2830

Covid-19 Related Illness Reporting Form

Instructions

- To be completed by all members of an OzArk work crew, including subcontractors and/or community volunteers. All members of the fieldwork team are referred here to as 'workers'.
- If a worker answers **Yes** to any question below, please send this form to sheridan@ozarkehm.com.au

Date	
Time	
Worker name	
Worker mobile number	
Site / Location	
Name of OzArk Field Director	

Question		**Yes**	**No**
1.	Have you travelled overseas in the last 14 days?		
2.	Have you had contact with a confirmed or suspected case of Covid-19 (Coronavirus)		
3.	Are you experiencing flu like symptoms? i.e. fever, sore throat, cough, fatigue, difficulty breathing?		
4.	Do you currently have a fever > 37.3 degrees?		

If my health condition changes at any point during work from the above, I will ensure that I inform the OzArk Fieldwork Director immediately.

Worker Signature	
Date	

If you have answered Yes to 1 and 2, do not enter the workplace, self-isolation is required for 14 days from the date of your last contact or arrival back to Australia.

If you have answered Yes to 3 and 4, do not enter the workplace, contact your GP by phone to arrange a medical assessment.

If you answered **No** to all of the above, you are able to enter the workplace.

Project Update letter to RAPs informing of change of assessment to due diligence and ending ACHCRs.

OzArk Environment & Heritage ABN 59 104 582 354

Dubbo T: 02 6882 0118 145 Wingewarra St

Queanbeyan enquiry@ozarkehm.com.au PO Box 2069

Newcastle www.ozarkehm.com.au DUBBO NSW 2830

23 June 2020

Members

Albury and District Local Aboriginal Land Council

PO Box 22

LAVINGTON NSW 2640

ceo@alburydistrictlalc.org

UPDATE FOR THE ABORIGINAL CULTURAL HERITAGE ASSESSMENT FOR THE PROPOSED SHEEP FEEDLOT – CULVERLEY RISE.

Dear Members,

The purpose of this letter is to update you in relation to the progress of the above-mentioned project.

The fieldwork for this assessment was undertaken 3 June 2020 by OzArk Senior Archaeologist, Dr Alyce Cameron and a representative of the Albury and District Local Aboriginal Land Council. The survey was undertaken following the survey methodology as provided on 4 May 2020. It followed the requirements as outlined in the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in New South Wales* (OEH 2011). During the field survey of the study area, no Aboriginal sites or areas of Aboriginal archaeological potential were recorded.

Following a discussion with the client concerning the results of the field survey, the proponent, Bungowannah Pastoral Company Co. Pty Ltd, has elected to cease the *Aboriginal Cultural Heritage Assessment Report* (ACHAR) and consultation using the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (ACHCRs). Instead, the proponent has chosen to proceed using the *Due Diligence Code of Practice*.

We would like to thank you for your participation as a Registered Aboriginal Party (RAP) and for your interest in this project. Once the Due Diligence Report has been finalised, we will send you a copy for your records. The report will include the details of the consultation conducted under the ACHCRs.

Should you have any queries in relation to the enclosed information please do not hesitate to contact our office

Kind regards,

Rebecca Hardman
Community Liaison & Administration

APPENDIX 3: ABORIGINAL HERITAGE: UNANTICIPATED FINDS PROTOCOL

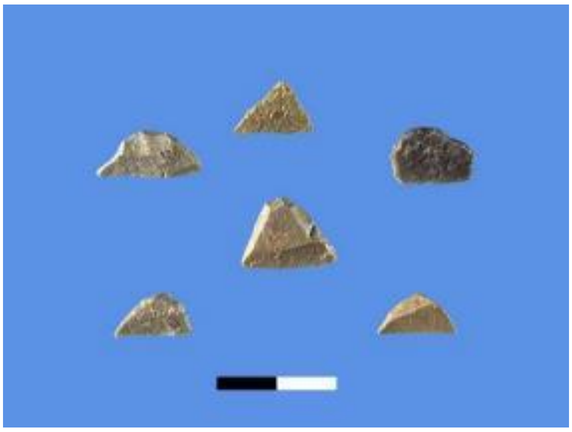
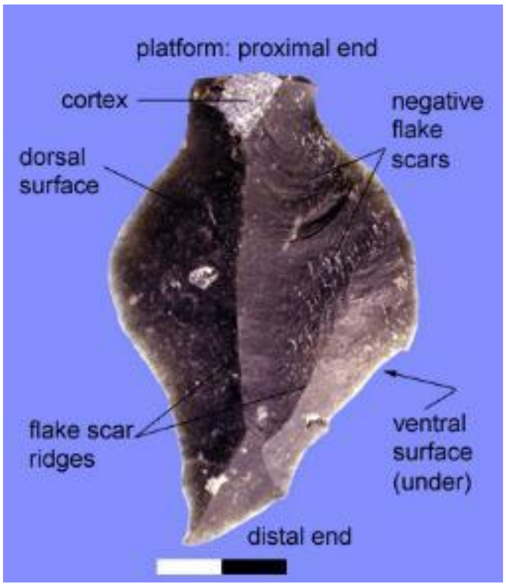
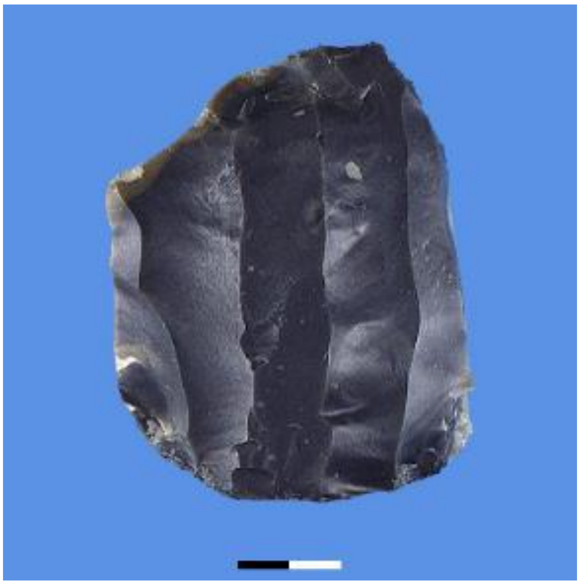
An Aboriginal artefact is anything which is the result of past Aboriginal activity. This includes stone (artefacts, rock engravings etc.), plant (culturally scarred trees) and animal (if showing signs of modification; i.e. smoothing, use). Human bone (skeletal) remains may also be uncovered while onsite.

Cultural heritage significance is assessed by the Aboriginal community and is typically based on traditional and contemporary lore, spiritual values, and oral history, and may also take into account scientific and educational value.

Protocol to be followed in the event that previously unrecorded or unanticipated Aboriginal object(s) are encountered:

1. If any Aboriginal object is discovered and/or harmed in, or under the land, while undertaking the proposed development activities, the proponent must:
    a. Not further harm the object;
    b. Immediately cease all work at the particular location;
    c. Secure the area so as to avoid further harm to the Aboriginal object;
    d. Notify Heritage NSW as soon as practical on 131 555, providing any details of the Aboriginal object and its location; and
    e. Not recommence any work at the particular location unless authorised in writing by Heritage NSW.
2. In the event that Aboriginal burials are unexpectedly encountered during the activity, work must stop immediately, the area secured to prevent unauthorised access and NSW Police and Heritage NSW contacted.
3. Cooperate with the appropriate authorities and relevant Aboriginal community representatives to facilitate:
    a. The recording and assessment of the find(s);
    b. The fulfilment of any legal constraints arising from the find(s), including complying with Heritage NSW directions; and
    c. The development and implementation of appropriate management strategies, including consultation with stakeholders and the assessment of the significance of the find(s).
4. Where the find(s) are determined to be Aboriginal object(s), recommencement of work in the area of the find(s) can only occur in accordance with any consequential legal requirements and after gaining written approval from Heritage NSW (normally an Aboriginal Heritage Impact Permit).

APPENDIX 4: ABORIGINAL HERITAGE: ARTEFACT IDENTIFICATION

	
Retouched blades (scale = 1cm)	Flakes
	
Microliths (scale = 1cm)	Scraper (scale = 1cm)
	
Flake characteristics (scale = 1cm)	Core from which flakes have been removed (scale = 1cm)