AECOM

Deniliquin Ethanol Plant

Environmental Impact Statement
Volume 1

Document Verification

Project Title:	**Deniliquin Ethanol Plant**
Project Number:	60344248
Project File Name:	60344248 dongmungreentec eis 02oct15 (vol1).docx
Revision:	1
Date:	02-Oct-2015
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In respect of	Deniliquin Ethanol Plant, New South Wales

EIS Prepared For:

Proponent Name:	Mr Joo
Proponent Address:	524 Poictiers Street Deniliquin NSW 2710
Land to be Developed:	Lot 234, 272 and 273 DP 756325 Deniliquin Barham Road, Deniliquin, NSW, 2710.
Proposed Development:	Construct and operate an ethanol production plant.

Environmental Impact Statement

An Environmental Impact Statement is attached.

Certificate:

I certify that I have prepared the contents of this Statement and to the best of my knowledge:

- Has been prepared in accordance with Clauses 72 and 73 of the Environmental Planning and Assessment Regulations 2000.
- The statement contains all available information that is relevant to the environmental assessment of the activity to which the statement relates.
- The information contained in the statement is neither false nor misleading.

Signature:

Name: Catherine Brady

Date: 2 October 2015

Executive summary

Introduction

This Environmental Impact Statement (EIS) has been prepared by AECOM Australia Pty Ltd (AECOM) on behalf of Dongmun Greentec Pty Ltd (Dongmun Greentec), to accompany a State Significant Development (SSD) application for the construction and operation of an ethanol production facility at Deniliquin, New South Wales (NSW) (the Project).

Dongmun Greentec is seeking approval for the development of an ethanol plant capable of producing 115 mega litres (ML) of ethanol annually. Approval for the Project is being sought under Part 4, Division 4.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). AECOM has prepared this EIS pursuant to the requirements of the EP&A Act and the Environmental Planning and Assessment Regulation 2000 (EP&A Regulation) and the Director General's Requirements (DGRs) issued on 23 December 2013.

The Project

The Project will have a capacity of producing 115 ML of ethanol per annum and will include several grain storage silos, a wastewater treatment facility and a workshop area. The Project will operate 24 hours per day, seven days a week for 330 days per year with a scheduled shut down period.

The Project is located in Deniliquin in the Murray region of south western NSW and is approximately 250 kilometres (km) north of Melbourne, 375 km west of Canberra and 600 km south west of Sydney.

The Project Site is located on approximately 120 hectares (ha) of land over lots 234, 272 and 273 of DP 756325, Deniliquin Barham Road, Deniliquin, NSW. The Project Site is approximately 5.5 km south west of the township of Deniliquin. The Project Footprint will occupy 25.6 ha of the Project Site.

The Project will process approximately 300,000 tonnes (t) of locally grown grain of wheat per annum. Utilising the carbohydrate (starch) in the wheat, the primary output from the production is fuel graded ethanol, which will be sold to the major petroleum companies as an additive to regular unleaded petrol (ULP) to produce E10, or exported. The co-products of the ethanol production process will be a dried distiller grain with solubles (DDGS), distiller's syrup and liquid fertiliser. DDGS and distiller's syrup will be sold as high nutrient agricultural protein meal supplements. The liquid fertiliser will be sold, as a land based fertiliser to the agricultural sector.

The following key infrastructure has been included within the Project's conceptual design:

- Ethanol plant infrastructure for processes including: closed system grain milling, liquefaction of grain flour, fermentation, distillation and dehydration and centrifuge and drying of dried distiller's grain (DDG).
- A natural gas-fired steam boiler which will also take recovered biogas from the process
- Associated office, control room and maintenance room
- Storage area and silos for input grain
- Storage area for DDG output
- On-site ethanol storage
- A wastewater treatment plant including anaerobic and aerobic treatment processes and generation of a liquid fertiliser co-product
- Staff car and visitor car parking area
- Associated internal roadwork
- Stormwater infrastructure including vegetated swales and a bio-retention and flood retention basin
- Research and development centre.

The Project is proposed to be constructed over a 14 to 16 month period. The Project will generate approximately 350 jobs during construction and 50 permanent jobs during the operation and ongoing management of the Project. Power from the nearby network will be provided to the site and compressed natural gas will be supplied by pipeline from a third-party proposed nearby gas storage and delivery operation.

Project proponent

Dongmun Greentec is an Australian branch of Korean company Dongmun IRS Co Ltd (Dongmun IRS) established in 2012. Dongmun IRS, founded by Sungho Joo in 1996, specialises in the construction and installation of anaerobic fermentation facilities which convert organic materials and waste into useful, sustainable

energy products such as ethanol. Dongmun IRS Anaerobic Digestion Systems have been applied to treat the organic waste from Dae Gu city and Gwang Ju city, Korea. These systems have been successfully in operation since 2002 under the supervision of the Korean Government's Ministry of Environmental Protection.

Project objectives

The Project objectives have been developed based on the objectives established during the options analysis. These objectives, which incorporate environmental, social and economic considerations, are as follows:

- To supply the domestic fuel grade ethanol market with approximately 115 ML of ethanol per year
- To provide sellable co-products (DDG, DDGS, distiller's syrup and liquid fertiliser) to the agricultural sector
- To generate employment opportunities for local residents during construction and operations phases
- To utilise local grain supplies in the production of ethanol
- To minimise impacts on the natural and built environment through sensitive design and appropriate environmental management practices
- To comply with the requirements of law and company policy
- To provide economic stimulus to local and regional economies.

Proposal justification and benefits

Dongmun Greentec elected to develop the Project in Australia as a result of the following positive influential factors:

- Site suitability including the wide area of agricultural land and established grain industry within the region. The Project Site offers the following merits:
    - Central to major agricultural area for the efficient supply of input grain.
    - Central to the major agricultural market for the sale of DDGS and distiller's syrup.
    - A sparsely populated area surrounding the Project Site which is located in a disturbed area in close proximity to a railway line, major roadways and an existing industrial area.
    - Access to the domestic fuel market.
    - Established transport links with direct road frontage to Deniliquin Barham Road and convenient access to the Cobb and Riverina Highway.
    - Logistical advantages including a rail siding from the Sydney to Melbourne line in close proximity to the Project Site.
    - Supply of a skilled workforce.
    - Strong local support from Deniliquin Council and the local community.
- Established ethanol mandates in NSW and Queensland (QLD): between NSW and QLD, a move to reinstate 6 percent and 5 percent mandate targets respectively will require approximately 835 ML of ethanol per year.
- Demand for co-products within the agricultural sector: DDG and DDGS are excellent, lower cost alternative feed ingredients that continue to be produced in large quantities by the dry-grind fuel ethanol industry. The high energy, mid-protein and high digestible phosphorus content of DDG and DDGS make them a very attractive, partial replacement for some of the more expensive, traditional energy, protein and phosphorus inputs used in animal feeds.

The Project will provide economic benefits to the local, regional and State economies, in particular through providing improved opportunities for grain markets in the Deniliquin area and NSW in general. The additional key benefits provided by the Project include:

- Jobs: The facility will generate approximately 350 jobs during construction, 50 permanent jobs for operation and ongoing management, contributing an additional $5 million into the local employment market.
- Trades: Ongoing plant maintenance will contribute a further $1 million per annum to local trades.
- Sourcing inputs: The purchase of grain input will inject a further $50 million annually into the local economy and provide a stable local market for growers.

Project alternatives

Dongmun Greentec has considered alternatives to the Project in the planning and pre-feasibility stages of the Project's development. A number of alternatives have been considered as part of the development of the Project with a particular focus upon:

- Alternate processing methods
- Water management alternatives
- Gas supply alternatives
- Transport alternatives
- Locality alternatives
- Project layout alternatives
- Not proceeding with the Project.

These alternatives have been assessed to ascertain their comparative environmental, social and economic impacts and the most viable option selected.

Environmental impact assessment process

The development of the EIS for the Project has involved the following key steps:

- Project definition.
- A consultation program to identify the issues and concerns of the community and government agencies to be addressed through the development of the Project and the EIS.
- Involvement of technical specialists to undertake baseline studies and provide input to the design of the Project.
- Refinement of the Project based on the results of baseline studies.
- Impact assessment of the Project on environmental and social values.
- Development of environmental management measures and mitigation strategies.
- Final assessment of residual impacts.

A summary of the findings of the EIS is provided in the following sections.

Identification of issues

An assessment of the likely environmental issues and associated level of risk was made for the Project based on issues raised during the planning for the Project Site, the DGRs or in consultation with stakeholders. Based on the results of the environmental risk analysis, consultation with DP&E and information presented in the EIS, the following issues have been confirmed as the key environmental issues for the Project:

- Biodiversity
- Water management
- Waste management
- Traffic and transport
- Hazard and risk
- Aboriginal heritage.

The following non-key issues were also identified:

- Landscape and visual impact assessment
- Groundwater
- Noise and vibration
- Air quality
- Land and soils
- Non-aboriginal heritage.

Community consultation

Community participation is an important part of the development of the Project. The community consultation program included: consultation with affected and interested parties, including neighbouring landholders; local, NSW government agencies; registered Aboriginal Parties and the general public.

Feedback received from the community and stakeholders has been summarised and addressed in the EIS. The outcomes and recommendations of the EIS have been informed by community and stakeholder views.

During the public exhibition period for the EIS, further consultation will be undertaken with the community and other stakeholders. This will include public displays and stakeholder briefing sessions including a number of presentations with State government agencies.

Summary of the EIS findings

Biodiversity

The Project would require the clearing of 17.8 ha of 'Poor' condition native vegetation, consisting of:

- 17.3 ha of derived native grassland
- 0.5 ha of black box woodland.

These plant communities are not identified as significant community types (i.e. threatened ecological communities) at a State or Commonwealth level.

No threatened flora or fauna species were identified during the field survey. The plains wanderer (*Pedionomus torquatus*) was identified as having a 'Moderate' likelihood of occurring within the Project Site. It is listed as 'Endangered' under the *Threatened Species Conservation Act 1995* and 'Critically Endangered' under the EPBC Act.

The assessment undertaken for the plains wanderer (7-part test) concluded that potential exists for the Project to have a significant impact on the local Deniliquin population of the species, particularly if primary habitat in the region becomes unsuitable. The EPBC Act significant impact assessment concluded that the Project is unlikely to significantly impact the Riverina population of the plains wanderer. Based on these assessments, further actions are required under the *Threatened Species Conservation Act 1995* and NSW Biodiversity Offsets Policy for Major Projects. As part of this EIS, a Species Impact Statement (SIS) and Offset Strategy have been prepared. The SIS determined that potential exists for the Project to have a significant impact on the local population of plains wanderer. However, minimisation of impacts through measures such as a reduced Project Footprint and the location of the Project Footprint adjacent to existing disturbances will ensure other threatening processes are minimal. Furthermore, the application of offsets, guided by current recovery and conservation objectives and expert advice, will ensure a positive biodiversity outcome is achieved.

Overall, through the application of the proposed mitigation and management measures proposed, it is not anticipated that the Project will have a significant impact on flora and fauna values.

Surface water and groundwater

It is estimated that 2.7 ML/day of water would be required for normal operation, and approximately 148 ML of water would initially be required during the commissioning process. It is proposed to source water during the commissioning period from Deniliquin Council supplied water. During operation the water would be sourced from a combination of Deniliquin Council supplied water (1.3 ML/day) and recycled water from an on-site wastewater treatment plant (1.4 ML/day).

It is estimated that approximately 34 ML of water would be required during the construction phase of the plant (over 14-16 months) and this would be sourced from Deniliquin Council supplied water.

Deniliquin Council has indicated a commitment to develop a mains extension to the Project Site to provide water for the plant. Overall, the Project is considered to have an unlikely and relatively insignificant impact on local water supply sources.

An onsite wastewater treatment plant would be used to treat process wastewater generated by the ethanol plant. Treated wastewater would be recycled into the plant as process water.

Sewage generated from site facilities would be discharged to a new sewer main, which is proposed to be developed by Deniliquin Council.

The Project Site is currently cleared, and was previously used for agricultural purposes. The Project Site is not located in a flood risk area. The Project would increase the impermeable area of the Project Site, which would

increase stormwater runoff from the Project Site, and potentially affect the quality of stormwater runoff. A concept Stormwater Management Plan has been developed, which will be refined during detailed design stage.

The Project is not expected to have significant impacts on the surrounding environment or communities from a groundwater perspective. The Project does not propose to source water from groundwater and excavations for the Project are unlikely to encounter groundwater.

Overall, the Project is not expected to have a significant impact on the surrounding environment or communities from a water perspective.

Co-products and waste

The waste assessment carried out as part of the EIS revealed that the construction and operation of the Project would produce a relatively small amount of waste that would need to be disposed of to landfill, with the remainder of the waste recycled or re-used on-site or re-used by the local agriculture industry (liquid fertiliser/compost). In addition co-products from the process would be sold to the local agricultural market (DDGS and syrup). Relatively small amounts of residual waste would be generated by the construction and operation of the Project, with most of the waste streams being reused or recycled.

A number of mitigation and management measures would be implemented to ensure the potential residual impact of the Project would be minimised and effectively managed. A Construction Waste Management Plan (CWMP) would be developed to ensure appropriate waste separation, storage and disposal occurs during construction. Additionally, waste management measures would be incorporated into an operational environmental management plan.

Overall, the Project is not expected to have a significant impact on the environment as a result of the co-products and waste generated.

Traffic and transport

During construction vehicles transporting employees and construction materials will access the Project Site from the local and wider road network. During operation the rail network will be used to transport 70 percent of the raw materials and output products to and from the Project via the Deniliquin Rice Growers Siding.

A traffic impact assessment was undertaken that concluded that the impact of the Project from increased traffic volumes on the local and wider road network is likely to be minimal, for both the construction and operations phases. The number of heavy vehicle volumes (56 vehicles per direction per day during peak construction activities and 65 heavy vehicles per direction per day during daily operations) and light vehicle volumes (122 vehicles per direction per day during construction activities and 44 vehicles per direction per day during daily operations) can be accommodated on the existing transport network without the requirement for local or far-field road works.

Deniliquin Council is upgrading a 2 km section of Deniliquin Barham Road from the Ochtertyre Street roundabout with Cobb Highway approximately 2.6 km to the east of the Project Site. The road is being widened, strengthened and resurfaced for the use of road trains and the upgrade would assist in maintaining a safer road network for Deniliquin and hence the upgrade would be a benefit to the Project. Impacts to the road pavement of Deniliquin Barham Road between the Project Site and the end of Deniliquin Council's upgrade work are possible due to the increase in heavy vehicles. These potential impacts would be mitigated following discussions with Deniliquin Council to confirm an appropriate approach.

It is estimated that the average number of train wagons required per day (based on 330 days per year) would be around 12 wagons per day inbound and 10 wagons per day outbound from Deniliquin. The availability of line and train capacities to support the Project has been confirmed with the rail freight operator QUBE Logistics.

To provide safe access to the Project Site, the site access intersections and driveways would be designed in accordance with Australian Standards AS 2890 for the vehicular access to the site car park as well as the heavy vehicle access points to and from the proposed ethanol plant allowing access for heavy rigid and articulated vehicles.

The existing road and rail network has the capacity to accommodate the predicted increase in volumes during construction and operation and the Project will have a low impact on the traffic and transport network. Mitigation measure would be employed to ensure impacts to road infrastructure (e.g. pavement) and road safety are managed to an acceptable low level.

Overall, significant impacts on the wider regional transport networks are not expected as a result of the Project, subsequent to the implementation of all appropriate and agreed upon mitigation measures.

Hazard and risk

The Project will store, handle and produce hazardous materials.

A risk screening was carried out as per *Applying SEPP 33 Application Guidelines* to determine if the Project is potentially hazardous and whether or not SEPP 33 applies. Hazardous chemicals were identified, assessed and preliminarily screened in accordance with the requirements of *Applying SEPP 33 Guideline*. Although no hazardous chemicals definitively exceeded the screening assessment requirements when *Applying SEPP 33* criteria, four hazardous chemicals were identified to have possible potentially offsite effects, namely ethanol, grain dust, corrosive Class 8 chemicals and compressed natural gas (CNG). The study further followed the *Multilevel Risk Assessment Approach* and the applicable Hazardous Industry Planning Advisory Papers.

A number of mitigation measures to control, mitigate and manage initiating factors relevant to the identified credible hazard scenarios have been developed for the Project. With the application of these proposed mitigation measures to achieve acceptable consequence outcomes, the Project could be undertaken in a manner that is protective of human health and safety onsite and offsite, and protective of the surrounding environment.

Preparation and implementation of a comprehensive health and safety management system has been identified as a necessary and effective means of managing hazards and risks posed by the Project through construction, operation and eventual decommissioning.

Overall, it was found that the hazards associated with the facility are not significant with respect to land use safety planning criteria and that appropriate safeguards have been proposed to prevent and mitigate the hazards and risks associated with hazardous chemicals within the Project Site.

Cultural heritage

As a result of ground disturbances the Project has the potential to impact cultural heritage items, places and values that may be present on the Project Site.

There are five known heritage sites on the Project Site: a potential hearth, an artefact scatter and three Aboriginal scarred trees. The scarred trees were identified as being of moderate significance in an earlier assessment. However, further investigation suggested that they are unlikely to be of Aboriginal origin, and hence are unlikely to be of heritage value. The potential hearth has been assessed as being of low significance and the artefact scatter as being of moderate significance.

As currently proposed, the Project would remove four of the known heritage sites on the Project, and has the potential to disturb or remove currently unknown heritage places within the Project Footprint, constituting a moderate significance of impact to the heritage values of the Project Site.

A series of management measures to mitigate this impact, include an archaeological salvage program, reassessment and management of the scarred trees, development of cultural heritage inductions, protection measures for sites remaining *in situ*, and chance finds procedures. With these measures in place, it is anticipated that Project's overall significance of impact to the site's heritage values would be reduced to minor.

Soils, land capability and land use

Several broad, land based topics were considered. These included: geology, soils and geomorphology; land tenure and use; potential land degradation and likelihood of land contamination, and landscape character.

The Project Site is suitable for both industrial and agricultural uses, with the surrounding land use being predominantly pastoral and associated agricultural industries. The potential environmental impact on adjacent uses is limited due to the land disturbance and vegetation clearing occurring only within the Project Site's boundaries. In terms of future land uses, the Project would require the reclassification of the Lots it occupies, therefore altering the intended land use from a planning perspective.

Although construction and operational activities may have the potential to impact on land based environmental values, the application of mitigation and control measures where appropriate, as well as adherence to proposed plans and procedures, reduces the residual risks to an relatively low level.

Visual

An assessment of the visual amenity values found the impact on landscape character is considered to be acceptable within the context of the location of the Project in relation to the Deniliquin township and the extensive nature of the landscape character types within which the Project is located. Visual impacts from representative receiver locations were considered to be 'moderate' with the implementation of reasonable mitigation measures. Lighting impacts were considered to be minimal with the exception of those to the adjoining property to the south, for which specific mitigation measures have been proposed.

Impacts to visual amenity and landscape character are unavoidable due to the local topography of the area, and the verticality of the Project infrastructure. Although currently proposed mitigation measures are unlikely to entirely mitigate these impacts, the impacts are generally considered to be not significant. The implementation of 'for consideration' mitigation measures presented in the landscape and visual impact assessment has the potential to provide a significant improvement over time to the currently proposed landscape outcomes for the Project, including reduced visual impacts for all sensitive receivers.

Air quality, odour and greenhouse gas emissions

The air quality impact assessment found:

- Offsite impacts from appropriately mitigated construction activities at the Project would be negligible at all nearby sensitive receptors.
- There would be no impacts at sensitive receptors due to operational emissions from the Project for annual average particulate matter (PM_{10}, $PM_{2.5)}$, nitrogen dioxide (NO_2), carbon monoxide (CO), and volatile organic compound (VOC) concentrations.
- No additional exceedances of the 24-hour average PM_{10} criterion were likely to occur as a result of operational activities at the Project.

A number of in-principle mitigation strategies aimed at avoiding, managing or mitigating off-site air quality impacts by reducing construction emissions from the Project would be implemented.

Greenhouse gas (GHG) emissions associated with gas consumption, biogas combustion, the fermentation process, electricity consumption, fuel use (associated with the delivery of materials and dispatch of ethanol and staff movements) and consumption of Dongmun Greentec ethanol by end users were considered. The total emissions of the Project were estimated to be 0.163 Mt CO_2-e per year, which represents approximately 0.03 percent of the total Australian emissions and 0.1 percent of the total NSW emissions in Australia in 2012. The greatest contributor to emissions is expected to be the fermentation process (55.8 percent of Dongmun Greentec's estimated emissions). The estimated emissions of GHG associated with the Project were considered to be minor in the context of emissions for the NSW and Australia as a whole.

Overall, this assessment indicates that the Project will not result in significant impacts on air quality.

Noise and vibration

The assessment of the noise emissions assumed minimum background noise levels for all assessments and noise affects were predicted under neutral conditions as well as conditions that would enhance noise propagation.

Assessment of proposed construction activities for the facility show that there is a minor exceedance at one location, indicating that some properties may be 'noise affected' as defined by the Interim Construction Noise Guideline. A detailed construction noise management plan would be prepared once more detailed construction planning has been undertaken.

Operational noise from the Project is predicted to exceed the applicable INP requirements related to amenity and intrusiveness at the sensitive receptors without the provision of noise mitigation. Acoustic treatments (such as noise walls, mounding or similar) will be considered during detailed design to reduce impacts to sensitive receptors. Further assessment of noise emissions would be undertaken during the Project's detailed design once inputs and assumptions have been refined.

Noise emissions from the proposed road and rail movements associated with the proposed site are predicted to comply with the nominated limits.

Vibration levels attributed to plant operations are expected to fall well below the recommended limits.

A number of mitigation and management measures will be employed during the construction and operation of the Project. The noise controls proposed will reduce the potential for and impact of noise generated by the Project. Their implementation will result in a negligible impact on the surrounding environment.

Overall, the Project would not result in significant, long term impacts on sensitive receptors.

Socio – economic

The Project would provide significant positive economic benefits within the local, area, which is currently considered a low socio-economic area at a State and national level. These include increased employment, increased profitability for local business including the creation of an end user market for local grain growers, upskilling of the local labour force and an increase in gross regional product.

Impacts to property were considered to be negligible however, some impacts to amenity, related to landscape character and visual amenity were identified. The assessment determined that there would not be any major impacts on access to community infrastructure or services or traffic and public transport.

Overall, the Project would provide beneficial social and economic outcomes making it desirable for the local and regional area.

Health and safety

The health and safety risk profile of the Project is generally low or moderate. Risks associated with the Plant are common to all ethanol production plants and are subject to the controls and management practices outlined in legislation and Australian Standards.

Dongmun Greentec is committed to providing a safe and healthy workplace for its employees, consultants, contractors, service providers and visitors and completing the Project with minimal negative impacts to the surrounding environment and communities. Health and safety risks associated with the development would be managed under an Integrated Management System and associated policies, plan, protocols and procedures.

Mitigation and management measures

The assessment process examined the likely consequences of the Project and measures to mitigate and manage each likely impact have been proposed. The mitigation measures developed for the Project aim to remove or minimise potential impacts through design in the first instance. Where a potential impact is unable to be mitigated through design, additional mitigation and management measures are outlined.

Public exhibition

The Department of Planning and Environment (DP&E) will make the EIS publicly available for a minimum period of 30 days. During this period, it will be available for inspection at a number of public locations. These will likely include the DP&E offices, Deniliquin Council offices and other locations such as public libraries in the Deniliquin region.
The environmental impact statement document will also be available to view and download from:

- The DP&E webpage www.planning.nsw.gov.au
- Dongmun Greentec webpage http://www.dongmungreentec.com/

Dongmun Greentec will hold public displays during the exhibition of the EIS at locations readily accessible to the Deniliquin community and other interested stakeholders to promote access to Project information and EIS documentation. These displays will provide opportunity for members of the community to ask questions of the project team and help to further inform the development of formal submissions regarding the proposal.

Details of the locations of displays will be provided in a community update, advertised in local and metropolitan media and via an email notification to registered stakeholders.

During the public exhibition period, the community, government agencies and other interested parties will be invited to make written submissions on the Project to the DP&E

To provide feedback on the Project, a person may make written submissions to the DP&E. All submissions received will be placed on the DP&E website.

Conclusion

This EIS describes the Project, its possible alternatives, and provides an assessment of the potential environmental impacts from construction and operation. Where potential impacts have been identified, management measures have been determined to minimise impacts to acceptable levels. This EIS has also demonstrated that the Project is both permissible and would have a range of benefits that, when considered relative to potential impacts, justify the Project proceeding.

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Volume 2 Appendices

Glossary of terms

Term	Abbreviation
ABS	Australian Bureau of Statistics
ADG	Australian Dangerous Goods
AECOM	Architecture, Engineering, Consulting, Operations, and Maintenance
AEP	Annual Exceedance Probabilities
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
ALA	Atlas of Living Australia
AQMS	Air Quality Monitoring Stations
ARI	Average Recurrence Interval
ASC	Australian Soil Classification
ASM	Advanced Soil Mapping
AS/NZS	Australian/New Zealand Standard
ATSIHP Act	*Aboriginal and Torres Strait Islander Heritage Protection Act*
BSAL	Biophysical Strategic Agricultural Land
BOD	Biological Oxygen Demand
BoM	Bureau of Meteorology
CAMBA	Chinese Australia Migratory Birds Agreement
CEMP	Construction Environmental Management Plan
CIV	Capital Investment Valve
CNG	Compressed Natural Gas
COD	Chemical Oxygen Demand
CO_2	Carbon Dioxide
CO_2-e	Carbon Dioxide Equivalent
CoRTN	Calculation of Road Traffic Noise
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CWMP	Construction waste management plan
dB	Decibels, unit of sound pressure
dBA	'A' weighted decibels
DDG	Dried distiller's grain
DDGS	Dried distiller's grain with solubles
DECC	Department of Environment and Climate Change
DGRs	Director General's Requirements
DLALC	Deniliquin Local Aboriginal Land Council
DoE	Department of the Environment
Dongmun Greentec	Dongmun Greentec Pty Ltd
Dongmun IRS	Dongmun IRS Co. Ltd

Term	Abbreviation
DoP	Department of Planning
DPI	Department of Primary Industries
DP&E	Department of Planning and Environment
DP&I	Department of Planning and Infrastructure
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMS	Environmental Management System
EPA	Environmental Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ERS	Effluent Reuse Storage
ESD	Ecologically Sustainable Development
GDA	Geocentric Datum of Australia
GDE	Groundwater Dependant Ecosystems
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GL	Gigalitres
GRP	Gross Regional Product
GVA	Gross Value Add
ha	Hectares
HCl	Hydrochloric Acid Solution
HIPAP	Hazardous Industry Planning Advisory Paper
HMP	Heritage Management Plan
HV	Heavy vehicle
IBRA	Interim Biogeographic Regionalisation for Australia
ICNG	Interim Construction Noise Guideline
ICOMOS	International Council on Monuments and Sites
IHO	Interim Heritage Orders
INP	Industrial Noise Policy
IPART	Independent Pricing and Regulatory Tribunal
IRSAD	Index of Relative Socio-Economic Advantage/Disadvantage
JAMBA	Japan Australia Migratory Birds Agreement
kg	Kilogram
kL	Kilolitre
km	Kilometres
km^2	Square Kilometres
kPa	Kilopascals
kWh	Kilowatt hour

Term	Abbreviation
kW/m^2	Kilowatt per square metre
L	Litres
LA_{90}	Background noise level excluding nearby sources
L_{Aeq}	Equivalent continuous noise level
LCT	Landscape Character Type
LEP	Local Environmental Plan
LGA	Local Government Area
LLS	Local Lands Service
L_{MAX}	Maximum sound pressure level measured over a given period
LNG	Liquefied Natural Gas
LVIA	Landscape and Visual Impact Assessment
m	Metres
MCAP	Murray Catchment Action Plan
MBR	Membrane Bio-Reactor
mins	Minutes
ML	Mega litres
ML/d	Mega litres per day
ML/yr	Mega litres per year
mm	Millimetres
mm/s	Millimetres per second
MNES	Matters of National Environmental Significance
MSDS	Materials Safety Data Sheet
Mt	Million tonnes
MW	Megawatts
NEPM	National Environment Protection Measure
NGA	National Greenhouse Accounts
NGER Act	*National Greenhouse and Energy Reporting Act 2007*
NLA	National Library of Australia
NNTT	National Native Title Tribunal
NPI	National Pollutant Inventory
NSW	New South Wales
NPW Act	*National Parks and Wildlife Act 1974*
NV Act	Native Vegetation Act 2003
NW Act	Noxious Weeds Act 1993
OEH	Office of Environment & Heritage
OECD	Organisation for Economic Co-operation and Development
PEA	Preliminary Environmental Assessment
PFM	Planning Focus Meeting
PHA	Preliminary Hazard Analysis

Term	Abbreviation
PMST	Protected Matters Search Tool
PoEO	*Protection of the Environment Operations Act 1997*
PSA	Preliminary Study Area
QLD	Queensland
RAPs	Registered Aboriginal Parties
RBL	Rating Background Noise
RCR	Regional Controlled Road
RDA	Regional Development Australia
RDA Riverina	Regional Development Australia Riverina Regional Plan 2013 – 2016
RE	Regional Ecosystem
RING	Rail Infrastructure Noise Guideline
SEPP No 44	State Environment Planning Policy No 44 – Koala Habitat Protection
SEM	Single Event Maximum
SHI	NSW State Heritage Inventory
SHR	NSW State Heritage Register
SIS	Species Impact Statement
SEPP	State Environmental Planning Policy
SS	Suspended Solids
SSA	Secondary Study Area
SSD	State Significant Development
STP	Sewage Treatment Plant
SWL	Sound Power Level
TDS	Total Dissolved Solids
TEC	Threatened Ecological Community
t	Tonnes
The Project	Deniliquin Ethanol Plant
Proponent	Dongmun Greentec Pty Ltd
TSC Act	*Threatened Species Conservation Act 1995*
TSC Regulations	*Threatened Species Conservation Regulation 2010*
TSS	Total Suspended Solids
UXO	Unexploded ordinances search
VIC	Victoria
VIS	Vegetation Information System
VP	View Points
WMP	Water Management Plan
WONS	Weeds of National Significance
WSP	Water Sharing Plan
WWTP	Waste Water Treatment Plant
$\mu g/m^3$	Micrograms per cubic metre

Term	Abbreviation
YIKCAC	Yarkuwa Indigenous Knowledge Centre Aboriginal Corporation

Definitions

Term	Definition
ADG Code	The Australian Code for the Transport of Dangerous Goods by Road and Rail
Ambient noise	Total noise at a site comprising all sources such as industry, traffic, domestic, and natural noises
Assessment Background Level 'ABL'	A single number representing the typical background noise level during each day, evening and night. The ABLs measured on all days are used to determine the overall RBL at a site.
Class	The classification number assigned to a dangerous good to indicate its most significant type of risk.
dB (linear) peaks	The maximum reading in decibels (dB) obtained using the 'P' time–weighting characteristic as specified in AS 1259.1 – 1990 with all frequency-weighted networks inoperative
dB(A)	'A' weighted overall sound pressure level
Frequency (Hz)	The human ear responds to sound in the frequency range of 20 Hertz to 20,000 Hertz. A combination of sound pressure and frequency determine perceived loudness. The centre frequency of an octave is double the frequency of the lower octave. Sound measurements are usually taken at 16 one-third octave bands between 50 and 5000 Hz
Hazardous materials	Substances falling within the classification of the Australian Code for Transportation of Dangerous Goods by Road and Rail (Dangerous Goods Code).
Impulsiveness	Noise that comprises distinct impulses in the noise (such as bangs, clicks, clatters, or thumps)
Intermediate	A partly processed substance formed during a manufacturing process which is neither unconverted raw material nor a finished product.
LA_{01}	Noise level exceeded for 1% of the measurement period. The L_{01} represents a 'typical maximum' noise level and is often used to represent intermittent noises.
LA_{10}	Noise level exceeded for 10% of the measurement period. The L_{10} represents the intrusive noise level and is often used to represent traffic/ music noise.
LA_{90}	Noise level exceeded for 90 % of the measurement period. This represents the background noise level excluding nearby sources.
LA_{eq}	Energy-averaged noise level over the measurement period.
Low Frequency Noise	Noise with frequency content less than 200 Hz.
Pasquil Stability Classes	There are six distinct atmospheric classes typically used to represent atmospheric stability. These range from Class A to Class F. Each of these classes represents a differing ability of sound to propagate across terrain.
Peak Particle Velocity (PPV)	A measure of ground vibration magnitude, PPV is the maximum instantaneous particle velocity at a point during a given time interval in mms^{-1}. PPV can be taken as the vector sum of the three component particle velocities in mutually perpendicular directions.
pH	A measure of acidity of alkalinity on a scale of 0 – 14
RBL	Rating Background Level. A single number established from all the daily ABLs from a site. It represents the minimum background noise level. The RBL (or minLA90, 1 hour) is the level used for assessment purposes.
Sensitive Receptor	Sensitive receptors are described in *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales:* A location where people are likely to work or reside; this may include a dwelling,

Term	Definition
	school, hospital, office or public recreational area. An air quality impact assessment should also consider the location of known or likely future sensitive receptors. For hydrogen fluoride, a sensitive receptor includes land-use areas with vegetation sensitive to hydrogen fluoride such as grapevines and stone fruit.
Sound Power Level	The total sound energy radiated from a source per unit of time. The sound power is a property of the source and not affected by the surrounding environment.
Sound Pressure Level	The sound pressure level is a property of the surrounding environment and is dependent on the distance to the source and surrounding surfaces.
Temperature inversion	A meteorological phenomenon which typically occurs on cloudless nights in winter when the ground becomes cooler than the surrounding air.
Tonality	Continuous tone in the noise heard (e.g. whine, hiss, screech, insects chirping, loose fan belt on truck engine). As a general rule, a prominent tonal component may be detected in one-third octave spectra if the level of a one-third octave band exceeds the level of the adjacent bands by 5 dB or more.
Topsoil	The surface soil layers. Typically extends between 20 cm and 100 cm depending on soil characteristics.
UN Number	United Nations Number, a four digit number assigned by the United Nations Committee of Experts on the Transport of Dangerous Goods Petroleum and Gas Legislation / Queensland: 2004

1.0 Introduction

This Environmental Impact Statement (EIS) has been prepared by AECOM Australia Pty Ltd (AECOM) on behalf of the proponent, Dongmun Greentec Pty Ltd (Dongmun Greentec), for a State Significant Development (SSD) application for the construction and operation of an ethanol production facility at Deniliquin, New South Wales (NSW) (the Project).

Approval for the Project is being sought under Part 4, Division 4.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). AECOM has prepared this EIS pursuant to the requirements of the EP&A Act and the Environmental Planning and Assessment Regulation 2000 (EP&A Regulation). This EIS was prepared in accordance with the requirements of the Director General's Requirement s (DGRs) issued on 23 December 2013 by the Department of Planning and Infrastructure (DP&I) (now the Department of Planning and Environment (DP&E)).

An assessment was undertaken to consider and address the potential direct and indirect environmental, social, and economic impacts associated with the construction and operation of the Project. This assessment is documented in the EIS and provides information about the existing environment, the likely impacts and their significance and mitigation measures to be applied to avoid or reduce potential adverse impacts to an acceptable level.

The EIS has been developed to provide information for stakeholders, including the DP&E, a number of other State referral agencies and other affected or interested bodies and/or parties.

1.1 Project proponent

The Project proponent is Dongmun Greentec, a wholly owned subsidiary of Dongmun IRS Co. Ltd (Dongmun IRS). Dongmun Greentec is an Australian branch of Dongmun IRS established in 2012. Dongmun IRS, founded by Sungho Joo in 1996, specialises in the construction and installation of anaerobic fermentation facilities which convert organic materials and waste into sustainable energy products such as ethanol. Dongmun IRS Anaerobic Digestion system has been applied to treat the organic waste from Dae Gu city and Gwang Ju city, Korea. These systems have operated successfully since 2002 under the supervision of the Korean Government's Ministry of Environment Protection.

1.2 Project Site

The Project Site is located on approximately 120 hectares (ha) of land over lots 234, 272 and 273 of DP 756325, along Deniliquin Barham Road, Deniliquin, NSW (Project Site). The Project Site is approximately 5.5 kilometres (km) southwest of the township of Deniliquin. Deniliquin is located approximately 250 km north of Melbourne, Victoria, and approximately 600 km south west of Sydney, NSW.

Further detail regarding the Project Site is provided in Chapter 2 Regional and Local Context.

1.3 Project overview

The Project will produce up to 115 mega litres (ML) of fuel grade ethanol per year and a number of associated agricultural co-products. The Project involves the following general works:

- Construction of ethanol plant infrastructure for processes including: closed system grain milling, liquefaction of grain flour, fermentation, distillation and dehydration and centrifuge and drying of dried distiller's grain (DDG).
- Installation of a boiler to remove odour from vapour release
- Anaerobic digestion area to treat and store liquid fertiliser co-product
- Construction of associated office, control room and maintenance room
- Storage area and silos for input grain
- Storage area for DDG output
- Storage area for solid waste from anaerobic digestion
- On-site ethanol storage
- Staff car and visitor car parking area

- Internal roadwork
- Research and development centre.

Further detail on the construction and operation of the Project is provided in Chapter 3 Project Description.

1.4 The EIS process

Environmental Impact Assessment (EIA) is a systematic analysis of a proposed development in relation to existing environmental values. The outcomes of an EIA are subsequently documented in an EIS that is submitted for regulatory and stakeholder review and made available for public comment.

The general method for undertaking an EIA and preparing an EIS is to:

- Determine the basis of the assessment and the required scope.
- Conduct individual assessments of each relevant aspect of the environment, measuring and predicting the likely impacts of the Project on each aspect.
- Determine and propose appropriate mitigation measures to minimise likely adverse impacts on the environment for each aspect.
- Determine the significance of environmental effects and prioritise mitigation and rehabilitation (where applicable).
- Produce a summary of commitments that incorporates the proposed mitigation.

The EIS process is undertaken concurrently with stakeholder consultation and community engagement.

The process for developing an EIS is underpinned by the EP&A Act and typically involves the following nine stages.

Stage 1 – Preliminary planning

A number of preliminary activities were carried out to determine the environmental values of the Project Site. This included preliminary assessments of:

- flora and fauna values
- permissibility and strategic planning
- hydrological assessments and preliminary water infrastructure requirements
- potential noise, vibration and dust impacts.

Stage 2 – Lodge preliminary environmental assessment to DP&E

A preliminary environmental assessment (PEA) was conducted in December 2013, following a Planning Focus Meeting (PFM) and site visit attended by representatives from key Government agencies, Dongmun Greentec and Deniliquin Council. The assessment provided the parameters of the Project and other supporting information required in the request for DGRs. Key environmental impacts were also identified and a justification for the Project provided. This assessment supported an application for the DGR's for the EIS submitted to DP&E in December 2013.

Stage 3 – DGRs issued

The Project DGRs were issued on 23 December 2013 and include specific requirements from relevant government agencies. A copy of the final DGRs is attached as Appendix A.

Stage 4 – Preparation of EIS

Following the release of the final DGRs, an EIS for the Project was developed. This EIS addresses the requirements of the DGRs by virtue of describing the environmental values, identifying potential impacts and proposing mitigation.

Stage 5 – Submission of the EIS to DP&E

Upon submission of the EIS to DP&E, there is a review period in which the DP&E determines if the EIS adequately addresses the DGRs. Once adequate, the EIS can be placed on public exhibition.

Stage 6 – Public exhibition and consultation

During the public exhibition period, which must be a minimum of 30 business days, government agencies and the public are invited to make submissions on the EIS. Section 1.6 describes the procedure for making a submission

on the EIS. There is also a requirement to give written notice of the public submission period to each affected and interested person and any other person decided by the Secretary (formerly known as the Director General).

Stage 7 – Response to submissions

DP&E will provide Dongmun Greentec the submissions, or a summary of the submissions, received in relation to the application during the public exhibition period. Dongmun Greentec is required to summarise and respond to submissions, providing DP&E with any amendments to the EIS.

Stage 8 – Assessment by DP&E

DP&E is required to assess the EIS, submissions received during the public comment period and the responses provided by the Proponent. Following its assessment, DP&E will produce an EIS assessment report which will include:

- an assessment on the adequacy of the EIS in addressing the DGRs
- an assessment on the adequacy of management and mitigation measures proposed
- recommendations about the suitability of the Project and whether to grant approval
- conditions of approval.

Stage 9 – Determination by DP&E

This decision is then provided to the relevant Minister, who decides to either grant or refuse the Project.

1.5 Document structure

This EIS comprises of two volumes. Volume One (environmental impact statement) consists of the main EIS document which is structured as follows:

Volume 1

- **Chapter 1** provides an introduction to the Project, including information about the applicant, the EIS process and consultation approach.
- **Chapter 2** describes the site location and provides the regional and local context the Project.
- **Chapter 3** describes the Project and provides an overview of its management.
- **Chapter 4** describes the objectives and needs for the Project, including Project benefits and alternatives to the Project.
- **Chapter 5** describes the approval pathway for the Project.
- **Chapter 6** describes the stakeholder consultation process undertaken throughout the EIS process in accordance with the DGRs.
- **Section 7** outlines the key environmental issues identified in the risk assessment, PEA report, stakeholder consultation and DGRs and their prioritisation.
- **Chapters 8 – 20** provide an assessment of the potential impacts of the Project on a range of environmental issues and outline mitigation and management measures to be implemented for the life of the Project. Key environmental issues include: traffic and transport, hazard and risks, waste, surface and groundwater and biodiversity. A range of other environmental issues including, but not limited to, soils and geology, landscape and visual effects, air quality, noise, cultural heritage, social and economic effects and health and safety are also considered in these chapters.
- **Chapter 21** provides an assessment of the potential cumulative impacts of the Project.
- **Chapter 22** describes the residual environmental consequences of the Project.
- **Chapter 23** summarises the environmental management system framework for the Project and the monitoring program to be implemented for both the construction and operation phase of the Project.
- **Chapter 24** outlines the mitigation measures to be implemented for the Project.
- **Chapter 25** details the justification for the Project with respect to the net Project benefits and the principles of Ecological Sustainable Development.
- **Chapter 26** provides a summary of the findings and a conclusion to the EIS.

- **Chapter 27** provides a consolidated reference list from all previous chapters.

Volume 2 (Technical Appendices) contains technical information relating to a number of environmental and social topics. Information includes technical reports, methodologies, baseline data information and data analysis.

A list of the technical appendices in the EIS is provided below:

- **Appendix A** Director Generals Requirements
- **Appendix B** Drawings and Plans
- **Appendix C** Capital Investment Value
- **Appendix D** Risk Assessment and Issues Prioritisation
- **Appendix E** Stakeholder Register
- **Appendix F** Consultation Materials
- **Appendix G** Landholder Consent Letters
- **Appendix H** Flora and Fauna Desktop Searches
- **Appendix I** Flora and Fauna Likelihood Assessment
- **Appendix J** Flora and Fauna Field Survey Results
- **Appendix K** Plains Wanderer Impact Assessment
- **Appendix L** Surface Water and Groundwater Technical Report
- **Appendix M** Traffic and Transport Technical Report
- **Appendix N** Preliminary Hazard Analysis, Technical Report
- **Appendix O** Landscape and Visual Impact Assessment Methodology
- **Appendix P** Air Quality
- **Appendix Q** Noise Technical Report
- **Appendix R** Cultural Heritage Technical Report
- **Appendix S** Study Team

1.6 Submissions

The public are welcome and encouraged to make submissions on the EIS during the public notification period.

Submissions will be invited through advertisements in the local newspaper, The Pastoral Times and the DP&E website.

In accordance with section 89F of the EP&A Act, submissions should be made as follows:

- In writing (hard or electronic form).
- State the name and address of each signatory.
- Be signed by or for each person making the submission.

Submissions must be received on or before the last day of the submission period.

DP&E will provide copies of the submissions to Dongmun Greentec, who must consider the submissions, provide DP&E with a response to each of the submissions and any amendments of the submitted EIS because of the submissions. Both the submissions and Dongmun Greentec's response will be taken into account as part of DP&E's assessment of the Project.

1.7 Public consultation process

A community consultation program has been carried out by Dongmun Greentec. Consultation included affected and interested parties as required by the EP&A Act and the Project's DGRs.

Community consultation is an ongoing process that aims to provide opportunities to educate and involve the community throughout the life of the Project. Information on the specific methodologies and the level of community consultation carried out to date is provided in Chapter 6 Stakeholder Engagement.

2.0 Regional and local context

This chapter describes the site location and the regional and local context of the site, including the economic and development strategies, land use and the strategic compatibility of the Project.

2.1 Overview of the Murray region

The Project is located in the Murray region which stretches 400 km east to west across NSW covering an area of approximately 78,869 square kilometres (km^2) and services a population of 110,317 people (ABS, 2011). The Murray region comprises 13 Local Government Areas (LGA's) including: Albury, Balranald, Berrigan, Conargo, Corowa, Deniliquin, Greater Hume, Jerilderie, Murray, Tumbarumba, Urana, Wakool and Wentworth.

The Murray region is situated along the Murray River. The region is known for its agriculture and food sector having both rich alluvial soil and leveraging the irrigation opportunities presented by the River. The Murray region relies heavily on the agriculture sector for its economic prosperity. The region produces approximately one third of NSW's grapes, a quarter of its citrus and over half of Australia's rice crop. The region is also home to the third largest vegetable growing area in NSW and Livestock is also important to the region. Retail, manufacturing (particularly value adding to food and beverages), health care and social assistance are also major employers in the region.

2.2 Regional economic and development strategies, priorities and goals

The Draft Murray Regional Strategy 2009-2036 (Regional Strategy) sets out specific regional infrastructure requirements identified in the State Infrastructure Strategy 2008-2009 to 2017-2018 as well as delivering a vision for the future development of the region. The key aim of the Regional Strategy is to guide sustainable growth throughout the region over the next 25 years by:

- Protecting and managing sensitive riverine environments of the region's major waterways to safeguard the future health and wellbeing of one of Australia's most important catchments, its associated $1 billion agricultural industry, the needs of downstream users and the $400 million tourism industry.
- Cater for a housing demand of 13 900 new dwellings by 2035 to accommodate the combined pressure of the forecast population increase.
- Prepare for and manage the significantly ageing population and ensure that new housing meets the needs of smaller householder and ageing populations by encouraging a shift in dwelling mix and type.
- Reinforce the role of Albury as the region's major regional centre and the opportunities in taking advantage of its strategic location and emerging economic strengths.
- Ensure an adequate supply of employment, particularly in Albury and other major towns to accommodate a projected 3100 new jobs.
- Protect rural landscapes and natural environment by limiting urban sprawl.
- Only consider additional development sites outside of agreed local strategies if they can satisfy the Regional Strategy's Sustainability Criteria.
- Ensure that land use planning systems can respond to changing circumstances for settlement and agricultural activity arising from water trading, by setting a strategic framework for decisions on land use change and investment in irrigation infrastructure.
- Recognise the value and protect cultural and archaeological heritage values of the region for both Aboriginal and European cultures, including the visual character of rural towns and the cultural landscapes of the Aboriginal people.

2.2.1 Riverina

The Regional Development Australia Riverina Regional Plan 2013 – 2016 (RDA Riverina) outlines the key emerging priorities and issues, along with the goals to be achieved through this plan. RDA Riverina has six key goals. The key emerging priorities and issues for the area are:

1) To proactively encourage greater economic growth, diversity and industrial innovation.
2) To nurture the development of a sustainable environment for future generations including the development of an innovative response to the water challenge.

3) To support education and skill development initiatives that enable all people to have the capacity and confidence to contribute to the region's growth.

4) To facilitate a collaborative approach between all tiers of government, business and community to solving the challenges of the region.

5) To encourage a proactive approach to health and living.

6) To act with honesty, integrity, transparency and in accord with relevant legal and financial obligations, sound corporate governance procedures and to fulfil Departmental funding requirements.

2.3 Regional land use and context

Land use and land management practices have a profound impact on Australia's natural resources, the environment and agricultural production. The Murray region spans three states, NSW, South Australia and Victoria and covers a significant area of land incorporating a huge diversity of natural environments and land use types. In the NSW part of the Murray region, major land uses include irrigated and dryland cropping, horticulture, wool and meat production, water storage (Menindee Lakes and Lake Victoria), mining, tourism, recreational fishing, forestry and nature conservation.

2.4 Strategic compatibility of the Project

The Project is compatible with the regional context and existing land use practices of the region. The Project also reinforces the strategic management frameworks of the region by:

- Helping to ensure an adequate supply of employment within the region as well as supporting education, skill development and economic diversification.
- Promoting industrial growth in the region and encouraging industrial and commercial development opportunities in small towns within the Murray region.
- Assisting primary production industries by providing end markets for agricultural products.
- Supporting and strengthening emerging industries by diversifying the agricultural industry sector and encouraging ethanol production.
- Promoting the generation and use of renewable energy supplies and helps to achieve the ethanol mandates of a number of surrounding states.

2.5 Project location and context

2.5.1 Regional context

The Project is located in the Murray-Lower Darling region of south western NSW and is approximately 250 km north of Melbourne, 375 km west of Canberra and 600 km south west of Sydney.

The area to the north west of the Project Site is the agriculturally intensive Riverina region where the majority of wheat grain will be sourced for the production of ethanol. This region is bounded to the west by the Great Dividing Range and situated within the drainage basin of the Murray and Murrumbidgee Rivers.

The Riverina region consists predominantly of flat plains with a typically warm to hot climate and plentiful supplies of water to support the agricultural and pastoral practices. Produce from the region varies, providing significant contributions of food produce, such as wheat, rice, maize, citrus and wine grapes, to the wider State.

Figure 2.1 illustrates the location of the Project in a regional context.

2.5.2 Local context

The Project Site is located to the south of Deniliquin Barham Road, approximately 5.5 km south west of the town of Deniliquin. The town services the intensive agricultural practices of the surrounding area with notable wheat, rice, wool and timber industries.

The local area is dominated by agricultural farmland, split between cropping and pasture related activities. The topography of the area is typical of the wider Murray region with predominantly lowland arable plains with little variation in elevation.

The Moama Deniliquin Rail line runs adjacent to Line Road (also known as Leetham Road) and the eastern boundary of the Project Site (refer Figure 2.2).

Deniliquin was specifically chosen for an ethanol plant due to its strategic locational advantages. The Project Site will have unique access to:

1) grain markets in south west NSW and Victoria
2) well-established agricultural producing areas
3) established rail and road transport networks
4) metropolitan fuel markets (Melbourne/Sydney)
5) skilled employment
6) services that allow efficient operation of the Project.

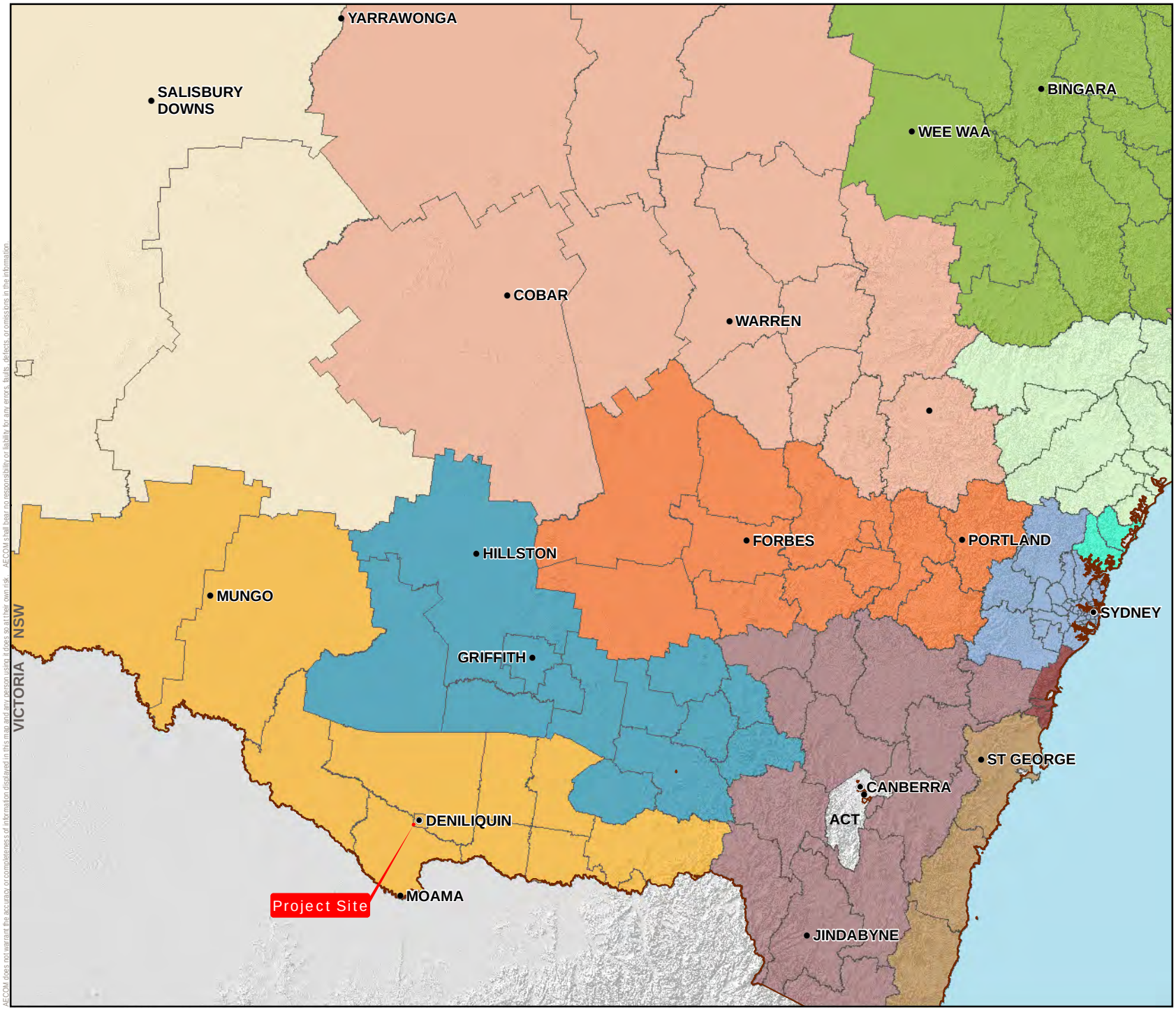
Figure 2.2 illustrates the location of the Project in a local context.

2.6 Project Site

The Project Site comprises lots 234, 272 and 273 of DP 756325 which covers an area of approximately 120 ha of land (Figure 2.3). The Project Footprint is approximately 25.6 ha and located wholly within lots 234 and 272 of DP756325 (refer to Figure 2.3). 273 of DP 756325 also forms part of the Project Site, however this land is currently not being considered as part of the planned construction and operation of the Project. Lot 234 DP 756325 and the majority of lot 273 DP756325 are being considered as either a potential future development area or offset location for the Project.

Deniliquin Ethanol Plant
Environmental Impact Statement

FIGURE 2.1
Regional Context



DATUM GDA 1994, PROJECTION MGA ZONE 55

N

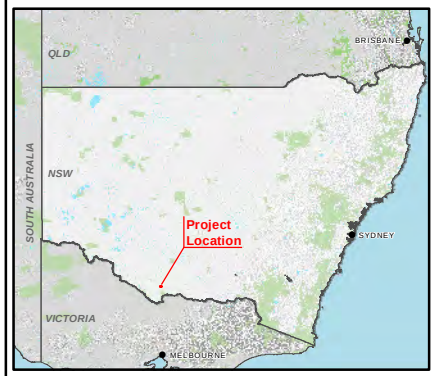
0 50 100 150
Kilometres

LEGEND

- Cities / Towns (selection)
- State Boundary

Regional Development Areas

- Central Coast
- Central West
- Far West
- Hunter
- Illawarra
- Mid North Coast
- Murray
- Northern Inland
- Orana
- Riverina
- South Coast
- Southern Inland
- Sydney



Data Sources:
1. Roads, Railway, Parks, Drainage, Suburbs: @ Street Pro, 2011
2. Base Map Layer: Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community
3. Regional Development Areas: @ Government Australia website; https://rda.gov.au/files/rda_map_nsw.pdf

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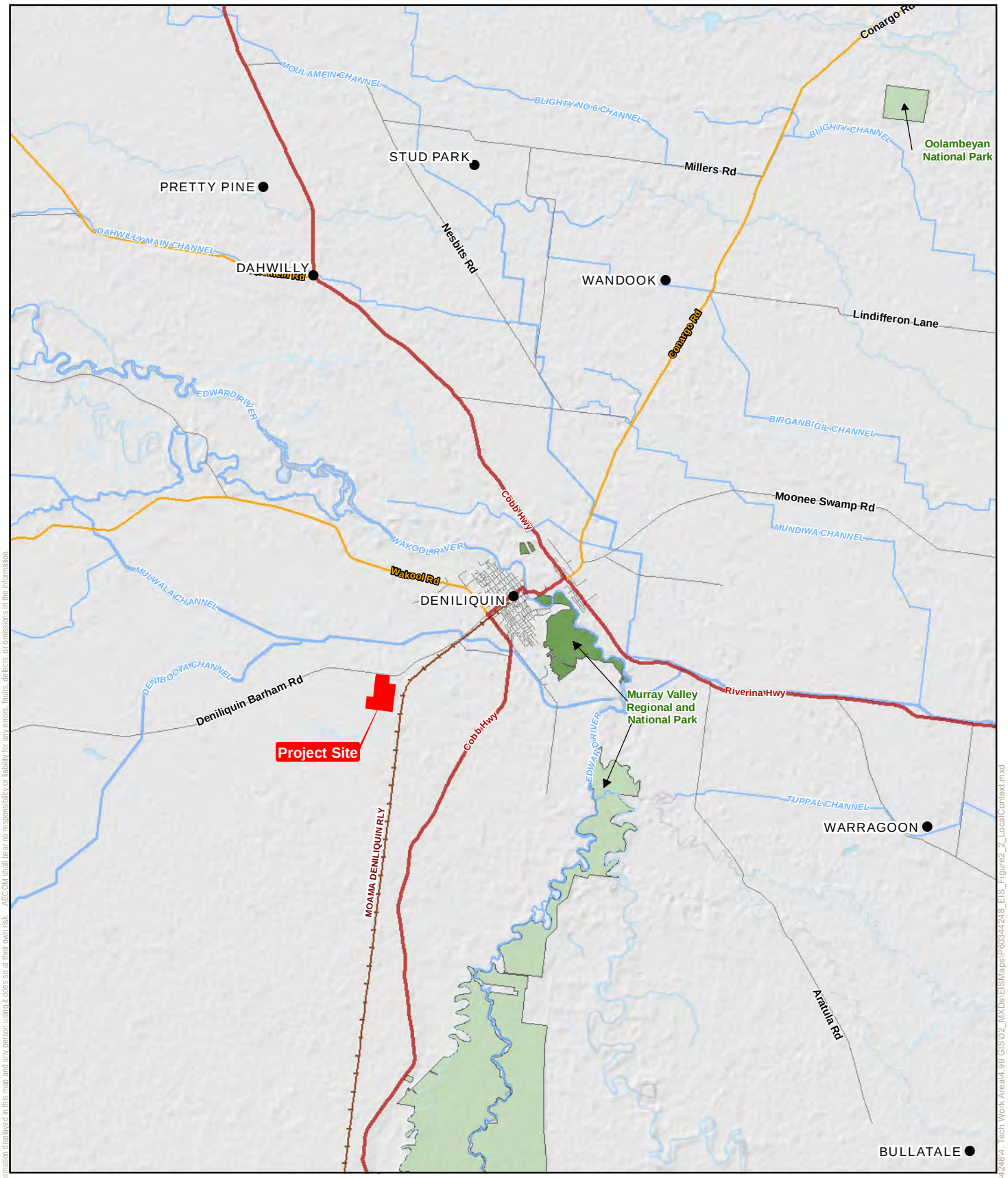
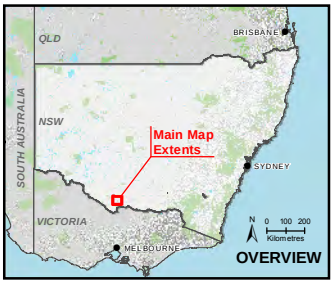
A4

Local Context





LEGEND

- Locality
- Freeway; Highway
- Main Road
- Other Roads
- Railway
- Major River / Watercourse
- Minor Watercourse
- Project Site

NSW Protected Areas

- Regional Park
- National Park
- Nature Reserve

Data Sources:
1. Roads, Railway, Parks, Drainage, Suburbs: @ Street Pro, 2011
2. Base Map Layer: Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community
3. Parks and Reserves: An area of land, the boundaries of which have been determined by the Governor by proclamation in the Government Gazette, which has been reserved for various protection purposes defined in instruments administered by Department of Environment and Climate Change (Parks & Wildlife Division).

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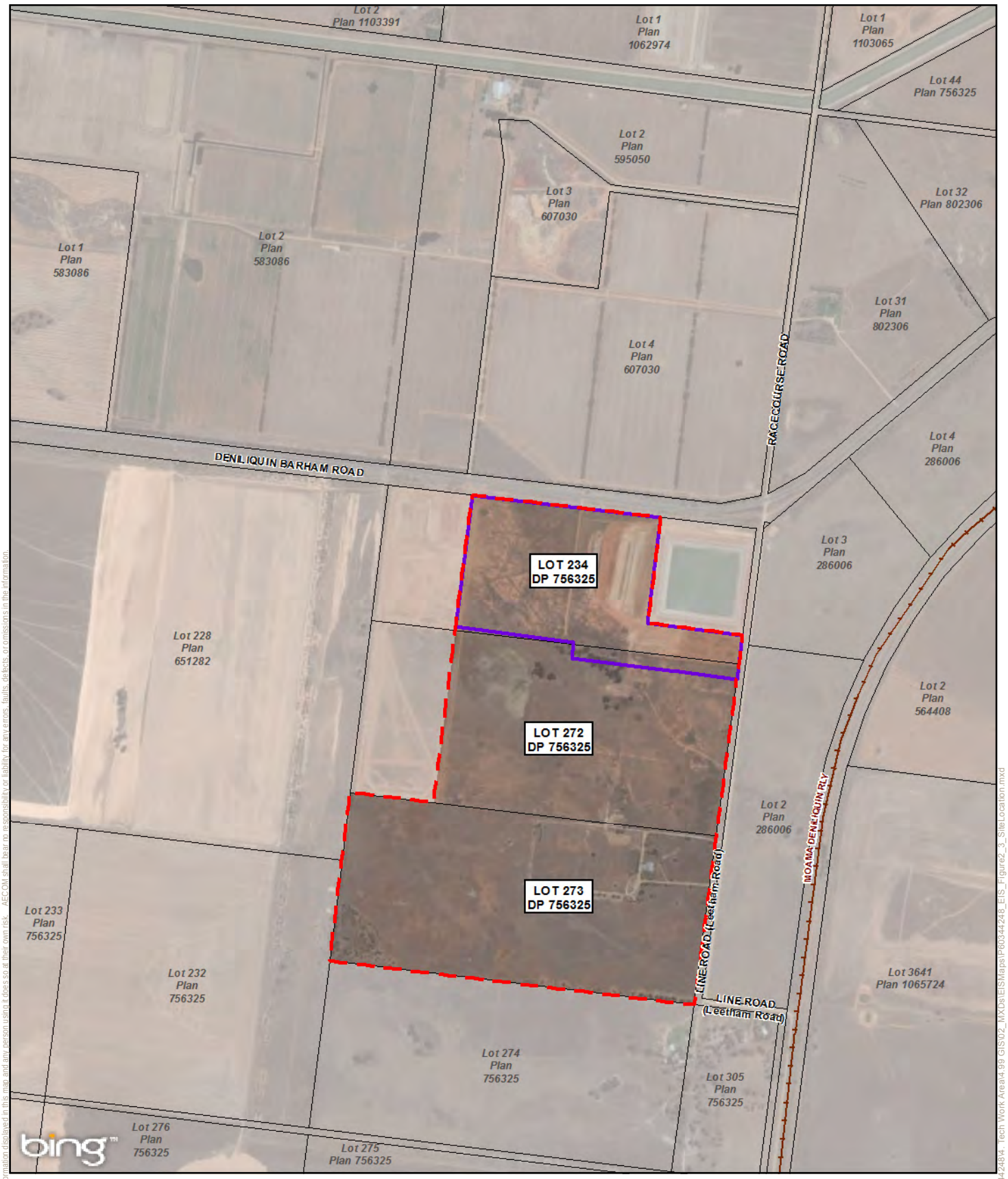
DATUM GDA 1994, PROJECTION MGA ZONE 55

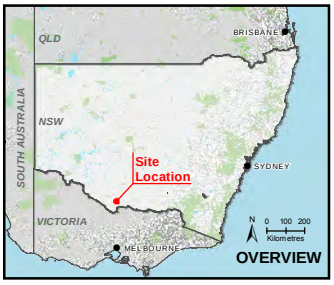
0 1.5 3 4.5
Kilometres

FIGURE 2.2

A4

Site Location





LEGEND

- Cadastral Boundaries
- Project Site
- Project Footprint

Data Sources:
1.Imagery: © 2015 DigitalGlobe © 2015 GeoEye Earthstar Geographics SIO © 2015 Microsoft Corporation
2. Roads, Railway, Drainage, Suburbs, Parks, Localities: @ Street Pro, 2011
3. Key Map Base Layer: ESRI Online
4. Site Layout: based on CAD Drawingd prepared by DONGMUN I.R.S. Co. Ltd.

Disclaimer:
Site Layout is indicative only. To be used for information only. For detailed design reffer to CAD Drawings

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DATUM GDA 1994, PROJECTION MGA ZONE 55

N 0 75 150 225 Metres

FIGURE 2.3

A4

3.0 Project description

This chapter describes the Project that is considered in this EIS.

3.1 Overview

The Project is proposed to take low grade wheat produce of the region and produce fuel grade ethanol. Several saleable co-products will be produced including DDG, DDGS, distiller's syrup and liquid fertiliser. A summary of the key features of the Project are presented in Table 3.1.

Table 3.1 Key features of the Project

Aspect of the Project	Description
Ethanol production limit	Approximately 115 ML per annum.
Project cost	Estimated $77 million
Project life	Ongoing. Ethanol Plant will be progressively graded as required.
Operating hours	24 hours per day, 7 days a week (11 months of year production with approximately one month of maintenance shutdown).
Workforce	Continued employment during plant operations in the order of 50 workers and up to a peak of 350 workers during construction.
Production method	Locally grown wheat to produce fuel grade ethanol through a series of production steps: Grain intake and processing, fermentation and distillation.
Key Project Infrastructure	- Grain intake areas - Storage area and silos for grain raw material - Ethanol plant processing infrastructure including: closed system grain milling; grain flour liquefaction; fermentation; distillation and dehydration; and centrifuge and drying of DDGS - Enzyme storage - Fermentation tanks - Mash tower - Rectifier tower - Sieve column - Decanter - Evaporator - Dryer - Ethanol product storage - Storage area for DDGS output - Boiler and air compression utilities - Water treatment plant - Cooling towers - Wastewater treatment - Storage area for liquid and potential solid waste from anaerobic digestion - Substation - Two workshops - Associated offices, control room and maintenance room - Staff and visitor car parking - Training and development centre.
Water infrastructure	- Stormwater holding tanks - Stormwater vegetated swales - Rain harvesting tanks - Deniliquin Council water supply connection - Bio-retention and flood detention basin.
Electricity supply	Estimated between 6.6 megawatts (MW) and 8.2 MW. On site substation.

Aspect of the Project	Description
Gas load	Estimated at 1,841,000 GJ per annum (with CNG to be piped to the site from a third party offsite storage facility).
Access and intersections	- Minor alterations to public roads - Site access for light vehicles accessing the main office area - A separate access point provided for heavy vehciles delivering raw materials and for the export of ethanol and other co-products. - A priority intersection onto Line Road (Leetham Road) with basic right turn movement.
Communications	Connection will be made to the local telecommunications supply network.

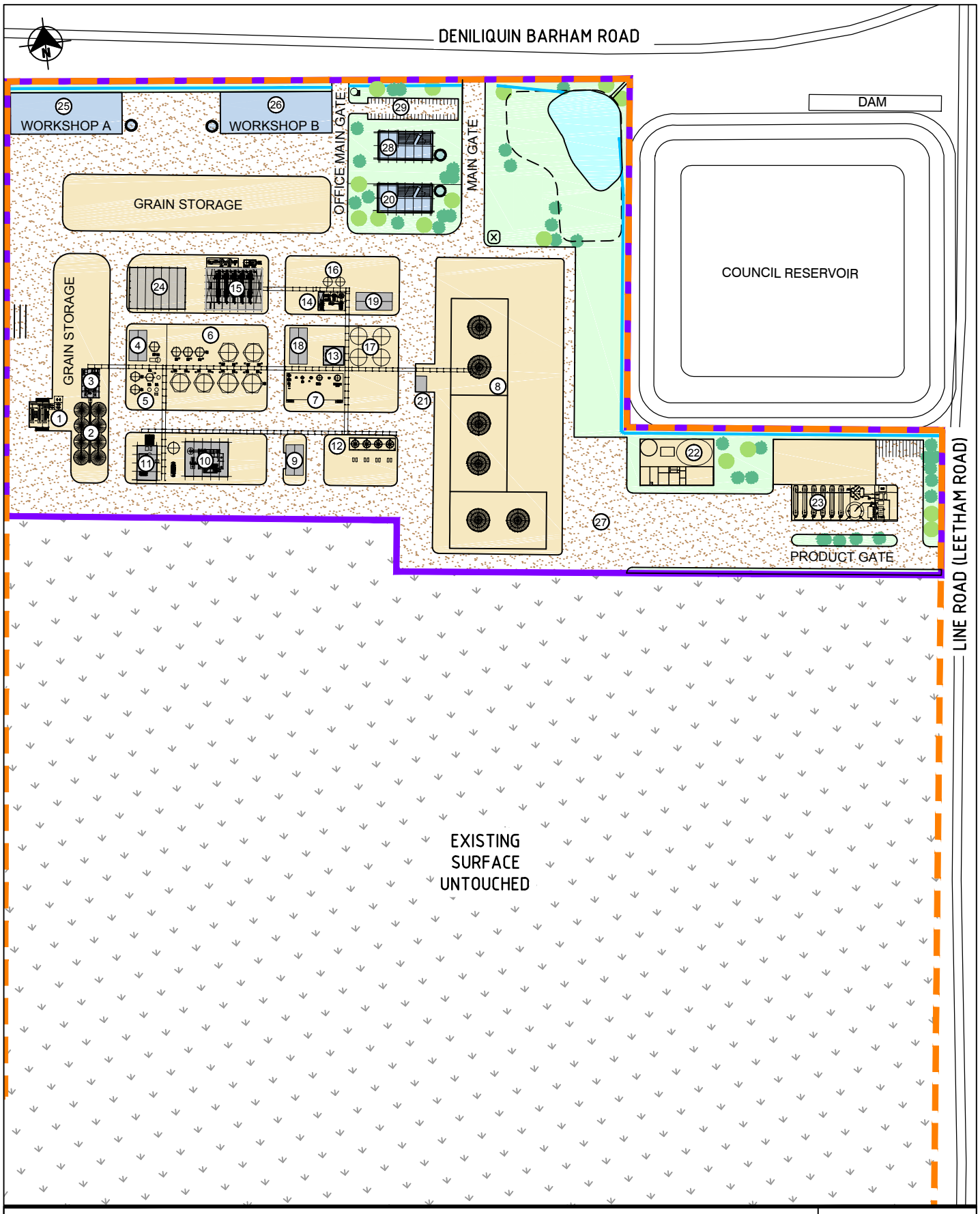
3.2 Project design

The Project has been designed to maximise efficiencies in the production of ethanol, DDG, DDGS, distiller's syrup and the liquid fertiliser, while minimising the impacts on the natural and built environment.

A number of studies have been undertaken to inform and guide the Project's design. This includes planning, engineering and environmental work that has ultimately contributed to an improved, efficient and sustainable design. These studies have been undertaken over a period of years and will be further refined to comply with the conditions of approval and, where relevant, engineering standards pertinent to ethanol facilities.

The proposed site layout and design of the Project is shown in Figure 3.1

Site Layout



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LEGEND

- ROADWAY
- SITE BOUNDARY
- PROJECT BOUNDARY
- LANDSCAPING
- RAIN HARVESTING TANK
- PAVEMENT AREA
- HARDSTAND AREA
- ROOFWATER CATCHMENT
- BIO-RETENTION & FLOOD DETENTION BASIN
- VEGETATED SWALE
- STORMWATER HOLDING TANK
- PARKING

1. Grain Intake
2. Grain Storage
3. Grain Preparation & Milling
4. Enzyme Storage
5. Gelatinization & Liquefaction
6. Fermentation
7. Distillation (Mash Tower, Rectifier Tower, Sieve Column & Dehydration)
8. Product Storage
9. Substation
10. Boiler & Air compressor
11. Water Treatment
12. Cooling Tower
13. Decanter
14. Evaporator
15. Dryer
16. Syrup Tank
17. Stillage Storage Tank
18. Control Room
19. Maintenance Room
20. Office
21. Ethanol Loading
22. Waste Water Treatment
23. Anaerobic Digestion
24. DDGS Storage & Loading Area
25. Workshop A
26. Workshop B
27. Impermeable Pavement
28. Training & Development Centre
29. Staff & Visitor Car Park

AECOM

0 100m

FIGURE 3.1

3.3 Project construction

Construction equipment will be transported to the Project Site at the direction of the contractors responsible for elements of the Project's construction. Where possible, the majority of the equipment required for construction will be sourced from local businesses around Deniliquin; however some specialist equipment may be required throughout the construction period which will be sought from specialist providers.

The main construction activities involved with development of the Project are:

- Site clearance, earthworks and security
- Foundation installation
- Workshop construction
- Process plant and utilities construction.

3.3.1 Site clearance, earthworks and security

In total the Project Footprint is 25.6 ha in size. Site clearance will include the removal of vegetation (where vegetation has not already been removed by prior land use), topsoil removal and storage, bulk earthworks, and temporary drainage works. The initial site clearance works will be focused on the Project's access roads. Temporary site construction facilities will be established, which will include relocatable site offices, ablutions and temporary site storage, laydown areas and parking areas.

Excavation of soil material will be required for roads, drainage, biorentention and flood detention basin, footings and similar components for the Project. As the site is relatively level, no significant cut or fill is expected. As excavations are not expected to exceed 5 m at any point on the Project Site and the ground water level exceeds ten m in this area, it is unlikely that construction works would impact on groundwater.

Security barriers would be installed to prevent unauthorised access to potentially hazardous site areas (such as temporary excavations).

3.3.2 Foundation installation

Foundations will be required to support buildings or structures and transmit loads directly to the underlying soil or rock. The type of foundations required for the various buildings and structures will be determined during the detailed design of the Project. However, it is considered likely that a range of shallow foundations will be required, including; strip foundations (footings) to support walls; pad foundations to support columns or piers; and raft foundations to support whole structures.

3.3.3 Workshop construction

Two workshops will be constructed within the Project Site (Workshop A and Workshop B). Construction of the workshops will be undertaken early in the construction phase to help facilitate the construction of the remainder of the Project.

The workshops will have separate purposes. Workshop A will be built first and will house industrial equipment, such as a bending machine, welding machine and plasma cutters, to allow for the manufacture of component parts and to support ongoing maintenance activities. This workshop will subsequently be used to fabricate and install the process equipment for the Project and continue to provide engineering services to the ethanol plant in the longer term. Workshop B will house microbial incubators and become a part of the research and development centre in the long term.

Each workshop will be installed on a sealed pavement and cover an area of approximately 3,840 m^2.

3.3.4 Construction equipment

The following typical equipment will be used during construction:

- Hand tools
- Bobcat
- Back hoe
- Hydraulic crane
- Excavator
- Grader

- Truck
- Roller
- Compressor
- Water truck
- Grout mixer
- Concrete batching plant
- Concrete mixer truck
- Concrete pump
- Welder
- Lathe
- Grinder
- Rivet gun
- Drills
- Hammers
- Saws

A further detail of construction equipment is provided in Chapter 17 Noise and Vibration.

3.3.5 Process plant and utilities construction

During the construction phase there will be regular deliveries of concrete materials (cement, aggregate, sand) and reinforcing steel. The majority of components specifically required for the Project will be assembled on the Project Site, with the exception of specialist equipment (such as the anaerobic digester and fuel facility components) that will be prefabricated and installed onsite. It is anticipated that all materials will be delivered by standard B-Double vehicles. No oversized heavy vehicles will be required to deliver materials for construction.

A series of process pipes and pumping systems will be installed to receive and load out the stored product. An extensive fire protection system will also be installed.

3.3.6 Power supply

Power lines will be laid underground where practical to do so and will supply electricity to the Project Site, with the only exceptions being the Steam Boiler, Waste Heat Boiler and DDGS dryers. These appliances will be powered by CNG which will be supplied via a pipeline to be constructed by a third party supplier to the east of the Project Site.

3.3.7 Water and sewerage services

It is estimated that approximately 34 ML of water will be required during the construction phase of the Project. This will be supplied by Deniliquin Council via an extension of the main trunk along Barham Road.

Sewage generated from site facilities (e.g. toilets and kitchen) will be discharged to a new sewer main, which is proposed to be developed by Deniliquin Council. Should the sewer main not be established before construction of the Project, a septic system designed in accordance with AS/NZA 1546.1:2008 On-site Domestic Wastewater Treatment Units – Septic Tanks standard will be established.

Further details on water and sewerage services are provided in Chapter 10 Surface Water.

3.3.8 Potable water

Potable water required during construction will be sourced from Deniliquin Council water supply. Further detail on potable water supply for the Project is provided in Chapter 10 Surface Water.

3.3.9 Stormwater drainage

It is proposed to manage stormwater through the establishment of vegetated swales and a bioretention and flood detention basin. The bio retention and flood detention basin will be designed in accordance with WSUD principles. It will be a ‘dry’ basin with the bioretention treatment facility included within a wider flood detention facility, as shown on the concept Stormwater Management Plan in Appendix F of Appendix L Surface Water and Groundwater Technical Report. The vegetated swales and bio-retention basin will be designed appropriately to

ensure that water discharge quality meets regulatory targets, and that sufficient attenuation is provided on site to ensure that post-development discharge rates do not exceed pre-development rates. At detailed design stage, a model for urban stormwater improvement conceptualisation (MUSIC model) would be developed to demonstrate water quality compliance.

Further detail on stormwater drainage for the Project is provided in Chapter 10 Surface Water.

3.3.10 Construction vehicles, access and parking

Construction of the Project will require the development of new access points off Deniliquin Barham Road and Line Road. Two driveways will be constructed along the straight section of Deniliquin Barham Road with good sight distances (greater than 250 m) along the carriageway in both directions.

A temporary car park will be constructed with clear markings and signage to ensure that all vehicles remain within the Project Footprint and do not impact any areas beyond it.

Further detail on how the Project will interact with public roads is provided in Chapter 12 Traffic and Transport.

3.3.11 Internal roads

Internal roads will be constructed to allow movement of construction traffic within the Project Site. Internal roadways will consist of the main access and egress route of through the truck load-out facility, and an 8 m wide site perimeter “fire access road” that will provide firefighting appliance access to all parts of the Project Site. These roadways will comprise a mixture of concrete, heavy duty asphalt, and chip sealed compacted crushed rock. Stormwater from internal roads will be diverted to vegetated swales.

3.3.12 Environmental monitoring and management (construction)

A Construction Environmental Management Plan (CEMP) would be prepared to cover the environmental aspects of the construction stage of the Project. The CEMP would describe the environmental management processes, controls and monitoring measures that Dongmun Greentec will apply during construction of the Project. Dongmun Greentec recognises that the Project construction activities will result in some adverse impacts on the environment. The CEMP would set out the minimum environmental management requirements that must be met or exceeded and includes instructions on implementation during construction. The purpose of the CEMP is to ensure that construction activities are undertaken in an environmentally responsible manner and that unavoidable adverse impacts on the environment are minimised.

3.3.13 Workforce and hours of construction

Construction is expected to take 14 to 16 months and employ a maximum of approximately 350 workers at any one time.

The construction hours for the Project will be:

- Monday to Friday 7:00 am to 6:00 pm
- Saturday 8:00 am to 1:00 pm
- No work on Sundays or public holidays.

3.3.14 Training and induction

All personnel including staff, employees and any contractors will undertake appropriate training prior to construction to ensure they are aware of their onsite responsibilities in respect of all environmental issues. Site inductions and specific training programs will be designed to ensure that all people are competent and aware of any environmental management procedures relevant to their activities. The induction process will also cover key elements of the CEMP.

3.4 Project operations

3.4.1 Operating procedure

The Project will process approximately 300,000 tonnes of wheat per annum in order to produce fuel grade ethanol and associated co-products. The wheat will be gathered from a range of locally grown sources and stored on-site prior to processing. To meet the processing requirements, the Project will need to operate 24 hours a day, seven days a week with a scheduled four week annual shutdown to allow for plant maintenance.

3.4.2 Workforce

It is anticipated the Project workforce will comprise 50 full time equivalent staff when fully operational. This includes six to eight administration staff and up to six to eight research and development staff that will be present

only during standard working hours. There will typically be three shifts per day for technical production staff. Shifts will nominally be 7.00 am to 3.00 pm, 3.00 pm to 11.00 pm and 11.00 pm to 7.00 am and operate on a rotational roster.

The workforce will be sourced from the local area where possible.

3.4.3 Process methods and equipment

The production of ethanol involves the milling of wheat to flour followed by a cooking, fermentation and distillation process. This process converts starch, which comprises up to 75 percent of the wheat to ethanol, DDGS, syrup and liquid fertiliser. Figure 3.2 provides a process overview. Figure 3.3 presents the locations of the major stages of the process described below.

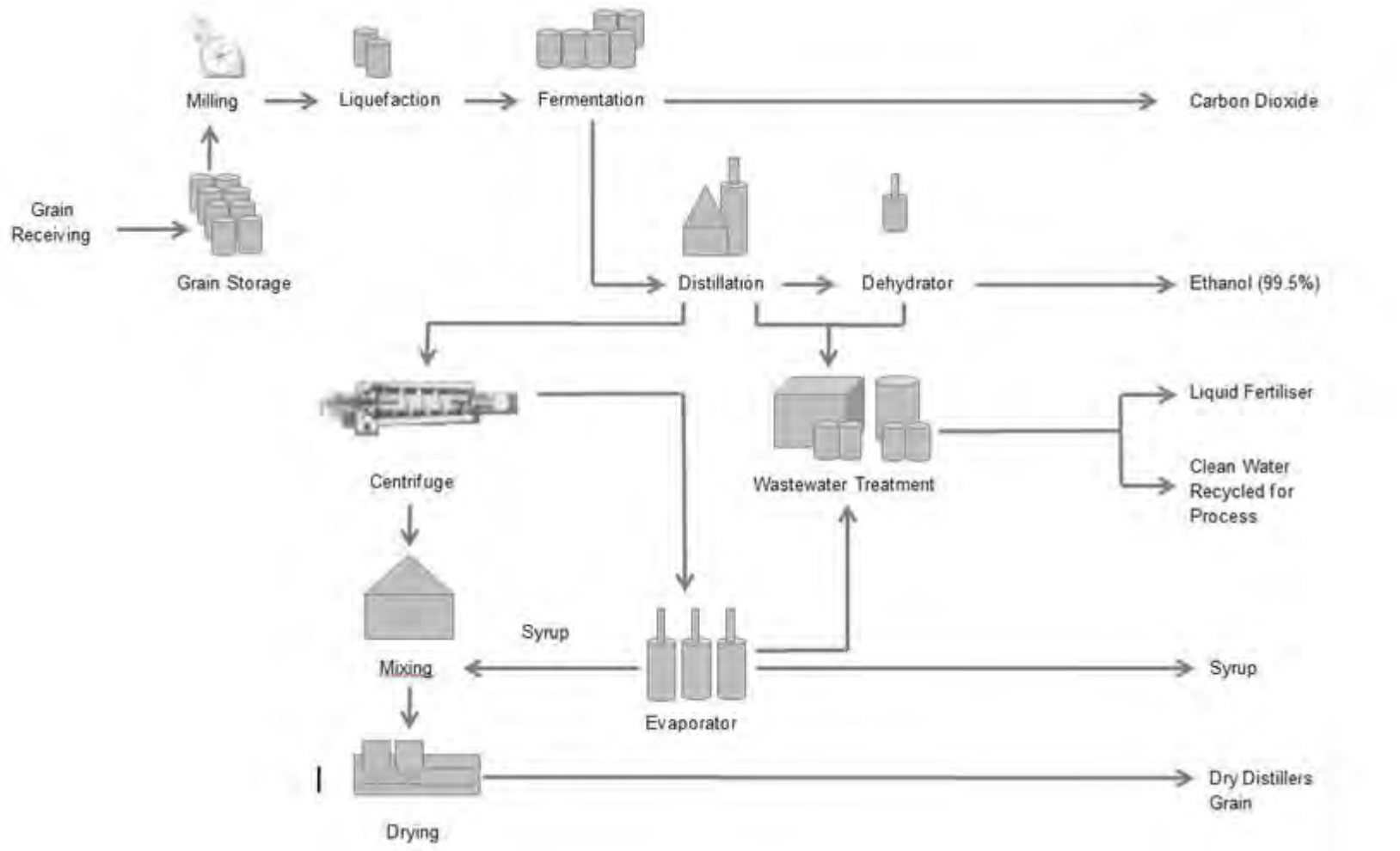
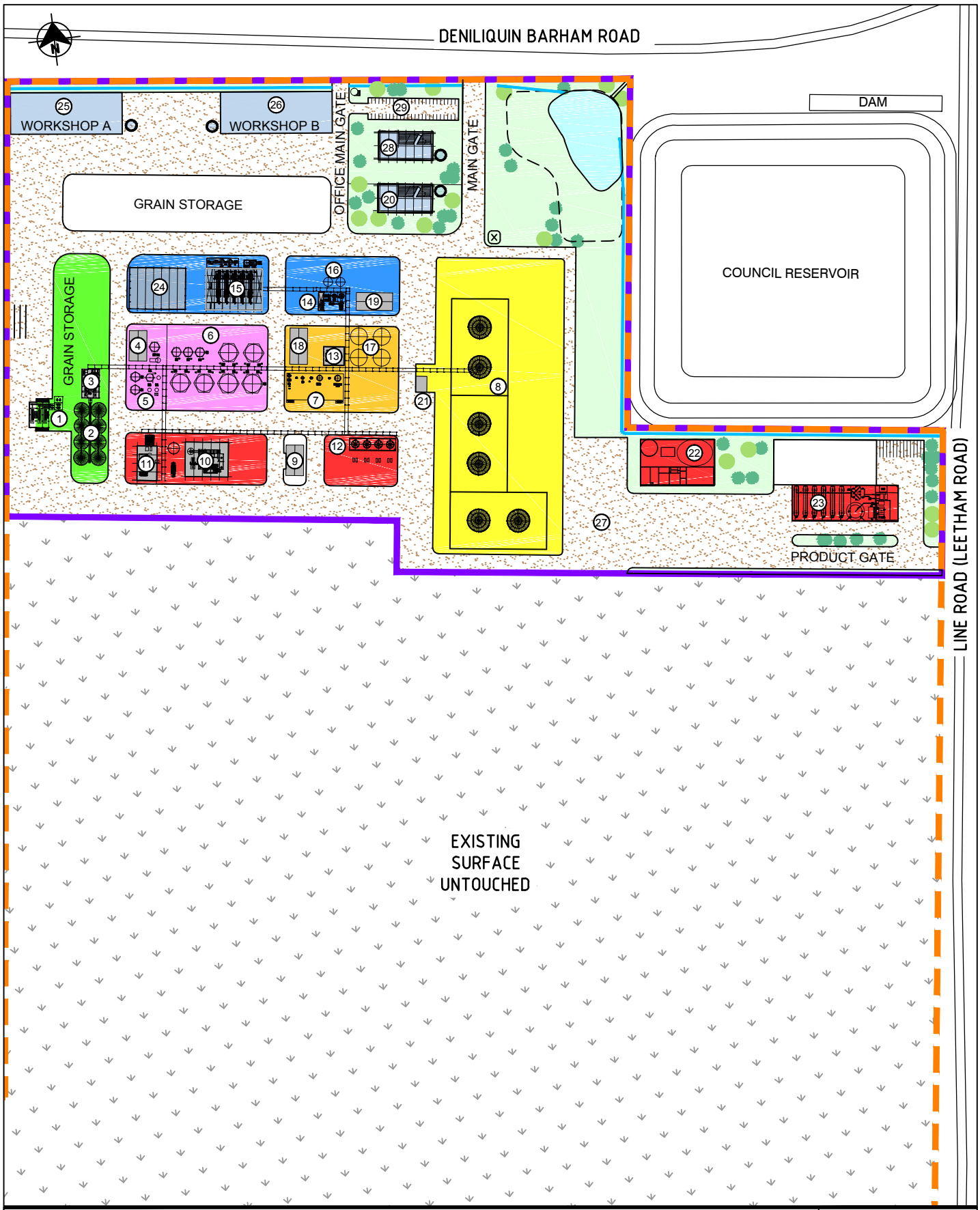


Figure 3.2 Process overview

Ethanol Plant Major Process Stages



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LEGEND

- ROADWAY
- SITE BOUNDARY
- PROJECT BOUNDARY
- LANDSCAPING
- RAIN HARVESTING TANK
- Process Stage 1: Grain Intake and Processing
- Process Stage 2: Fermentation
- Process Stage 3: Distillation
- Process Stage 4: Product Storage
- Process Stage 5: Dried Distillers Grain and Syrup
- Water Treatment, Boiler and Wastewater Treatment

1. Grain Intake
2. Grain Storage
3. Grain Preparation & Milling
4. Enzyme Storage
5. Gelatinization & Liquefaction
6. Fermentation
7. Distillation (Mash Tower, Rectifier Tower, Sieve Column & Dehydration)
8. Product Storage
9. Substation
10. Boiler & Air compressor
11. Water Treatment
12. Cooling Tower
13. Decanter
14. Evaporator
15. Dryer
16. Syrup Tank
17. Stillage Storage Tank
18. Control Room
19. Maintenance Room
20. Office
21. Ethanol Loading
22. Waste Water Treatment
23. Anaerobic Digestion
24. DDGS Storage & Loading Area
25. Workshop A
26. Workshop B
27. Impermeable Pavement
28. Training & Development Centre
29. Staff & Visitor Car Park

AECOM

0 100m

FIGURE 3.3

Process Stage 1 - grain intake and processing

1) Heavy vehicles delivering grain will enter and exit the site in a forward direction and travel along internal roads with appropriate signage.

2) Grain Reception and Storage: Grain delivered by heavy vehicle will be transferred to storage silos. This system will be a closed-system to prevent any dust emissions. The dust generated inside the intake hopper during unloading will be filtered by bag-filters.

3) Pre-cleaning: A drum screen will be used to separate foreign material, other than ferrous material, from the grain. The dust generated from this process will be filtered by bag-filters.

4) Magnetic Separator: A magnetic separator will be used to remove ferrous materials from the wheat. The ferrous materials will be collected for recycling. Refer to Chapter 11 Co-products and Waste for further detail.

5) De-branning: Bran is then removed from the grain. The dust generated from this process will be filtered by bag-filters

6) Flour milling – Hammer milling equipment will be used to mill the de-branned grain into flour. The dust generated from this process will be collected by a bag-filter system. Figure 3.4 illustrates the grain intake and processing stage (Process Stage 1).

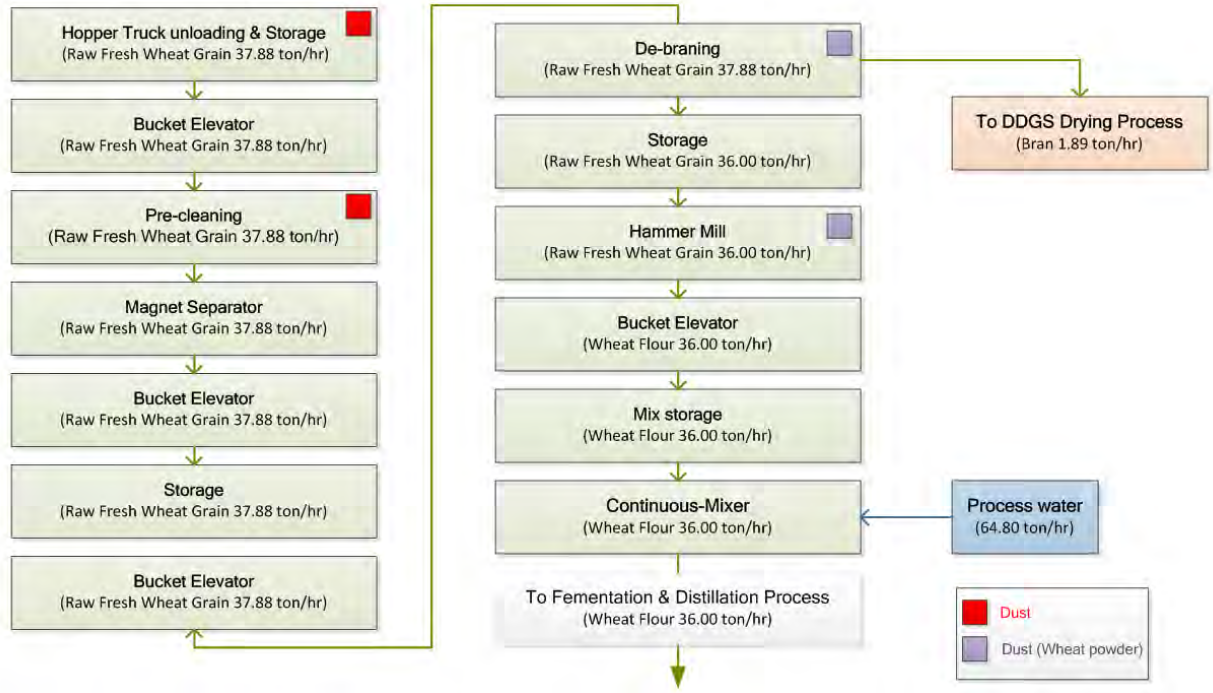


Figure 3.4 Grain intake and processing

Process stage 2 - fermentation

1) Mixing - Flour, process water and enzymes will be mixed firstly in the screw mixer and then in the mixing tank. Within the mixing tank, an agitator will ensure a uniform mixture and caustic soda will be added to adjust the pH to 6.2. The dust generated from the flour will be filtered by bag-filter.

2) Liquefaction – The slurry made from the mixing process will be pumped to the liquefaction tank. Steam is pumped into the tank where it reacts with the starch in the slurry and becomes gelatinized. The slurry is stirred in the tank to obtain a uniform mixture.

3) Saccharification – The liquefaction slurry will then be pumped to the saccharification tank where an enzyme is added. The slurry is mixed by an agitator to assist the enzyme to convert the starch in the slurry to glucose through hydrolysis. The pH of the slurry is re-adjusted to 6.2 using hydrochloric acid.

4) Pre-Fermentation – The hydrolysed slurry will then be pumped to the pre-fermentation tank where yeast is added and mixed using an agitator. In this process, the glucose is decomposed and CO_2 ethanol vapour generated will be passed through a vent scrubber, which is absorbed and recovered for future use.

5) Fermentation – The slurry is then pumped to the fermentation tank where it is allowed to ferment. This process produces ethanol and CO_2. The CO_2 will be treated by a vent scrubber for release to the atmosphere. Refer to Figure 3.3 for the location of Stage 2 activities for the Project and Figure 3.5 for key elements of the process.

Process stage 3 - distillation

1) Mash Tower - Mash will be fed to a Mash Tower through a feed pump. The Mash will be isolated to ethanol vapour and ethanol whole stillage by steam temperature. Ethanol vapour and inert gas will be exhausted by a ventilation system. Through the process, ethanol vapour will be collected in a vent scrubber. This distillate ethanol will then be sent to the rectification process. Whole stillage will be transferred to the centrifuge and treated in process Stage 5.

2) Rectification - The ethanol isolated in the Mash Tower will be fed to the Rectifier Tower passing through a feed pump and rectified as 95.5 percent of ethanol by differential temperature (steam) and then sent to the Dehydration process. Wastewater which is generated in this process will be transferred to the wastewater treatment system via a pipeline.

3) Dehydration - The ethanol (95.5 percent) that is isolated in the Rectifier Tower will be supplied to the Sieve Column through a feed pump and again dehydrated to more than 99.5percent of ethanol and water. Ethanol vapour will be vented in the exhaust system and then collected in the Vent Scrubber. Wastewater will be treated in the wastewater treatment plant. Refer to Figure 3.3 for the location of Stage 3 activities for the Project and Figure 3.5 for key elements of the process.

Process stage 4 - production (bio ethanol)

1) Storage tank - More than 99.5 percent of ethanol which is generated in the dehydration system will be stored in the on-site storage tanks. Ethanol vapour which is generated in the tank will be collected by a vent scrubber when vented through the exhaust system.

2) Loading system – The loading system will use a feed pump to load ethanol products from the storage tanks to a tank truck. At this time, ethanol vapour will be generated but these vapours will be collected safely by a vapour collection system. Refer to Figure 3.3 and Figure 3.5 for the location and description of Stage 4 activities for the Project. Chapter 16 Air Quality, odour and emissions provides further information on vapour and its management.

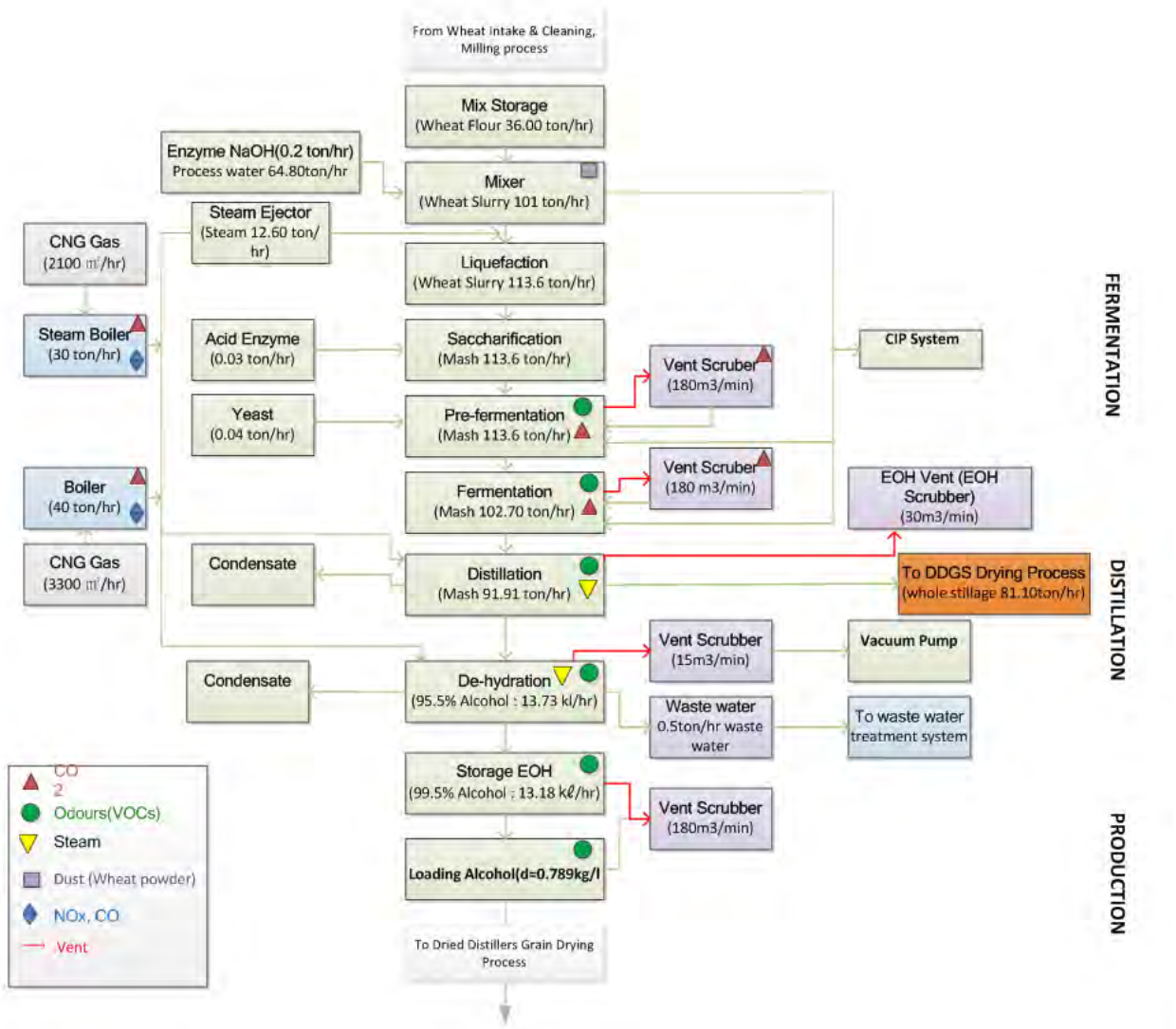


Figure 3.5 Fermentation, distillation and production

Process Stage 5 - Dried distillers grain

Drying process

1) Stillage Centrifuging - Whole stillage will be centrifuged to separate thin stillage (167.95 tonnes per hour) and wet distiller's grain (WDG) (35.32 tonnes per hour).

2) Evaporation – The thin stillage will then be evaporated to produce a syrup (32.2 tonnes per hour) with the condensate recovered partially for re-use and the rest for wastewater treatment (120 tonnes per hour). For further detail refer to 3.4.4 Wastewater Production and Treatment.

3) Mixing – To produce a higher quality of dried distiller's grain (DDG) WDG will be mixed with syrup (produced from the evaporation of thin stillage) and bran (produced from initial grain processing). There will be no dust produced from this process given the water content of the WDG. Odour generation is likely from this process; however odours will be eliminated using thermal oxidation methods by re-directing exhaust gas into the gas furnace.

4) Drying for DDGS – Compressed natural gas will dry the DDGS. Dust generated by this process will be collected by dust filters located at the rear of the drying equipment. Odours generated by this process will be combusted using thermal oxidation methods by re-directing exhaust gas into the gas furnace.

5) Cooling for DDG – The DDG will be cooled by mechanical fans. The cooling process will be a closed system process. Dust generated by this process will be collected by bag dust filters.

6) Packing and Transportation – The cooling, transporting, storing and packing process of DDGS will be a closed system process. Any dust generated by this process will be collected by bag dust filters. Figure 3.3 shows where the DDGS drying process takes place within the Project Site. Process Stage 5 is illustrated in Figure 3.6.

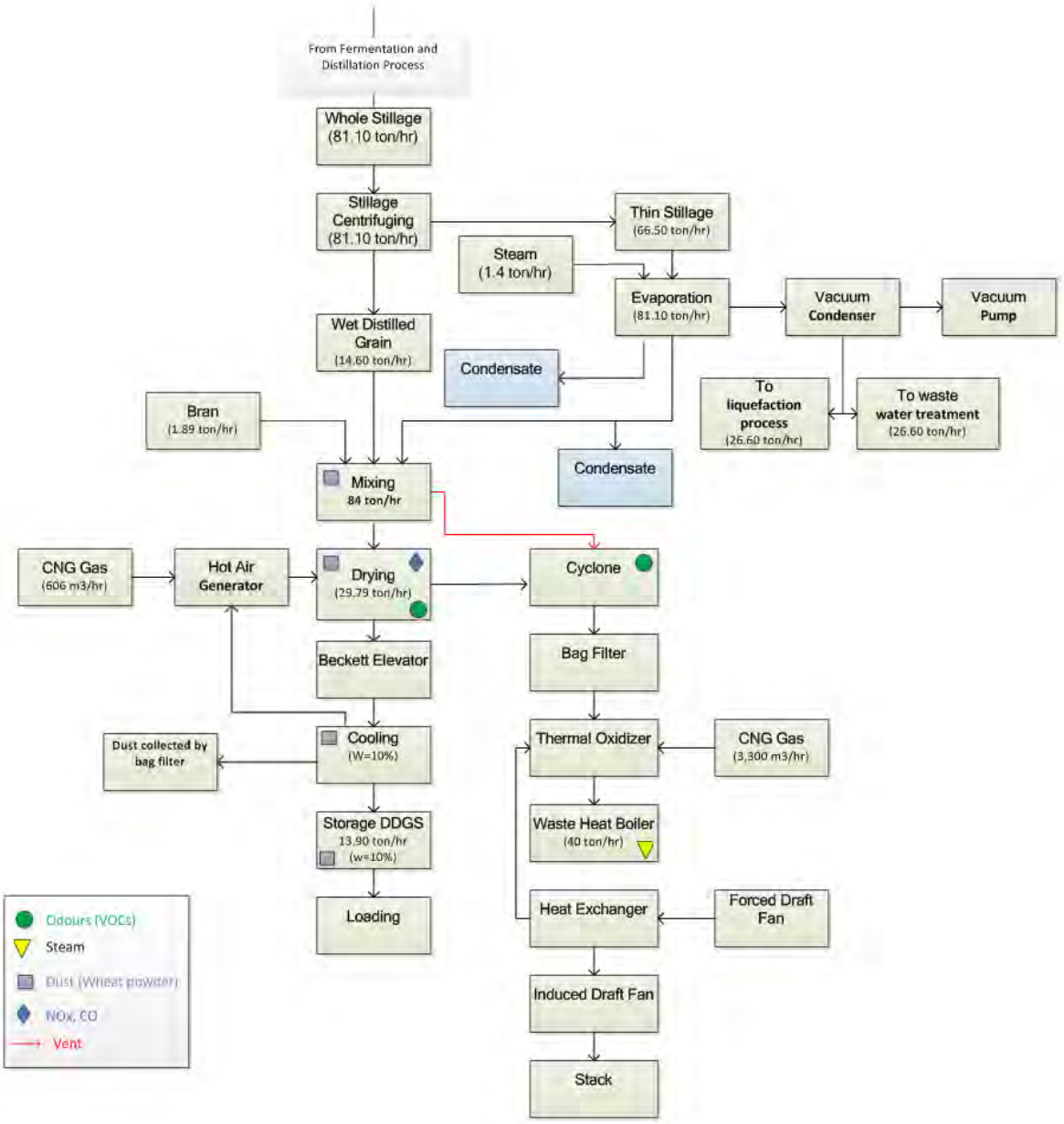


Figure 3.6 DDG process

3.4.4 Wastewater production and treatment

Sources of wastewater from the ethanol processing and utilities are:

1) Wastewater from stillage evaporation (condensate of evaporation). The wastewater generated from stillage evaporation is condensed in the condenser (approximately 1,350 m^3 per day, with a design of 1,400 m^3 per day). Approximately 1,350 m^3 of the daily condensate will be pumped to the on-site wastewater treatment system while approximately 640 m^3 per day pumped to a liquefaction process to be reused. The quality of this water will have the BOD of approximately 2,500 mg/L and SS of approximately 200 mg/L.

2) Wastewater from cleaning water. Wastewater generated from floor cleaning in the plant, including scrubber cleaning water, backwash of the ion exchange, cooling tower blow down, and the vacuum pump sealing water will be pumped to the wastewater treatment plant. This water will have a BOD of approximately 1,500 mg/L and SS of approximately 100 mg/L.

3.4.5 Wastewater treatment

The wastewater treatment process comprises a neutralisation/equalisation process, a sealed anaerobic digestion process and a subsequent aerobic and membrane bio-reactor process summarised below.

1) Neutralisation/equalisation. The pH of the wastewater is adjusted to 6.0 to support the subsequent anaerobic digester. The water is retained for a period of approximately 15 minutes. The wastewater also requires cooling. The temperature of condensate scrubbing wastewater will be approximately 42 to 45°C. This water must be allowed to cool to a temperature of 35ºC to 38ºC to support the mesophilic microorganisms in the anaerobic digester.

2) Anaerobic filter (digestion). This system consists of two anaerobic fermenters with a gas holder on top. The digester is operated at a temperature of approximately 35ºC to 38ºC, with a retention time of about 1.5 days. The digestion process begins with bacterial hydrolysis of the input materials in order to break down insoluble organic polymers such as carbohydrates and make them available for other bacteria. Acidogenic bacteria then convert the sugars and organic acids into intermediate products carbon dioxide, hydrogen, ammonia and organic acids. Acetogeric bacteria then convert these resulting organic acids into the intermediate products of acetic acid along with ammonia, hydrogen, and carbon dioxide. Methanogens then immediately convert these products to methane and carbon dioxide. The overall process can be described by the chemical reaction of biochemically converting glucose (input material) into carbon dioxide and methane (output material) through the use of anaerobic microorganisms. Gas from anaerobic digestion contains about 65-70 percent methane by volume, 25-30 percent CO_2, and small amounts of nitrogen, hydrogen and hydrogen sulphide, water vapour and other gases.

3) Aerobic biological system.

Anoxic basin

A small amount of the nitrogen components found in the wastewater is nitrified in the aerobic system. This nitrified wastewater is transferred and recycled and denitrified by organic carbon resources. This process removes the nitrogen gas.

Aeration basin

The wastewater treated in the anaerobic filter has a BOD of between 500 and 600 mg/L. To reduce BOD to 30 mg/L and total Nitrogen to 10 mg/L, the waste water is aerated in the aeration basin. The retention time is approximately 1.5 days. The amount of Oxygen required for the Aeration Basin (T-303) with capacity of 2 ML would be 0.1 kg-O_2/hr. The water aerator can supply 15.4 kg-O_2/hr to the basin that would be more than the required Oxygen.

Membrane bio-reactor

The membrane bioreactor (MBR) is a combination of a membrane process like microfiltration or ultrafiltration with a suspended growth bioreactor. Membrane bioreactor processes are widely used for municipal and industrial wastewater treatment applications and can produce effluent of high quality and will maintain a very low concentration of organic matter and nitrogen. The membrane bioreactor process produces two separate streams, treated effluent and sludge. The concentration of the sludge generated is approximately 8000 ppm (0.8 percent).

Advanced treatment

Water from the MBR is treated by an activated carbon filter to reduce COD by about 85 percent and recycled for reuse in the ethanol production process.

Sludge digestion

Organic waste generated in the production process and final sludge generated from the wastewater treatment facilities will be aerobically digested to generate liquid fertiliser. This will be stored in holding tanks located next to the digester solid waste. Biogas will be transferred to the boiler to be reused. Figure 3.3 shows where this process takes place within the Project Site. The waste water production and treatment process is illustrated in Figure 3.7.

The wastewater treatment process is further described in Chapter 10 Surface Water and its related technical report (Appendix L).

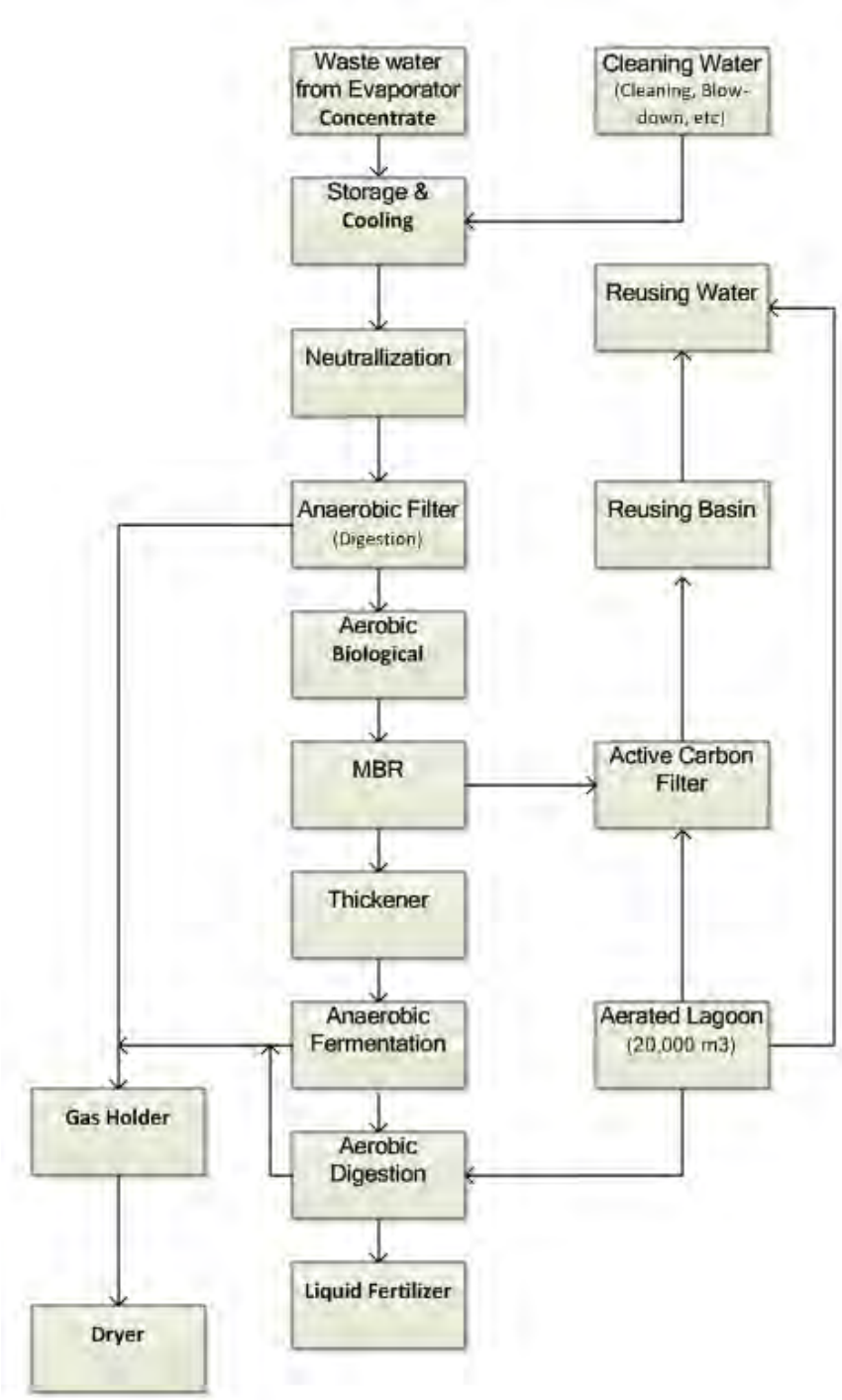


Figure 3.7 Wastewater Treatment Plant

3.5 Ethanol production co-products

3.5.1 Dried distiller's grain with solubles

The processing of grain results in DDG, a waste product that retains protein, minerals, beneficial fats and acids. Waste syrup is added to this to generate DDGS. DDGS has a protein level of approximately 35 percent compared to 12 percent typically in feedstock grain, making the product highly sought after by the feedlot and dairy industries for livestock feed. The product is also used by less intensive forms of agriculture and aquaculture.

DDGS has a long shelf life and can be transported and stored on farms. DDGS from the ethanol plant will be stored on site within a storage and load out facility, before being transported and sold into the Murray, Riverina, Goulburn Valley regions and other agricultural markets. It will be sold only as a 'dry' product. Sales will be direct to regional feedlot and dairy operations and nationally through agricultural supply outlets.

3.5.2 Distiller's syrup

Distiller's syrup is produced from the evaporation of the thin stillage process. The syrup is a high protein substitute for molasses, which is widely used in feedlots for livestock nutrition. Syrup also forms a basis for the production of highly effective liquid biological fertilisers that improve soil and plant health, reducing reliance on imported synthetic fertilisers.

A portion of the syrup produced by the plant will be added to DDG to improve the nutritional quality, reducing energy use in drying and to help prevent dust.

3.6 Infrastructure requirements

3.6.1 Transport

Road

It is anticipated that grain sourced from within 150 km – 300 km radius of the Project Site will be transported via the road and rail network for use in the ethanol production process. The road access to the Project Site will be via the Deniliquin Barham Road which is an existing, sealed road that connects to the wider local and State-controlled road network. The access driveways will be located along a straight section of Deniliquin Barham Road with good sight distances (greater than 250 m along the carriageway in both directions).

No significant upgrades or alterations to public roads are required to access the Project Site. Site access will be provided for light vehicles accessing the main office area. A separate entrance will enable safe access for heavy vehicles to deliver raw materials and exiting the site with ethanol and other co-products.

All heavy vehicle movements on the Project Site will be in a forward direction and heavy vehicles will exit the site on to Line Road (also known as Leetham Road), which connects directly to Deniliquin Barham Road.

The site layout plan in Figure 3.1 shows the internal access roads and parking areas for on-site workers and site visitors. Parking for on-site workers will be located close to the main entrance. Construction trucks, freight B-Double trucks and tanker trucks will park to the south of the grain storage area, within the central western aspect of the Project Site. The site layout and the internal road network will be further refined during detailed design and before the site configuration is finalised for construction. Further detail on the potential impacts of the Project on the local and state controlled network is provided in Chapter 12 Traffic and Transport.

Rail

The Project will transport approximately 70 percent of the raw materials and output products from the ethanol production by rail. Raw materials and products will be trucked to/from the Rice Grower's siding approximately 3 km to the north east of the Project Site. Upgrades to the rail network, if required, will be managed and operated by the relevant Rail Infrastructure Manager and QUBE Logistics. Approvals for planned upgrades, if required, would also be sought by these entities and as part of a separate approval process.

Increases in train movements due to the movement of ethanol product will be discussed with the Rail Infrastructure Manager as part of commercial discussions prior to construction. Agreements surrounding the increased utilisation of the network will be reached with the Rail Infrastructure Manager prior to the operation of the Project.

Port

Product will be transported by the road and rail networks to the Port of Melbourne. It is considered that there will only be an insignificant increase in shipping traffic through the Port of Melbourne relative to the shipping traffic

volume currently experienced by the port (3,300 ships a year carrying 2.5 million containers[1]). The Project is unlikely to significantly impact the operation of the Port of Melbourne or necessitate additional port infrastructure such as additional berths, dredging or land take.

3.6.2 Energy

Electricity

Power supply lines will be constructed to service the Project from the existing electricity supply network. It is anticipated that the Project will require in the region of 6 MW to 8 MW per annum.

Gas

The Project will use an estimated 232,433 MJ of natural gas per day. For a 330 day work year, the Project would use an estimated 76,703 GJ/year. This will be supplied as CNG from a nearby third party gas storage facility by pipeline. The gas storage and supply activity is being developed by a third party gas provider (Elgas) with the support of Deniliquin Council to meet several identified demands in the Deniliquin area including reopened abattoirs, a rice grains facility and aged care facilities. Correspondence from both the Deniliquin Council and the third party gas provider are provided in the Consultation Appendix (Appendix F).

3.6.3 Water supply and storage

Water is a primary input to the ethanol production process, and is therefore crucial to the operation of the Project. The dominant use of water will be for the ethanol production process, with smaller amounts used for landscaping and workplace supply (such as toilets and drinking water).

It is estimated that 2.6 ML/day will be required for normal operation, and approximately 148 ML would initially be required during the commissioning process. It is proposed to source water during the commissioning period from Deniliquin Council supplied water (0.5 ML/day). During operation, in the order of 1.3 ML/day will be supplied via the Deniliquin Council pipeline and recycled water from the onsite wastewater treatment plant will supply1.3 ML/day.

An on-site wastewater treatment plant will be used to treat process wastewater generated by the Project.

Wastewater generated from two sources. These sources are described below:

- wastewater would be generated within the process area and DDGS would be condensed in the condenser. It would then be pumped to the wastewater treatment system.
- wastewater generated within the cooling tower, general cleaning of process and utility areas would be discharged to the wastewater treatment system.

The proposed wastewater treatment system is expected to generate a low volume of effluent as the majority (98 percent) of wastewater generated will be recycled as process water. The remaining 2 percent (23.8 kL) is in the form of organic waste (sludge) that ends up as a liquid fertiliser.

Further detail on water supply and storage is provided in Chapter 10 Surface Water.

3.6.4 Stormwater drainage

The Project Site was previously used for agricultural purposes and is predominantly cleared at present. Once fully constructed, the Project will increase the impermeable area of the Project Site, which will increase stormwater runoff.

Stormwater will be managed through stormwater harvesting, the establishment of vegetated swales and the bioretention and flood detention basin. Most of the 20.2 ha of hardstand is proposed to drain into the bioretention and flood detention basin.

The bioretention and flood detention basin will be designed in accordance with WSUD principles. It will be a ‘dry’ basin with the bioretention treatment facility included within a wider flood detention facility, as shown on the Concept Stormwater Management Plan (Appendix F of the Surface Water and Groundwater Technical Report). The flood detention facility will be sized to ensure that peak discharges from the site are not increased beyond that of the pre-developed environment for nominally the critical 1, 10 and 100 year ARI storm events. Preliminary calculations suggest that flood storage of around 6,000 m^3 will be required.

[1] Based on 2011 data derived from http://portcapacity.portofmelbourne.com/downloads/120502-expanding-port-capacity.pdf

Targets

Stormwater pollution control targets set out in the draft document Managing Urban Stormwater: Environmental Targets (DECC, Consultation Draft, 2007) are applicable to the operation phase of the Project. The NSW Office of Environment and Heritage recommends the following targets as the minimum requirements for developments to minimise impacts on the environmental values of water. These targets require pollutant reductions for TSS of 85 per cent, Total Phosphorus of 65 per cent, and Total Nitrogen of 45 per cent.

Size

The Project Footprint required for bioretention systems in Deniliquin to meet these treatment targets is typically about 2 per cent of the contributing catchment. The Concept Stormwater Management Plan (Appendix F of the Surface Water and Groundwater Technical report) illustrates the proposed and indicative location and size of the bioretention system. A bioretention and flood detention basin of about 4,000 m^2, equivalent to 2 per cent of the contributing catchment has been included in the Project

Design considerations

Runoff that is discharged to bioretention systems must be pre-treated to remove coarse sediments, prior to the runoff reaching the bioretention filter media surface. Swales are proposed along the perimeter of the site for the purposes of collecting runoff from the drainage system, and conveying this to the flood detention and bioretention systems. Swales are an efficient device for coarse sediment removal and would provide suitable pre-treatment.

A concept Stormwater Management Plan has been developed and provided in Appendix L Surface Water and Groundwater Technical Report. This plan will be refined during the detailed design stage.

3.6.5 Sewerage

Sewage generated from site facilities (i.e. toilets and kitchen) will be discharged to a new sewer main, which is proposed to be developed by Deniliquin Council. Should the sewer main not be established before construction of the Project, a septic system designed in accordance with 'AS/NZA 1546.1:2008 On-site Domestic Wastewater Treatment Units – Septic Tanks' will be provided subject to appropriate approvals.

3.6.6 Landscaping

The Project Site layout proposes a vegetative screen around the eastern and northern edges of the Project Site to minimise the visual impact of the Project. Native vegetation would be used where possible for this screen.

3.7 Environmental management and monitoring (operations)

An Integrated Health, Safety and Environmental Management System (IMS) will be developed following approval of the Project. The purpose of the IMS will be to set out measurable commitments, objectives, targets, and management mechanisms for managing health, safety and the environment (HSE) at the Deniliquin Ethanol Plant in accordance with State and Commonwealth legislation, applicable Australian and international standards, and in general accordance with ISO 14001, ISO 18001, and ISO 9001. The IMS will provide a platform for preparing and implementing site-specific management plans, programs, monitoring, standard operating procedures, and standards that safeguard the health and safety of all employees, contractors and visitors to the plant, and the environment. The IMS will demonstrate a commitment to HSE, as well as a commitment to continually improving the system through inspections, audits, and reviews.

3.7.1 Environment and incident monitoring

An Emergency Response and Incident Management Plan would be developed for the operation of the Project as part of the IMS. The plan would include the following minimum content:

- Clearly defined roles and responsibility of relevant emergency response personnel
- Emergency specific triggers
- Emergency response procedures
- Resources to be used in response to an emergency or environmental incident
- Monitoring procedures
- Communication procedures and coordination with stakeholders
- Notifications and reporting protocols
- Incident investigation protocols.

3.7.2 Quality assurance/ quality control plan

Dongmun Greentec would establish a Quality Assurance/Quality Control (QA/QC) Program to ensure that the accuracy, precision, and reliability of environmental monitoring data are consistent with the requirements of NSW legislation and guidelines.

For environmental monitoring, QA would deploy an integrated system of management activities that involves planning, implementation, control, reporting, assessment, and continual improvement. QA practices may include the following:

- audits and/or evaluations of the efficiency, effectiveness or appropriateness of the contracting arrangements
- spot checks of staff understanding of, and compliance with, entity contracting policies and procedures
- peer review of selected aspects of contracting, for example contract deliverables, performance management regime or contract management plans
- self assessment checklists
- analysis of existing contracting performance data (for example, comparing the performance of different divisions or programs).

QC activities would measure each process or service against the QA standards. QA/QC practices and procedures would be documented in detail in manuals, plans, and a comprehensive set of standard operating procedures (SOPs) for environmental monitoring. Staff members would be required to follow these procedures and to document that they have reviewed and understand them.

3.8 Site management and security

To ensure no unauthorised access during operation, the Project Site would be made secure through the installation of a perimeter fence and signage. Boom gate access will be required to enter the site beyond the visitor carpark and office. Visitors to the Project Site would be required to report to the office to undertake an induction prior to entering the site. Further information on inductions is provided in Section 3.3.14.

4.0 Project needs and alternatives

This chapter describes the objectives of the Project, the need for its development and the alternatives considered as part of the feasibility studies, preliminary design stage and development of the EIS.

4.1 Project objectives

Dongmun Greentec aims to construct and operate a fuel grade ethanol plant on the Project Site to take advantage of the grain resource within the Deniliquin region. The project concept has been based on an extensive environmental assessment as well as market considerations relating to the availability of source crop, the ethanol product and the co-products of DDG and DDG with solubles (DDGS), distiller's syrup and liquid fertiliser.

The key objectives of the Project are:

- To supply the domestic fuel grade ethanol market with approximately 115 ML of ethanol per year
- To provide sellable co-products (DDG, DDGS, syrup and liquid fertiliser) to the agricultural sector
- To generate employment opportunities for local residents during construction and operations phases
- To utilise local grain supplies in the production of ethanol
- To minimise impacts on the natural and built environment through sensitive design and appropriate environmental management practices
- To provide economic stimulus to local and regional economies.

Further information regarding the need for the Project and its benefits are discussed in Section 4.3.

4.2 Project justification

Dongmun Greentec elected to develop the Project in Australia as a result of the following positive influential factors:

- Site suitability including the availability of agricultural land and an established grain industry within the region
- Established ethanol mandates
- Demand for co-products within the agricultural sector.

Each of these factors is discussed further below.

4.2.1 Suitability of the site

Australia provides significant advantages for the development of agricultural processing industries. The south western plains of NSW are well suited to broad scale agricultural cropping industries due to the availability of land and low population density. This scale and type of agricultural development is not possible in Korea (which is where one of the principal owner's in located) as a result of limited land availability and high population density. As such Australia present significant advantages in terms of land availability and suitability over Korea.

The Project Site is located within a well-established grain producing area. The regional location of the Project Site provides efficient access to production input grain and a ready market for process co-products, of DDG and DDGS which are sold as stock feed.

The Project Site is connected to major highways and rail networks with in the region. It is centrally located to metropolitan ethanol markets and port facilities, approximately 250 km north of Melbourne and 600 km south west of Sydney. The Project Site is located close to an existing industrial zone on the outskirts of Deniliquin which is connected to well established transport routes. The existing rail spur off the main Melbourne to Sydney rail line as well as the Cobb and Riverina highway are in close proximity to the Project Site. This provides strategic advantages for the logistics of both inputs and outputs of production.

A skilled workforce within the Deniliquin region increases the viability and strategic location of the Project Site. As indicated by the ABS statistics, the workforce of the Deniliquin LGA is well suited to support the development and operation of the Project. Statistics indicate that 15.8 percent of residents are technicians and trade workers, a further 8.3 percent are machinery operators and drivers and 11 percent are labourers. Over 35 percent of the workforce in the area is skilled in trades/occupations relevant to the construction and operation of the Project (ABS, 2013). The Project would provide new employment opportunities for a number of people in the local area. Further information regarding the socio-economic context of the region and Deniliquin is provided in Chapter 19 Socio-Economic.

The Project has received significant support from the Deniliquin Council and the local community. The establishment of the Project in the Deniliquin region provides opportunities for employment as well as the creation of an end user market for grain growers in the region. The positive economic influences the Project would have on the local area have been highlighted by the local media who have issued a number of statements and articles in support of the Project.

In summary, the Project Site offers the following merits:

- Central to major agricultural area for the efficient supply of input grain.
- Central to the major agricultural market for the sale of DDG, DDGS, distiller's syrup and the liquid fertiliser.
- The area surrounding the Project Site is sparsely populated and is located in a highly disturbed area in close proximity to a railway line, major roadways and an existing industrial area.
- Established transport links with direct road frontage to Deniliquin Barham Road and convenient access to the Cobb Highway.
- Logistics advantages with close proximity to a rail spur from the Sydney to Melbourne line.
- Ready access to a skilled workforce.

4.2.2 Ethanol mandates

The NSW Government has set an ethanol mandate since 2007. Ethanol mandates are designed to encourage broader use of ethanol and other biofuels in NSW. A summary of the history of the NSW mandate is detailed below:

- A State wide two percent average ethanol content was achieved in September 2008, less than 12 months after the commencement of the mandate (Department of Industry: Resources & Energy, 2015).
- Amending legislation commenced on 1 October 2009, which increased the volumetric ethanol mandate to four percent (from 1 January 2010) and later 6 percent (from 1 January 2011, later deferred until 1 October 2011), before requiring all regular grade unleaded petrol to become E10 from 1 July 2011 (later deferred until 1 July 2012 and then repealed on 29 May 2012) (Department of Industry: Resources & Energy, 2015).
- The 2009 amendments also introduced a volumetric biodiesel mandate, initially two percent (from 1 January 2010), increasing to five percent when sufficient supply of biodiesel is available, and broadened the volumetric mandate obligations to apply to major retailer's as well as primary wholesalers (Department of Industry: Resources & Energy, 2015).
- On 28 September 2011 the mandate was increased to six percent from October 2011 (Biofuels Association of Australia, 2014).
- A similar increase in the biodiesel mandate was suspended in December 2011 following realisation that the local supply of biodiesel could not meet the mandate target (Department of Industry: Resources & Energy, 2015).
- In February 2012, the NSW Government requested the Independent Pricing and Regulatory Tribunal (IPART) to report on supply and demand for ethanol. IPART's report found there is sufficient production capacity to meet the six percent mandate; however it has identified some factors that may make achieving the mandate challenging (Department of Industry: Resources & Energy, 2015).

Government mandated demand is projected to grow to over 1.9 gigalitres (GL) per annum by 2019 (Department of Industry: Resources & Energy, 2015). However, Australian capacity expansion through organic growth in domestic ethanol production is estimated to grow by only 6.5 percent to 408 ML by 2019 (OECD-FAO, 2011). Mandates are critical to drive market demand for ethanol as are new ethanol development to help achieve the mandate targets. Between NSW and QLD, a move to reinstate 6 percent and 5 percent mandate targets respectively will require the additional production of 835 ML of ethanol per year (Biofuels Association of Australia, 2014). Dongmun Greentec has identified a potential for demand in ethanol production into the future to supply local markets, based on the government retaining the mandates currently in place.

4.2.3 Demand for ethanol

With underlying demand for transport fuels remaining strong well into the future, market growth for ethanol as an alternate fuel or fuel additive is underpinned by a number of factors:

- Concerns surrounding Peak Oil and fuel security are causing nations to look to alternative renewable fuels to reduce reliance on imported petroleum based fuels.

- Growing global concern for the environment creating political pressure on world governments, resulting in government policies in support of locally produced ethanol as a renewable energy, through tax concessions and mandates.
- Growing consumer acceptance of ethanol blended fuel. Sales of ethanol blended fuel grew by 35 percent and 34 percent respectively in 2010 and 2011.
- Increasing accessibility to ethanol-blended fuels, with retail outlets offering E10 growing to 1690 in Australia (1340 in NSW/QLD) in 2010.
- Worldwide shortage of octane enhancing additives, as regulation increasingly restricts the use of traditional octane enhancers (e.g. Benzene, Toluene and Xylene) and as vehicles move to higher compression ratio engines requiring 95 or 98 Octane fuels.
- Grain exporters meeting increasingly stringent import protection from the European Union and United States of America.
- Market in Australia will require up to ten ethanol production facilities over the next five to eight years. This has led to significant Commonwealth and state government support for economic stimulus to regional Australia (IPART, 2012).

4.2.4 Demand for co-products

DDG and DDGS

DDG and DDGS are the nutrient rich co-products of dry milled ethanol production. Their utilisation as a feed ingredient is well documented as both an energy and a protein supplement (Klopfenstein et al., 2008). DDG and DDGS are excellent, lower cost alternative feed ingredients that continue to be produced in large quantities by the ethanol industry. The high energy, mid-protein and high digestible phosphorus content of DDG and DDGS make them a very attractive, partial replacement for some of the more expensive, traditional energy (corn), protein (soybean meal), and phosphorus (mono- or dicalcium phosphate) used in animal feeds. Protein in DDG has about 2.4 times greater protein value and DDGS has1.8 times greater protein value than soybean meal (Aines et al., 1987). When these co-products are added to standard stock feeds, it results in excellent animal health, performance and food product quality. These attributes have made DDG and DDGS some of the most popular feed ingredients for use in animal feeds around the world.

United States DDG and DDGS exports have soared from 1 million tonnes in 2006 to more than 11 million tonnes in more than 45 countries in 2014 (United States Grains Council, 2015). China received the bulk of DDGS exports, consisting of 52 percent of the export market, while Mexico received a further 12 percent, Korea (our percent, Vietnam four percent and Japan another four percent (United States Grains Council, 2015).The United States produced 34.6 million tons of DDGS in the 2010/11 crop year, nearly six times the level in of 2003/04, according to the United States Department of Agriculture Economic Research Service. Increasing supply, coupled with high prices for competing feeds (soybean meal and corn) and foreign market development efforts by the United States Grains Council, led to a surge in United States DDG and DDGS exports beginning in 2008. Exports now constitute about 22 percent of domestic DDG and DDGS production and reached a record $1.9 billion in the calendar year 2011, more than $200 million above the previous record set in 2010.

Currently, Australia has only a small biofuel and bioenergy industry. As a result the Australia DDG and DDGS industry and market is not as well established. In spite of this, in 2008 the United States Grain Council exported 45.7 metric tonnes of DDGS to Australia as part of a commercial trial to evaluate the compatibility of DDGS with existing dairy practices in Australia (United States Grains Council, 2015). The preliminary trial suggests that DDGS can be included in dairy rations in the Northern Victorian Dairy region of Australia (United States Grains Council, 2015). Additionally, it was found that DDGS would be a tangible alternative for existing traditional feeds, and could become a viable and beneficial option against current raw material protein and energy sources particularly in times of drought (United States Grains Council, 2015). Since the conclusion of the trial, the US Grains Council has worked cooperatively with Australian feed supplier CopRice, conducting further feeding and milling trials using DDGS pellets in dairy cattle rations in the south west Victoria and NSW (United States Grains Council, 2015).

An expansion of the biofuels industry would increase direct competition for grain, but would also increase the availability DDG and DDGS, which could provide a useful source of supplementary protein for livestock grazing low-protein, dry summer pastures. Current DDGS production is limited to the Dalby Biorefinery in Queensland and Manildra Group ethanol plant at Nowra, NSW (Braid, 2012). At full capacity, the Dalby plant produces 134 000 tonnes per year of DDGS, equivalent to approximately 47 000 tonnes of DDG. All of the DDGS from the Dalby plant is sold direct to a beef feedlot in southern Queensland (Braid, 2012). The distiller's syrup that is an additional co-product of the process is sold on to a livestock feed processor to be mixed with cane sugar

molasses to form a highly nutritious feed supplement for horses and ruminants. The Manildra ethanol plant, uses a waste-starch stream from their flour-to-gluten plant, together with some low-grade wheat and grain sorghum, to produce ethanol and DDGS (Braid, 2012). At full capacity, the Manildra Group's current plant can produce 175 000 tonnes per year of DDGS (Braid, 2012). Some goes to beef feedlots, but the primary market is the NSW south coast dairy industry, which uses the DDGS either as inclusion in the grain supplement fed during milking or as a drought supplement (Braid, 2012).

Based on the existing international market demand, the growth in the import and export rates of DDG and DGGS, and potential for the development of and Australian market, Dongmun Greentec believe there will be significant demand for the co-products generated as a result of the ethanol processing component of the Project.

Distiller's Syrup

Distiller's syrup is another co-product produced by the ethanol process, specifically from the evaporation of thin stillage process. The syrup is a high protein substitute for molasses, which is widely used in feedlots for livestock nutrition. A portion of the syrup produced by the plant will be added to DDG to improve the nutritional quality, reducing energy use in drying and to help prevent dust. Syrup also forms a basis for the production of highly effective liquid biological fertilisers that improve soil and plant health, reducing a farmer's reliance on imported synthetic fertilisers.

In Australia, molasses, being a co-product of sugar refining, is produced in northern QLD. The market for the distiller's syrup in NSW and Victoria, specifically for dairy farms and feedlots, is strong given the higher nutritional value of distiller's syrup and the reduction in transportation costs compared to molasses from QLD. A portion of the syrup will also be marketed to liquid fertiliser manufactures and used to produce the liquid fertiliser proposed as part of the Project.

Overall, the Project provides a significant opportunity to supplement the DDG and DDGS, distiller's syrup and liquid fertiliser markets (both domestically and internationally).

4.3 Project benefits

The local region is well resourced to provide the full range of construction and operational expertise required to build and operate the Project. It is estimated the Project will inject significant revenue into the local region's economy annually. A Capital Investment Valuation (CIV) Report is included in Appendix C.

The Project will benefit the Deniliquin area, the state of NSW and Australia more broadly. Key benefits of the Project include:

- Jobs: the Project will generate approximately 350 jobs during construction, 50 permanent jobs for operation and ongoing management, contributing an additional $5 million into the local employment market.
- Trades: ongoing plant maintenance will contribute a further $1 million per annum to local trades.
- Sourcing inputs: the purchase of grain input will inject a further $50 million annually into the local economy and provide a stable local market for growers.
- Ethanol mandates: assist NSW in meeting its ethanol mandate of six percent.
- Co-products: domestic supply of protein rich livestock feed and a centre of excellence for efficient fuel production and agricultural nutritional improvement, over the longer term.

Based on the positive benefits provided by the construction and operation of the Project, it is considered that the Project is in the public interest and will contribute significantly to the local region, NSW and Australia more generally.

4.4 Alternatives to the Project

Dongmun Greentec has considered alternatives to the Project in the planning and pre-feasibility stages of the Project's development. The feasible alternatives are described in this section, with particular focus upon:

- Alternate processing methods
- Water management alternatives
- Gas supply alternatives
- Transport alternatives
- Locality alternatives

- Project layout alternatives
- Not proceeding with the Project.

4.4.1 Alternate processing methods

Starchy materials are converted to ethanol by two major processes, dry milling (proposed by the Project) and wet milling. While the basic steps remain the same, the process has been considerably refined in recent years leading to a much more efficient and environmentally sustainable process. The main difference between the two is in the initial treatment of the grain.

Wet milling

In wet milling, the grain is soaked or "steeped" in water and dilute sulfurous acid for 24 to 48 hours. This steeping facilitates the separation of the grain into its many component parts.

After steeping, the grain slurry is processed through a series of grinders to separate the grain germ. The grain oil from the germ is either extracted on-site or sold to crushers who extract the grain oil. The remaining fibre, gluten and starch components are further segregated using centrifugal, screen and hydroclonic separators.

The steeping liquor is concentrated in an evaporator. This concentrated product, heavy steep water, is co-dried with the fibre component and is then sold as grain gluten feed to the livestock industry. Heavy steep water is also sold by itself as a feed ingredient and is used as a component in Ice Ban, an environmentally friendly alternative to salt for removing ice from roads.

The gluten component (protein) is filtered and dried to produce grain gluten meal co-product. This product is also highly sought after as a feed ingredient in poultry broiler operations.

The starch and any remaining water from the mash can then be processed in one of three ways: fermented into ethanol, dried and sold as dried or modified corn starch, or processed into grain syrup. The fermentation process for ethanol is very similar to the dry mill process described below.

Dry milling

In dry milling, the entire raw material (starchy grain) is first ground into flour, as "meal", and processed without separating out the various component parts of the grain. The meal is slurried with water to form a "mash." Enzymes are added to the mash to convert the starch to dextrose, a simple sugar. Ammonia is added for pH control and as a nutrient to the yeast.

The mash is processed in a high-temperature cooker to reduce bacteria levels ahead of fermentation. The mash is cooled and transferred to fermenters where yeast is added and the conversion of sugar to ethanol and carbon dioxide (CO_2) begins.

The fermentation process generally takes about 40 to 50 hours. During this part of the process, the mash is agitated and kept cool to facilitate the activity of the yeast. After fermentation, the resulting liquid is transferred to distillation columns where the ethanol is separated from the remaining "stillage". The ethanol is concentrated using conventional distillation and then is dehydrated in a molecular sieve system. The anhydrous ethanol is then blended with about 5 percent denaturant (such as natural gasoline).

The stillage is sent through a centrifuge that separates the coarse grain from the solubles. The solubles are then concentrated to about 30 percent solids by evaporation, resulting in Condensed Distillers Solubles or distiller's syrup. The coarse grain and the syrup are then dried together to produce DDGS, a high quality, and nutritious livestock feed.

Dry milling is the dominant and more efficient ethanol production process compared to wet milling. In a recent study by Rendleman and Shapouri (2007), the environmental benefits of dry milling relative to wet milling were assessed and compared. The study concluded that dry milling uses significantly less water and energy during the processing phase. In addition dry milling was found to be a more efficient process producing more ethanol output per tonne of raw material input (Rendleman and Shapouri, 2007). This is the process that will be used by the Project.

4.4.2 Water supply and management alternatives

Water is required for construction and operation of the Project. Ethanol plants require a significant volume of water during operations. The Project with a production capacity of 115 ML of ethanol per year would require 34 ML/y water during construction and approximately 870 ML/y water during operation for ethanol production. About 52 percent of the required water during operation would be recycled through an onsite wastewater treatment system and reused in the ethanol production process. Approximately 3.65 ML of water is required to produce 1 ML of ethanol. Approximately 148 ML will initially be required during the commissioning process.

In addition to operational requirements, water is also needed for workplace requirements and landscape management. The Project would operate all year with the exception of December when it would be shut down for general maintenance. This is the only measurable variation in water requirements in a year. The plant operates in a relatively closed system and changes to water requirements across seasons and years is relatively small.

A wide range of potential water sources for the Project were investigated as part of the Project development and EIS process. Suitability of the potential water sources were evaluated in relation to availability, security, quality, abstraction location and entitlements. Each source is discussed below and includes:

- Barham Effluent Reuse Storage (ERS) Pond
- Murray irrigation canal
- onsite recycled wastewater
- groundwater
- Deniliquin Council town water supply
- rainwater harvesting.

Barham ERS Pond

The ERS Pond, owned by Deniliquin Council with a capacity of 175 ML, is located adjacent to the Project Site, to the north east along Deniliquin Barham Road. This pond, locally known as 'Barham ERS Pond', is part of Deniliquin Council's Effluent Reuse Scheme, which in turn is a part of Deniliquin Council's Sewage Treatment Plant (STP). The main ERS storage pond is located at Warbreccan Farm to the north of the Project Site (approximately 5 km north west of the Project Site). Overflow from this main pond is pumped to the Barham ERS Pond. Rights to the treated water in these two storage ponds are owned by Warbreccan Farm.

Under this agreement, Deniliquin Council is obliged to sell all the effluent produced by the STP to the owners for the next 30 years. The quality of the water in Barham ERS Pond is suitable for input into the ethanol production process. A commercial arrangement with Warbreccan Farm to access water in Barham ERS Pond would be required. This potential water source is not currently proposed by the Project due to existing licencing and contractual arrangements between Deniliquin Council and a private landholder.

Murray irrigation canal

Water could potentially be purchased from the Murray Irrigation Supply, and taken from an existing irrigation canal that is located approximately 600 metres (m) from the Project Site. However, water will not be available between May and July each year due to canal maintenance works. As such this source has been discounted at this stage due to its unreliability.

On-site recycled wastewater

An onsite wastewater treatment system has been developed as part of the Project. Wastewater generated by the process will be treated on site and reused to reduce raw water requirements. Approximately 52 percent of the overall daily water demand of the ethanol production process will be supplied by the recycled wastewater (about 1.4 ML/day out of 2.6 ML/day).

Groundwater

An assessment of groundwater resources indicated that adequate supply is available to support the Project. Based on the characteristics of the aquifer in the proposed area, extraction of 1-15 ML/day is possible from the Renmark Aquifer Group, which would likely to cause groundwater drawdown. Preliminary calculations of predicted groundwater levels due to groundwater extraction at the required rates indicate that the groundwater level drawdown is likely to be less than 1 m at a distance of 1 km from the bore. The feasibility of using groundwater as a source for the Project was investigated. It is not considered as a source at this stage due to the level of uncertainty with regard to potential drawdown impacts and extraction rates. This option would require detailed field investigations and a licence application.

Deniliquin Council town water supply

Dongmun Greentec has agreed with Deniliquin Council that up to 1.3 ML/day of town water could be provided for the Project via an extension of the main trunk along Deniliquin Barham Road as part of the industrial development scheme for the area. Currently there is no capacity in the reticulation system to provide this demand to the Project Site. Deniliquin Council is planning to construct a 4 ML reservoir in a nearby industrial area in 2016. On completion, the reservoir could be used to transfer water to the Project via a pump station and trunk main. This source would be highly reliable and of high water quality, acceptable for ethanol production. It is proposed to

supply about 48 percent of the overall daily water demand of the ethanol production process from Deniliquin Council town water (about 1.2 ML out of 2.6 ML/day).

Rainwater harvesting

Lot 273 of the Project is zoned RU1 Primary Production and under Deniliquin Council's current Water and Sewer Limits Policy, Deniliquin Council does not service properties in this zone. Properties in the RU1 zone must source potable water from a separate source than the town supply system, which for Deniliquin is predominantly a rainwater tank.

Rainwater tanks would be used as the water source for general usage. This would meet the requirements of the RU1 zone and minimises the use of the town water supply by the development. Captured roof runoff would be used as drinking water. Runoff from some hardstand areas would be captured and would be used for minor on-site landscape watering.

4.4.3 Wastewater alternatives

Process water discharge

Ethanol production plants typically produce wastewater with high levels of Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), and Suspended Solids (SS), Total Dissolved Solids (TDS) as well as colour impurities and odour. The key pollutant of ethanol production would be organic waste. The proposed wastewater treatment system would produce two separate streams, treated effluent and sludge. The treated effluent would be directed to an intermediate basin where it would be filtered for reuse as process water. The proposed wastewater treatment system is expected to generate a low volume of effluent as the majority (98 percent or 1,368 kL) of wastewater generated will be recycled as process water. The remaining two percent (23.8 kL) contained in organic waste (sludge) that will be further processed and converted into a liquid fertiliser. All recycled and reused water generated in the wastewater treatment system will be beneficial and safe for reusing in ethanol production. This helps to reduce the risk of surface water and groundwater contamination.

The wastewater treatment system is critical for the Project and its failure would have a significant impact on ethanol production. As such a double system of key components will be installed and the volume supplied by each system would exceed the required volume to ensure a reliable supply.

The alternative option considered as part of the Project development was to discharge treated effluent to the Barham ERS Pond. This option was excluded due to water quality monitoring requirements outlined in Deniliquin Council.

Sewage

Sewage generated from the site workforce has the potential to contaminate surface water and groundwater. To mitigate this risk, Dongmun Greentec is seeking approval to dispose of the effluent via Deniliquin Council's sewerage system extension. Should Deniliquin Council be unable to provide a connection to the Deniliquin Council's sewerage system, Dongmun Greentec would use an off-line septic system. In such an event an 'Application for Local Activity' under Section 68 of the *Local Government Act 1993* will be lodged with Deniliquin Council to seek approval to install a septic tank.

Stormwater management alternatives

The Project would increase the impermeable area of the Project Site, which could potentially increase stormwater runoff and affect the quality of stormwater runoff. A concept Stormwater Management Plan was developed, which would be refined during detailed design stage. It is proposed to manage stormwater through stormwater harvesting, the establishment of vegetated swales and onsite bioretention and flood detention basin. The vegetated swales and bioretention and flood detention basin will be designed appropriately to ensure that water discharge quality meets regulatory targets, and that sufficient attenuation is provided on site to ensure that post-development discharge rates do not exceed pre-development rates. The bioretention and flood detention basin will be designed in accordance with Water Sensitive Urban Design (WSUD) principles.

During the development of the Stormwater Management Plan, a number of alternatives were considered to reduce the impact of the Project on the surrounding environment. The Project Footprint has been modified to minimise the amount of land affected by the Project. Permeable surfaces were maximised across the Project Site where possible to reduce the volume and peak flow of runoff. A traditional pit-and-pipe drainage solution for the entire site was considered but discounted because of limited attenuation and treatment provisions. The proposed drainage solution aims to work with the natural environment, and will be designed to integrate with the landscape as much as possible.

4.4.4 Gas supply alternatives

During the development and assessment of the Project risk analysis modelling was undertaken to determine the potential and significance of hazards and risks posed by the Project.

A number of design options, control measures and environmental safeguards were considered as part of the hazards scenarios and a qualitative hazard analysis undertaken. One of the alternatives considered for gas supply was to have liquefied natural gas (LNG) delivered to the site and have onsite storage of LNG. The qualitative hazard analysis and consultation with the DP&E resulted in the removal of this option for gas supply. The selected alternative for gas supply is via a gas pipeline supplying CNG to the Project Site.

4.4.5 Transport alternatives

The operations proposed as part of the Project require the transport of raw material from the surrounding area to the Project Site and the transport of products to export terminals and domestic markets. Several options were investigated for transporting the materials, including:

- Trucking all materials and product via existing road networks
- Trucking all materials and product to existing rail networks
- Utilising a combination of road and rail transport to transport raw materials and the product
- The development of a new rail siding connecting the Project Site and the Moama Deniliquin rail line

Following an evaluation of each transportation alternative, it was concluded that the most suitable method of transport was the use of both existing road and rail networks. Based on the existing rail network and sidings as well as established major highways in close proximity to the Project Site, coupled with the available capacity on these networks, it was determined that in order to maximise efficiency and minimise impact, a combination of both rail and roads systems will be used to transport raw materials and products.

All transport networks are already operational with proposed capacity upgrades planned; as a result no project delays are likely to be experiences in regards to the establishment of transport systems.

Rail

The proposal is to transport 70 percent of the raw materials and output products from the ethanol production using the existing Rice Grower's Rail Siding connecting to the Deniliquin rail line. The rail line is approximately 3 km north east of the site and is accessed via Ricemill Road off Deniliquin Barham Road. Other rail sidings in the area were considered, as well as the development of a new rail siding providing a direct connection between the Moama Deniliquin Rail Line to the Project Site. Following assessment of the impact of the rail siding on adjacent land owners and feedback received indicating lack of support for this option, it is not currently being pursued as part of the Project. Due to the close proximity of Rice Grower's Rail Siding to the site and the available capacity on the line, it was selected as the most appropriate option for the Project.

The existing Deniliquin line is operated and managed by QUBE Logistics who coordinate freight transport from Deniliquin to Melbourne. QUBE Logistics has confirmed significant capacity on the line with the additional traffic volumes generated by the project falling within the upper limits of the line.

Road

The remaining 30 percent of the raw materials and output will be trucked via the existing road network. The Project will connect directly to the Deniliquin Barham Road and will utilise the Cobb Highway and Riverina Highway as the main transport routes. The Riverina Highway is an approved AB-Triple route. The Cobb Highway is an approved AB-Triple route north of Deniliquin and approved Road Train Route south of Deniliquin. Deniliquin Barham Road is an approved 19 m B-Double route. The transportation of raw material and outputs from the plant will use heavy vehicles up to the B-Double category which will conform with the approved B-Double transport routes connecting to the State road network.

The use of existing road networks offers a significant advantage to the Project as the impact of the construction and operational related traffic along the Cobb and Riverina Highways is likely to be minimal. There is likely to be some impact on Deniliquin Barham Road, however, due to its low traffic volume the additional traffic generated by the Project will fall within the capacity limit of the road.

4.4.6 Locality alternatives

International

Dongmun Greentec investigated a number of potential alternate locations in Korea. However, due to the limited availability of land and high population density, the development of an ethanol production facility dependent on

agricultural grain markets to supply raw inputs to the ethanol production facility was not economically viable. Raw materials required to operate the ethanol plant would have to be imported. The costs associated with this make the Project unviable in Korea. Australia has a low population density, significant area of agricultural land and established agricultural sectors to support the development of an ethanol production facility making it the most economically viable option considered.

Additionally, Australia has established ethanol mandates and commitments to pursue biofuels and low energy alternatives across a number of States. These mandates and commitments increase the viability of the Project and help ensure its support by governments in Australia.

Preferred location

NSW is considered the most viable State in Australia to support the construction and operation of the Project based on:

- Established agricultural and grain industry in the Murray, Riverina and Goulburn region
- Land availability, compatibility and strategic location
- Highest established ethanol mandate in Australia

The Murray and Riverina regions are key agricultural regions of south western NSW. They is distinguished from other Australian regions by the combination of flat plains, warm to hot climate and an ample supply of water for irrigation. This combination has allowed the regions to develop into one of the most productive and agriculturally diverse areas of Australia.

In 2010-2011, the gross value of agricultural production in the regions was $1.8 billion, which was 16 percent of the total gross value of agricultural production in NSW ($11.7 billion) (Regional Development Australia, 2014). The most important commodity in the region, based on agricultural output value, is wheat. In 2010-2011, wheat contributed 30 percent ($548 million) to the total gross value of agricultural production in the regions. Fruit was the second largest contributor, accounting for eight percent or $150 million of the total gross value of agricultural production in the region.

A number of different project locations within NSW were considered during the developmental stage. The Project was originally proposed to be located at Junee, NSW due to its central location within existing grain markets. A decision to relocate the Project to Deniliquin was made following an options assessment which revealed a number of key strategic advantages. These include:

- Access to alternative grain markets in south west NSW and Victoria
- Access to road and rail transport networks
- Access to port facilities
- Access to metropolitan fuel markets (Melbourne/Sydney)
- Access to employment
- Access to services
- High level of support and endorsement from Deniliquin Council.

The NSW Government has committed to an ethanol mandate of six percent from 1 January 2011. This equates to a demand for about 350 ML of ethanol per annum which is yet to be reached. The Project will assist in delivering approximately one quarter of the mandate if approved.

4.4.7 Project layout alternatives

The Project layout has been reviewed and condensed to minimise the area of land to be impacted by the Project. Originally proposed to affect over 68 ha of land, the layout has been modified to significantly reduce the Project Footprint to approximately 25.6 ha. The following key reasons drove the reduction in Project Footprint.

- Reduction of the potential habitat loss and minimise the impact to the plains wanderer (*Pedionomus torquatus*)
- Reduction of the impact of the Project on heritage items present on the Project Site
- Reduction of the likelihood for potential offsite impacts caused by hazardous materials and dangerous goods stored on the site
- Reduction of the extent of hardstand required to support the project in order to minimise the stormwater runoff, potential for sedimentation of water management systems and soil erosion.

4.4.8 'Do Nothing' alternative

The 'Do Nothing' alternative, whereby the Project is not progressed, would avoid impacts on the natural environment which are discussed in this EIS. However, grazing would continue to be the predominant land use which itself has negative environmental impacts including:

- Increased likelihood of weed invasion
- Altered structure of biological communities
- Altered hydrological conditions, including decreased water quality and increased turbidity
- Reduced tree cover/canopy shade
- Increased likelihood of erosion and increased sedimentation
- Reduced wildlife habitat (Wilson, 1990).

Not progressing the Project would result in lost opportunity for positive economic impacts. Commercial losses would result primarily in relation to the loss of agricultural end market creation, employee opportunities and support of local businesses. In addition, there would be a loss of opportunity to provide a project to satisfy a quarter of the NSW ethanol mandate would be lost. Conversely, development of the Project would result in an economic benefit for the township and the broader region through continued employment and investment in local and regional economies.

5.0 Statutory controls and approvals

This chapter provides the statutory controls and approvals relevant to the Project by summarising:

- the statutory approval that the Project is seeking
- the legislative framework under which this EIS has been prepared
- the additional environmental licences, permits and approvals the Project may require and
- the applicable environmental and planning legislation, policies, guidelines and plans that apply to the assessment of environmental impacts throughout this document.

5.1 Commonwealth matters

5.1.1 Environment Protection and Biodiversity Conservation Act 1999

The purpose of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is to provide protection of the environment, particularly for matters of national environmental significance (MNES). Actions that have, or are likely to have, a significant impact on an MNES require approval from the Australian Government Minister for the Environment under Part 6 of the EPBC Act.

The EPBC Act lists nine MNES that must be addressed when assessing the environmental impacts of an action. A search of potential MNES within an area can be undertaken using the EPBC Act Protected Matters Search tool. The results of the search are contained in Appendix H Flora and Fauna Desktop Searches.

This EIS has considered the impact of the Project on MNES and the outcomes are summarised in Table 5.1. The MNES relevant to this Project and its location are limited to ecological matters including Ramsar wetlands; nationally threatened species and ecological communities; and migratory species listed under the EPBC Act. Chapter 8 Biodiversity provides a detailed assessment of the biodiversity values that could potentially be impacted by the Project.

Table 5.1 Consideration of Matters of National Environmental Significance

EPBC Act	
MNES	**Comment**
Australia's World Heritage properties	There are no properties on the DoE Heritage Register on the Project Site or adjoining properties.
National Heritage Places	There are no National Heritage Places and/or Commonwealth Heritage Places on the Project Site or in the local area.
Ramsar wetlands of international importance	The closest wetland of international importance to the Project Site is the NSW Central Murray State Forests, which is around 10 km to the southeast. Chapter 8 Biodiversity provides an assessment of potential impacts to this wetland.
Nationally threatened species and ecological communities	It is unlikely that there would be a significant impact on Commonwealth listed threatened species or ecological communities. Chapter 8 Biodiversity provides an assessment of potential impacts to nationally threatened species and ecological communities.
Migratory species listed under the EPBC Act	It is unlikely that there would be any impact on Commonwealth listed migratory species or migratory species protected under international agreements. Chapter 8 Biodiversity provides an assessment of potential impacts to migratory species.
Commonwealth marine areas	The Project is not located within or adjacent to a Commonwealth marine area. There would be no direct or indirect impact upon a Commonwealth marine area.
Great Barrier Reef Marine Park	The Project is not located within or adjacent to the Great Barrier Reef Marine Park. There would be no direct or indirect impact upon the Great Barrier Reef Marine Park.
Nuclear actions, including uranium mining	The Project does not involve a nuclear action.

EPBC Act	
A water resource, in relation to coal seam gas development and large coal mining development.	The Project does not involve coal seam gas or coal mining.

The EPBC Act *Environmental Offsets Policy* is the Australian Government's approach to offsetting 'significant', 'residual' adverse impacts of an action on MNES. 'Residual' impacts are those that remain after initial avoidance has been explored and mitigation measures have been applied. Environmental offsets under the EPBC Act are required if the 'residual' impacts are at risk of being 'significant'. Offsets are not considered until all reasonable avoidance and mitigation measures have been applied. As no significant impacts to MNES have been identified, providing offsets under this policy is not required.

5.2 State matters

5.2.1 Environmental Planning and Assessment Act 1979 and Environmental Planning and Assessment Regulation 2000

Development and planning in NSW is governed under the EP&A Act and the EP&A Regulation. Environmental planning instruments, including State Environmental Planning Policies (SEPPs) and Local Environmental Plans (LEPs), are legal documents enacted under Part 3 of the EP&A Act that regulate land use and development.

Specifically, environmental planning instruments determine the permissibility of a proposed development and the environmental assessment pathway.

The Act encourages the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment.

The EP&A Act and the EP&A Regulation also include provisions to ensure that proposals which have the potential to impact the environment are subject to detailed assessment, and provide opportunity for public involvement.

5.2.2 State significant development application

The State and Regional Development SEPP defines where development is declared to be SSD for the purposes of the EP&A Act. Under Schedule 1 of the SEPP this Project is considered to be SSD as it meets the criteria under development type *Agricultural produce industries and food and beverage processing*. It is an ethanol plant that has a capital investment value of more than $30 million (Schedule 1, clause 3(b)).

In 2013 consultation was undertaken with DP&E to confirm the status of the Project as SSD and to obtain the specific environmental assessment requirements for the project. DP&E consulted with relevant government agencies and stakeholders which resulted in a set of DGRs being issued on 23 September 2013. A copy of the DGRs is attached at Appendix A.

This EIS has been prepared in accordance with Part 4, Division 4.1 of the EP&A Act and the Project DGRs in support of an SSD application to the Minister for Planning and Environment (or the Minister's delegate).

The Project has been attributed the application number SSD 13_9281.

5.2.3 Environmental impact assessment

Under the EP&A Act and the EP&A Regulation it is a requirement to undertake an EIA and provide an EIS to accompany an SSD application.

This EIS has been prepared pursuant to Schedule 2 of the EP&A Regulation, which details the environmental assessment requirements. Clauses 6 and 7 of Schedule 2 provide the requirements in relation to the form and content of an EIS. The requirements of clauses 6 and 7 and where they are addressed in this document are outlined in Table 5.2 and Table 5.3 respectively.

Table 5.2 EP&A Regulation – Schedule 2, Clause 6

Form of Environmental Impact Statement An environmental impact statement must contain the following information:	Addressed in this EIS
a) The name, address and professional qualifications of the person by whom the statement is prepared.	Certification page
b) The name and address of the responsible person.	Certification page
c) The address of the land: (i) In respect of which the development application is to be made, or (ii) On which the activity or infrastructure to which the statement relates is to be carried out.	Certification page
d) A description of the development, activity or infrastructure to which the statement relates.	Chapter 3 Project Description
e) An assessment by the person by whom the statement is prepared of the environmental impact of the development, activity or infrastructure to which the statement relates, dealing with the matters referred to in this Schedule.	EIS Chapters 8 - 22
f) A declaration by the person by whom the statement is prepared to the effect that: (i) The statement has been prepared in accordance with this Schedule, (ii) The statement contains all available information that is relevant to the environmental assessment of the development, activity or infrastructure to which the statement relates, and (iii) That the information contained in the statement is neither false nor misleading.	Certification page

Table 5.3 EP&A Regulation – Schedule 2, Clause 7

Content of Environmental Impact Statement An environmental impact statement must also include each of the following:	Addressed in this EIS
(1) An Environmental Impact Statement must contain the following: (a) A summary of the environmental impact statement,	Executive Summary
(b) A statement of the objectives of the development, activity or infrastructure,	Chapter 4 Project Needs and Alternatives
(c) An analysis of any feasible alternatives to the carrying out of the development, activity or infrastructure, having regard to its objectives, including the consequences of not carrying out the development, activity or infrastructure,	Chapter 4 Project Needs and Alternatives
(d) An analysis of the development, activity or infrastructure, including: (i) A full description of the development, activity or infrastructure, and (ii) A general description of the environment likely to be affected by the development, activity or infrastructure, together with a detailed description of those aspects of the environment that are likely to be significantly affected, and (iii) The likely impact on the environment of the development, activity or infrastructure, and (iv) A full description of the measures proposed to mitigate any adverse effects of the development, activity or infrastructure on the environment, and (v) A list of any approvals that must be obtained under any other Act or law before the development, activity or infrastructure may lawfully be carried out,	Chapter 3 Project Description EIS Chapters 8 - 22 EIS Chapters 8 - 22 EIS Chapters 8 - 22 Chapter 5 Statutory Controls and Approvals
(e) A compilation (in a single section of the environmental impact statement) of the measures referred to in item (d) (iv),	Chapter 24 Summary of Commitments
(f) The reasons justifying the carrying out of the development, activity or infrastructure in the manner proposed, having regard to biophysical,	Chapter 25 Justification for Approvals

Content of Environmental Impact Statement	Addressed in this EIS
economic and social considerations, including the principles of ecologically sustainable development set out in subclause (4).	
(2) Subclause (1) is subject to the environmental assessment requirements that relate to the environmental impact statement.	EIS Chapters 8 - 22
(3) Subclause (1) does not apply if: (a) The Director-General has waived (under clause 3 (9)) the need for an application for environmental assessment requirements in relation to an environmental impact statement in respect of State significant development, and (b) The conditions of that waiver specify that the environmental impact statement must instead comply with requirements set out or referred to in those conditions.	N/A This EIS has been prepared in accordance with Project specific DGRs.
(4) The principles of ecologically sustainable development are as follows: (a) The ***precautionary principle***, namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by: (i) Careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and (ii) An assessment of the risk-weighted consequences of various options, (b) ***Inter-generational equity***, namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations, (c) ***Conservation of biological diversity and ecological integrity***, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration, (d) ***Improved valuation, pricing and incentive mechanisms***, namely, that environmental factors should be included in the valuation of assets and services, such as: (i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement, (ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste, (iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.	EIS Chapter 25 Justification for Approval EIS Chapter 25 Justification for Approval EIS Chapter 25 Justification for Approval EIS Chapter 25 Justification for Approval

5.3 Other permits, licences and approvals

Asides from the approvals required under Commonwealth and State legislation for the approval of the entire Project; there are other potentially relevant permits, licences and approvals that may be required that relate to specific aspects or activities of the Project.

The EP&A Act details other potential NSW approvals that may and may not be required if the Project is granted approval as a SSD. Under 89J and 89K of the EP&A Act it lists legislation that:

- does not apply for the Project (section 89J); or

must be applied consistently with the development consent for the Project (section 89K).

Table 5.4 provides a review of the legislation and relevant approvals that are not required have been considered for completeness as part of the preparation of the EIS and the SSD application. The legislation and environmental approvals that must be applied consistently outside of the SSD approval is provided in Table 5.5.

Table 5.4 Relevant approvals not required under section 89J

Approval	Comment
Concurrence under Part 3 of the *Coastal Protection Act 1979*	The Project would not significantly impact on coastal areas or the ecological or social qualities of other significant aspects of the area.
A permit under section 201of the *Fisheries Management Act 1994*	No works are proposed that would require a permit under the *Fisheries Management Act 1994*.
A permit under section 205 of the *Fisheries Management Act 1994*	The Project would not harm marine vegetation and as such, a permit under section 201 of the *Fisheries Management Act 1994* would not be required.
A permit under section 219 of the *Fisheries Management Act 1994*	The Project would not result in the blockage of fish passage.
An approval under Part 4, or an excavation permit under section 139, of the *Heritage Act 1977*	No historic items listed under the *Heritage Act 1977* would be impacted by the Project.
An Aboriginal heritage impact permit under section 90 of the *National Parks and Wildlife Act 1974*	The Project would require an Aboriginal Heritage Impact Permit (AHIP) to enable the progression of the Project should it not be considered SSD. Details of the extent of aboriginal heritage items and places, an assessment of the impacts of the Project on these items and places and recommended safeguard measures are provided within Chapter 18 Cultural Heritage.
An authorisation referred to in section 12 of the *Native Vegetation Act 2003* (or under any Act repealed by that Act) to clear native vegetation or State protected land	The Project would require clearance of native vegetation to enable the progression of the Project. Details of the extent of native vegetation clearance required, an assessment of the impacts of clearing, and mitigation measures are provided within Chapter 8 Biodiversity.
A bushfire safety authority under section 100B of the *Rural Fires Act 1997*	Components of the Project may be located in bushfire prone areas. It is not anticipated that bushfire prone land would require subdivision to accommodate the Project.
A water use approval (section 89), a water management work approval (section 90) or an activity approval (other than an aquifer interference approval) (section 91) of the *Water Management Act 2000*	The Project is likely to involve drainage works.. The assessment of the potential impact of the Project on water resources is in Appendix L Surface Water and Groundwater technical Report Chapter 9 Groundwater and Chapter 10 Surface Water. No taking of groundwater would occur as part of the Project construction or operation.

Table 5.5 Approvals required to be issued consistently under section 89K

Approval	Comment
An aquaculture permit under section 144 of the *Fisheries Management Act 1994*	Not applicable. The Project would not involve aquaculture therefore no aquaculture permit would be required.
An approval under section 15 of the *Mine Subsidence Compensation Act 1961*	Not applicable. The Site is not located within a mine subsidence area.
A mining lease under the *Mining Act 1992*	Not applicable. The Project does not constitute mining as defined by the *Mining Act 1992.*
A production lease under the *Petroleum (Onshore) Act 1991*	Not applicable. The Project would not involve petroleum exploration, mining or production as defined by the *Petroleum (Onshore) Act 1991*.
An environment protection licences under Chapter 3 of the	The *Protection of the Environment Operations Act 1997* (POEO Act) prohibits any person from causing pollution of waters or air, and provides penalties for

Approval	Comment
Protection of the Environment Operations Act 1997 (for any of the purposes referred to in section 43 of that Act)	pollution offences relating to water, air and noise. Schedule 1 of the PoEO Act lists a broad range of activities that are regulated by environment protection licences (EPLs). These licences focus on protecting the environment (including human health) and address air, noise, waste and land contamination issues as well as regulating discharges to waters from premises. EPLs will be required for the proposal based on the following triggers: - Composting (the site will receive over 5000 tonnes of organics per year and store more than 2000 tonnes of organics on site at any one time). - General agricultural processing (capacity to process more than 30,000 t of agricultural produce per year). - Brewing and distilling (capacity to produce more than 30 tonnes of alcohol or alcoholic products per day or 10,000 tonnes of alcohol or alcoholic products per year). - Chemical production (capacity to produce more than 20,000 tonnes of plant fertilisers per year). - Chemical production (involves having on site at any time more than 5 tonnes of prescribed waste, not including excluded material (where 1,000 litres of liquid is taken to weigh 1 tonne)). - Petroleum products and fuel production capacity to produce more than 100 tonnes of petroleum products per year).
Consent under section 138 of the *Roads Act 1993*	The Project involves access connections to a classified road to Deniliquin Barham Road and Line Road. This requires the consent of the appropriate roads authority (Deniliquin Council) with the concurrence of RMS (if required). An approval for the connection of the Project will be sought.
A licence under the *Pipelines Act 1967*	Not applicable: The Project would not involve the operation of a pipeline that would require a licence under the *Pipelines Act 1967*.

Other environmental approvals may be required in addition to those referred to under section 89J and 89K of the EP&A Act. These have be considered in Chapters 8 – 22 of the EIS and summarised in Table 5.6. These approvals will be confirmed following the detailed design of the Project.

Table 5.6 Potential other environmental approvals

Approval	Comment
Work Health and Safety Act 2011	The Project Site would require authorisations from WorkCover under the *Work Health and Safety Act 2011* and Work Health and Safety Regulations 2011 including the following: - WorkCover approval for the proposed pipelines/culverts; and - Notification to WorkCover prior to Dangerous Goods being onsite.
Wildlife licences	Under the *National Parks and Wildlife Act 1974* (NP&W Act) a permit would need to be obtained for the translocation of any protected fauna that may be encountered during clearing that requires relocation to avoid injury. As the Project would involve the felling of several large black box trees and the potential relocation of protected animals, the appropriate permits would be required under the NP&W Act.
Protection of the Environment Operations (Waste) Regulation 2014 - Resource Recovery Order and Exemption	Where practical, Dongmun Greentec intends on re-using and recycling wastes generated from the Project and acknowledges the potential need to apply for a Resource Recovery Order and Exemption if a specific waste is to be applied to land and is not listed under the list of general orders and exemptions. The following wastes would be produced by the Project and therefore would require a specific Resource Recovery Order and Exemption prior to application to land off-site: - liquid fertiliser from the wastewater treatment plant - compost from dewatering liquid fertiliser from the wastewater treatment plant
Local Government Act 1993 - Water supply, sewerage and stormwater drainage work	Under Section 68 of this Act approval is required to: install, construct or alter an on-site sewage management system; draw water from a Deniliquin Council water supply; carry out water supply work; carry out stormwater drainage work; or connect a private drain or sewer with a public drain or sewer under the control of a Deniliquin Council. This approval is required to ensure building standards are abided by and minimum health and safety standards are met.

5.4 Other Commonwealth legislation and policies

The following Commonwealth legislation is of relevance to the Project and has been considered in the assessment of impacts (Chapters 8 – 22).

5.4.1 National Environment Protection Measures (Implementation) Act 1998

Under the *National Environment Protection Measures (Implementation) Act 1998*, the National Environmental Protection Council (NEPC) was established to set national environmental goals and standards for Australia through the development of National Environment Protection Measures (NEPMs).

The National Pollutant Inventory (NPI) NEPM (NEPC, 2008) is considered to be relevant to the Project. The NPI NEPM establishes goals to assist in reducing existing and potential impacts of certain substances being emitted to air, land and water. Where the use of an NPI substance triggers the established threshold for that substance, emissions of that substance must be reported to the NPI. Emissions of these substances from various industrial and diffuse sources are reported to the NPI, (an internet database providing publicly available information on the types and amounts of certain substances being emitted).

Emissions to land, air and water from the construction and operation phases of the Project which trigger the NPI reporting threshold would be reported in accordance with the NPI Guide (Department of the Environment, 2015). The NPI Guide provides direction and guidance on NPI substances, trigger thresholds and reporting of emissions and transfers of waste. Emission estimation would be carried out in accordance with the most current Emission Estimation Technique Manuals (published online). The emissions associated with the Project would be reported to the Commonwealth Department of the Environment and would be publicly accessible via the NPI online database.

5.4.2 National Greenhouse and Energy Reporting Act 2007

The *National Greenhouse and Energy Reporting Act 2007* (NGER Act) established a national system for reporting greenhouse gas (GHG) emissions, energy consumption and energy production by corporations from 1 July 2008. The NGER Act requires corporations exceeding the corporation or facility thresholds to publicly report their GHG emissions, energy consumption and energy production each financial year.

Currently, the Project's operations trigger the facility threshold under the NGER Act (after the 2011-2012 reporting, a facility threshold of 25,000 tonnes of $CO_{2\text{-}e}$ of GHG emitted or 100 terajoules of energy consumed) Dongmun Greentec would be required to publicly report its GHG emissions, energy consumption and energy production from the Project each financial year. GHG is considered within Chapter 16 Air Quality, Odour and Emissions.

5.4.3 Aboriginal and Torres Strait Islander Heritage Protection Act 1984

The *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (ATSIHP Act) provides for the preservation and protection of places, areas and objects of particular significance to Indigenous Australians. The stated purpose of the ATSIHP Act is the 'preservation and protection from injury or desecration of areas and objects in Australia and in Australian waters, being areas and objects that are of particular significance to Aboriginals in accordance with Aboriginal tradition' (Part I, Section 4).

Under the Act, 'Aboriginal tradition' is defined as 'the body of traditions, observances, customs and beliefs of Aboriginals generally or of a particular community or group of Aboriginals, and includes any such traditions, observances, customs or beliefs relating to particular persons, areas, objects or relationships' (Part I, Section 3). A 'significant Aboriginal area' is an area of land or water in Australia that is of 'particular significance to Aboriginals in accordance with Aboriginal tradition' (Part I, Section 3). A 'significant Aboriginal object', on the other hand, refers to an object (including Aboriginal remains) of like significance.

The ATSIHP Act can override state and territory laws in situations where a state or territory has approved an activity, but the Commonwealth Minister prevents the activity from occurring by making a declaration to protect an area or object.

In the case of the Project, this legislation would only be invoked if the Registered Aboriginal Parties (RAPs) made an application to the Commonwealth Minister on the grounds that the heritage values of the Project Site were insufficiently protected under the State legislation.

5.4.4 National Waste Policy: Less Waste, More Resources (National Environment Protection Council, 2009)

The National Waste Policy: Less Waste, More Resources (NEPC, 2009) (National Waste Policy) provides an integrated policy and regulatory framework that sets Australia's waste management and resource recovery direction to 2020. The policy builds on the 1992 National Strategy for Ecologically Sustainable Development (ESD) (COAG, 1992) commitments to improve the range, variety and quality of environmental resources and reduce the environmental impacts of waste disposal. This policy drives streamlined and accurate business reporting to the NPI (and under a national product stewardship framework in the future) and has been considered as part of the waste management of the Project.

5.5 Other NSW legislation and policies

The following State legislation and policies are of relevance to the Project and have been considered in the assessment of impacts (Chapters 8 – 22).

5.5.1 State environmental planning polices

The following environmental planning instruments include provisions relating to issues that are relevant to the Project:

- State Environmental Planning Policy (State and Regional Development) 2011
- State Environmental Planning Policy No. 33 — Hazardous and Offensive Development
- State Environmental Planning Policy No. 55 — Remediation of Land
- State Environmental Planning Policy No. 64 – Advertising and Signage
- State Environmental Planning Policy (Rural Lands) 2008
- State Environmental Planning Policy No. 44 – Koala Habitat Protection
- NSW Biodiversity Offsets Policy for Major Projects

- BioBanking.

The aims of SEPPs have been summarised in the following sections and the Project is assessed in consideration of these policies (if applicable) within the relevant chapters of this EIS.

State Environmental Planning Policy (State and Regional Development) 2011

The aims of this Policy are as follows:

a) To identify development that is SSD.

b) To identify development that is State Significant Infrastructure and Critical State Significant Infrastructures.

c) To confer functions on joint regional planning panels to determine development applications.

The Project is declared to be SSD (refer to Section 5.2.2) in accordance with clause 8 and item 3(b) of Schedule 1 of this SEPP, given the Project is an ethanol plant with a capital investment value of more than $30 million.

State Environmental Planning Policy No.33 – Hazardous and Offensive Development

This Policy aims to:

a) amend the definitions of hazardous and offensive industries where used in environmental planning instruments, and

b) render ineffective a provision of any environmental planning instrument that prohibits development for the purpose of a storage facility on the ground that the facility is hazardous or offensive if it is not a hazardous or offensive storage establishment as defined in this Policy, and

c) require development consent for hazardous or offensive development proposed to be carried out in the Western Division, and

d) ensure that in determining whether a development is a hazardous or offensive industry, any measures proposed to be employed to reduce the impact of the development are taken into account, and

e) ensure that in considering any application to carry out potentially hazardous or offensive development, the consent authority has sufficient information to assess whether the development is hazardous or offensive and to impose conditions to reduce or minimise any adverse impact, and

f) require the advertising of applications to carry out any such development.

The hazard classification for the Project is based on both dangerous goods thresholds combined with some approximate effect zones from fire and explosion events associated with specific dangerous goods classes. The Department's *Applying SEPP 33: Hazardous and offensive Development Application Guidelines Multi-level Risk Assessment* can be used to determine whether or not SEPP 33 applies. This is considered within Chapter 13 Hazard and Risk.

State Environmental Planning Policy No. 55 – Remediation of Land

The aims of this policy are:

a) to provide for a Statewide planning approach to remediation of contaminated land

b) In particular this policy aims to promote the remediation of contaminated land for the purpose of reducing the risk of harm to human health or any other aspect of the environment:

    i) by specifying when consent is required, and when it is not required, for a remediation work, and

    ii) by specifying certain considerations that are relevant in rezoning land and in determining development applications in general and development applications for consent to carry out a remediation work in particular, and

    iii) by requiring that a remediation work meet certain standards and notification requirements.

This policy applies to the whole of the state. The planning process associated with the Project has taken the aims of the policy into consideration. The existing environment and potential impacts relating to contaminated land have been considered in Chapter 14 Soil, Land Capability and Land Use.

State Environmental Planning Policy No. 64 – Advertising and Signage

The aims of this Policy are:

a) to ensure that signage (including advertising):

i) is compatible with the desired amenity and visual character of an area, and

ii) provides effective communication in suitable locations, and

iii) is of high quality design and finish, and

b) to regulate signage (but not content) under Part 4 of the Act, and

c) to provide time-limited consents for the display of certain advertisements, and

d) to regulate the display of advertisements in transport corridors, and

e) to ensure that public benefits may be derived from advertising in and adjacent to transport corridors.

The Project would ensure any signage is in accordance with SEPP No. 64.

State Environmental Planning Policy (Rural Lands) 2008

The aims of this Policy are as follows:

a) To facilitate the orderly and economic use and development of rural lands for rural and related purposes.

b) To identify the Rural Planning Principles and the Rural Subdivision Principles so as to assist in the proper management, development and protection of rural lands for the purpose of promoting the social, economic and environmental welfare of the State.

c) To implement measures designed to reduce land use conflicts.

d) To identify State significant agricultural land for the purpose of ensuring the ongoing viability of agriculture on that land, having regard to social, economic and environmental considerations.

e) To amend provisions of other environmental planning instruments relating to concessional lots in rural subdivisions.

The Project Site is not located on State Significant Agricultural Lands. However, the Project is in keeping with the objectives of this policy in promoting economic development in rural areas (considered within Chapter 14 Soils, Land Capability and Land Use).

State Environmental Planning Policy No. 44 – Koala habitat Protection

The aims of the Policy are to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline:

a) by requiring the preparation of plans of management before development consent can be granted in relation to areas of core koala habitat

b) by encouraging the identification of areas of core koala habitat

c) by encouraging the inclusion of areas of core koala habitat in environment protection zones.

This policy applies only to the LGA's listed in Schedule 1 of the policy. The Project Site occurs within the Murray LGA, which is listed as an applicable LGA within the policy. The impact on potential koala habitat is considered within Chapter 8 Biodiversity.

5.5.2 NSW Biodiversity Offsets Policy for Major Projects

Biodiversity offsets provide benefits to biodiversity to compensate for adverse impacts of an action. They assist in achieving long-term conservation outcomes while providing development proponents with the ability to undertake actions that have unavoidable impacts on biodiversity. The NSW Biodiversity Offsets Policy for Major Projects provides a standard method for assessing impacts of major projects on biodiversity by determining offset requirements. The policy is underpinned by six principles:

- Principle 1: Before offsets are considered, impacts must first be avoided and unavoidable impacts minimised through mitigation measures. Only then should offsets be considered for the remaining impacts.
- Principle 2: Offset requirements should be based on a reliable and transparent assessment of losses and gains.
- Principle 3: Offsets must be targeted to the biodiversity values being lost or to higher conservation priorities.
- Principle 4: Offsets must be additional to other legal requirements.
- Principle 5: Offsets must be enduring, enforceable and auditable.

- Principle 6: Supplementary measures can be used in lieu of offsets.

To arrive at a conclusion that offsets are required, the Project requires a biodiversity assessment of the Project Site to be complete. The Project must then consider all reasonable measures to avoid and minimise impacts on biodiversity before consider offsetting them. Once all reasonable measures to avoid and minimise have been considered, an impact assessment on the remaining values should be undertaken. If adverse impacts on biodiversity values are determined through the impact assessment, then offsets requirements, in terms of specific number and type of biodiversity credits (see ***Biobanking*** below) need to be documented.

An impact assessment on the potential impacts of the Project on remaining values has been undertaken within Chapter 8 Biodiversity and Appendix K Plain's Wanderer Impact Assessment.

5.5.3 Biodiversity Banking and Offsets Scheme (BioBanking)

BioBanking is an offsetting scheme that enables 'biodiversity credits' to be generated by landowners who commit to enhance and protect biodiversity values on their land through a BioBanking agreement. These credits can then be sold, generating funds for the management of the site. Credits can be purchased by proponents and be used to counterbalance (or offset) the impacts on biodiversity values that are likely to occur as a result of development.

The credit calculator is an assessment tool used for major projects in the assessment of development sites or offset sites under 'the policy' and the BioBanking scheme, which is used to calculate the number and type of credits required for a development or created for an offset based on information collected during the site assessment stage.

The Project has the potential to cause adverse impacts on the plains wanderer, and as such an offset for this species would be required (considered within Chapter 8 Biodiversity and Appendix K Plain's Wanderer Impact Assessment).

5.5.4 Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act 1995* (TSC Act) is the main law protecting threatened species, populations and ecological communities in NSW. The TSC Act in conjunction with the Threatened Species Conservation Regulation 2010 (TSC Regulations) contains a framework for listing these species, populations and ecological communities.

Section 94 of the TSC Act lists seven factors (referred to as the 7-part test) which are used to assess potential impacts of proposed developments on threatened species, populations (including their habitats) or ecological communities. This assessment of the impact must be undertaken in accordance with section 5A of the EP&A Act. Should a 7-part test conclude that a significant impact on a listed threatened species, population or ecological community is likely; a Species Impact Statement (SIS) must be prepared.

The plains wanderer (*Pedionomus torquatus*), listed as 'Endangered' under the TSC Act, has been identified as having a 'Moderate' likelihood of occurring within the Project Site and a 7-part test was undertaken. This 7-part test concluded that the potential exists for the Project to have a significant impact on the plains wanderer, and as such a SIS has been prepared (Appendix K Palin's Wanderer Impact Assessment).

5.5.5 Native Vegetation Act 2003

The Native Vegetation Act 2003 (NV Act) regulates the clearing of native vegetation on all land in NSW except for land listed in Schedule 1 of the Act. Excluded land falls into the following categories:

- National parks and other conservation areas.
- State forests and reserves.
- Urban areas.

Native vegetation is classified as any species of vegetation that existed in NSW before pastoral settlement, including trees, saplings, shrubs, scrub, understorey, groundcover or wetland plants.

An authorisation referred to in section 12 of the NV Act (or under any Act repealing that act) to clear native vegetation or State protected land is not required for SSD.

5.5.6 Noxious Weeds Act 1993

The *Noxious Weeds Act 1993* (NW Act) imposes obligations on occupiers of land to control noxious weeds declared for their area. The Noxious Weeds (Weed Control) Order 2014 details the weeds declared in NSW under the NW Act, as well as the control class and control requirements for each species declared in a Local Control Authority area. The Order describes the legal requirements for any weed.

All landholders are required to manage pest species in accordance with the requirements of the NW Act. Several 'Class 4' noxious weeds have been identified within the Project Site and Project Footprint (considered in Chapter 8 Biodiversity).

5.5.7 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NP&W Act) provides a framework to conserve native terrestrial flora and fauna species and manage areas of conservation value such as Nature Reserves and National Parks. It is also the primary legislation for the protection of Aboriginal cultural heritage in NSW.

The purpose of the NP&W Act is to provide the primary basis for protection from unwarranted destruction of objects, places or features of significance, both Indigenous and non-Indigenous. The Act creates offences relating to species, populations and endangered ecological communities listed under the TSC Act 1995. Under the Act it is an offence to harm or pick a threatened species, endangered population or endangered ecological community. It is also an offence to damage critical habitat or habitat of a threatened species, endangered population or endangered ecological community.

All native fauna, with the exception of those listed on Schedule 11 of the NP&W Act, are protected from harm unless an action was conducted under another Act, such as development consent. The Act allows for the issuing of licences to authorise a number of different activities relating to fauna, including managing impacts that are likely to occur to protected fauna during the felling of any large trees.

There are five known Aboriginal heritage sites on the Project Site and the potential for further sites. Part 6 of the NP&W Act provides specific protection for Aboriginal objects and places by making it an offence to harm them and includes a 'strict liability offence' for such harm. A 'strict liability offence' does not require someone to know that it is an Aboriginal object or place they are causing harm to in order to be prosecuted. Defences against the 'strict liability offence' in the NP&W Act include the carrying out of certain 'Low Impact Activities', prescribed in Clause 80B of the *National Parks and Wildlife Amendment Regulation 2010* (NP&W Regulation), and the demonstration of due diligence. Section 89A of the NP&W Act requires notification of the location of Aboriginal sites, an exemption under the EP&A Act is provided for this approval.

5.5.8 The Heritage Act 1977

The NSW *Heritage Act 1977* (as amended) was enacted to conserve the environmental heritage of NSW. The *Heritage Act* protects registered and unregistered historical cultural heritage places across NSW. Under Section 32, places, buildings, works, relics, moveable objects or precincts of heritage significance are protected by means of either Interim Heritage Orders (IHO) or by listing on the NSW State Heritage Register (SHR). Sites that are assessed as having State heritage significance can be listed on the SHR by the Minister on the recommendation of the Heritage Council of NSW.

Archaeological relics (i.e. any relics that are buried) are protected by the provisions of Section 139 (if not protected by listing within a SHR curtilage). Pursuant to Section 139, it is illegal to disturb or excavate any land knowing or suspecting that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed. In such cases, an excavation permit under Section 140 is required. It is to be noted that that no formal listing is required for archaeological relics. Archaeological relics are automatically protected if they are of local significance or higher.

Approvals under s139 are not required for projects approved under Division 4.1 of Part 4 of the EP&A Act. There is generally a requirement, however, that impacts to historical archaeological relics will be managed in accordance with the principles of the Burra Charter and of the NSW Heritage Manual.

There are no registered historical heritage places on the Project Site, but there is the potential for currently unrecorded places and values.

5.5.9 Protection of the Environment Operations Act 1997

The POEO Act is the principal environmental protection legislation for NSW. The object of the Act is to achieve the protection, restoration and enhancement of the quality of the NSW environment. The Act enables the Government to set out explicit protection of the environment policies (PEPs) and adopt more innovative approaches to reducing pollution. It also provides a single licensing arrangement relating to air pollution, water pollution, noise pollution and waste management

Schedule 1 of the Act lists the activities for which licencing may be required (refer to Section 0).

Under the Act there is a Duty to Notify (Part 5.7) which will apply to pollution events which may occur during construction and operation of the Project.

Protection of the Environment Operations (Noise Control) Regulation 2008

The POEO (Noise Control) Regulation 2010 provides the statutory framework for management of noise in NSW. This Regulation controls noise from motor vehicles and marine vessels and sets community standards on acceptable noise intrusion in homes from such appliances as intruder alarms, music amplifiers, air conditioners and powered garden tools.

The project would be required to operate in line with this regulation in order to prevent unwanted noise.

Protection of the Environment Operations (Clean Air) Regulation 2010

The POEO (Clean Air) Regulation 2010 provides the statutory framework for management of air emission in NSW. Part 5 of the Regulation:

- sets maximum limits on emissions from activities and plant for a number of substances
- imposes operational requirements for air treatment measures.

The POEO (Clean Air) Regulation 2010 sets out the management responsibilities that the Project would be required to operate under in order to minimise adverse air quality impacts (considered in Chapter 16 Air Quality, Odour and Emissions).

Protection of the Environment Operations (Waste) Regulation 2014

The POEO (Waste) Regulation 2014 sets out provisions that cover the way waste is managed in terms of storage and transportation as well as reporting and record keeping requirements for waste facilities.

The regulation enables NSW to issue 'Resource Recovery Orders and Exemptions' that allow for the beneficial 'reuse' of wastes via land application or for use as a fuel. These regulations support the principle of 'wastes to resources' where the wastes are fit for beneficial reuse.

Resource Recovery Orders and Exemptions are granted by the Environmental Protection Agency (EPA) (general or specific) where the land application or use as fuel or a waste material is a bona-fide, fit for purpose, reuse opportunity that causes no harm to the environment or human health, rather than a means of waste disposal. A Resource Recovery Order and Exemption facilitates the use of these waste materials outside of certain requirements of the waste regulatory framework. Prior to applying for a Resource Recovery Order, proponents must ensure the waste material proposed for land application meets all of the criteria outlined in the *Guidelines on Resource Recovery Exemptions (Land Application of Waste Materials as Fertiliser or Soil Amendment)* (DECCW, 2011).

Where practical, Dongmun Greentec intends on re-using and recycling wastes generated from the Project (considered in Chapter 11 Co-products and Waste Management) and acknowledges the potential need to apply for a Resource Recovery Order and Exemption if a specific waste is to be applied to land and is not listed under the list of general orders and exemptions. The following wastes would be produced by the Project and therefore would require a specific Resource Recovery Order and Exemption prior to application to land off-site:

- liquid fertiliser from the wastewater treatment plant
- compost from dewatering liquid fertiliser from the wastewater treatment plant

5.5.10 Waste Avoidance and Resource Recovery Act 2001

The *Waste Avoidance and Resource Recovery Act 2001* (WARR Act) includes the majority of NSW's over-arching objectives and guiding principles to encourage beneficial reuse and resource recovery. Implementation of the waste hierarchy in accordance with the principle of Ecologically Sustainable Development (ESD) is identified as a main objective and is enacted along with objectives to minimise the consumption of natural resources and waste generation.

Waste minimisation is a concept which is integral to the operation of the Project. The Project is committed to minimising the impact of waste on the environment and the community wherever practicable through the adoption of the waste hierarchy (considered in Chapter 11 Co-products and Waste Management).

5.5.11 Waste Avoidance and Resource Recovery Strategy 2014-2021

The Waste Avoidance and Resource Recovery Strategy 2014-2021 (WARR Strategy) was released in December 2014 and sets clear directions for a range of priority areas over the next seven years and aligns with the NSW Government's waste reforms in 'NSW 2021: A plan to make NSW number one'.

The key areas identified in the WARR Strategy support investment in infrastructure, encourage innovation and improve recycling behaviour. They will also help develop new markets for recycled materials and reduce litter and illegal dumping.

The WARR Strategy provides a clear framework for waste management to 2021-22 and provides an opportunity for NSW to continue to increase recycling across all waste streams. The Project would aim to meet the objectives of the WARR Strategy and implement measures to manage waste in a way which minimises the impact waste has on the environment (considered in Chapter 11 Co-products and Waste Management).

5.5.12 NSW Waste Classification Guidelines

Waste classification helps those involved in the generation, treatment and disposal of waste, ensure the environmental and human health risks associated with their waste is appropriately managed in accordance with the POEO Act and its associated regulations. Part 1 of the Waste Classification Guidelines (EPA, 2014) (WCG) provides advice and directions on classifying waste so that appropriate management of all waste types is achieved.

Waste material from the Project's construction and operation activities would be classified in accordance with these guidelines (considered in Chapter 11 Co-products and Waste Management). The following waste classifications are relevant to the construction and operation activities:

- Liquid waste and
- Pre-classified waste, including:
    - Hazardous waste
    - General solid waste (putrescible) and
    - General solid waste (non-putrescible).

5.5.13 Contaminated Land Management Act 1997

This Act regulates the investigation and management of contaminated land. The objectives of the Act are:

- to establish a process for investigating and (where appropriate) remediating land that the EPA considers to be contaminated significantly enough to require regulation under Division 2 of Part 3
- to set out accountabilities for managing contamination if the Environmental Protection Authority (EPA) considers the contamination is significant enough to require regulation under Division 2 of Part 3
- to set out the role of the EPA in the assessment of contamination and the supervision of the investigation and management of contaminated sites
- to provide for the accreditation of site auditors of contaminated land to ensure appropriate standards of auditing in the management of contaminated land
- to ensure that contaminated land is managed with regard to the principles of ecologically sustainable development.

The Act is applicable in the planning and construction stage in the event that contaminated land is discovered on the existing undeveloped land. It would apply also following the commencement of the Project.

5.5.14 Water Act 1912 and Water Management Act 2000

Surface water and groundwater in NSW is managed by the NSW Office of Water (NOW) under the *Water Act 1912* (Water Act) and the *Water Management Act 2000* (Water Management Act*)*. The Water Management Act is gradually replacing the planning and management frameworks in the Water Act although some provisions of the Water Act remain in operation. The Water Management Act regulates water use for rivers and aquifers where water sharing plans have commenced, while the Water Act continues to operate in the remaining areas of the State.

Section 3 of the Water Management Act outlines the objects of the Act: The objects of this Act are to provide for the sustainable and integrated management of the water sources of the State for the benefit of both present and future generations and, in particular:

a) to apply the principles of ecologically sustainable development, and

b) to protect, enhance and restore water sources, their associated ecosystems, ecological processes and biological diversity and their water quality, and

c) to recognise and foster the significant social and economic benefits to the State that result from the sustainable and efficient use of water, including:

    i) benefits to the environment, and

    ii) benefits to urban communities, agriculture, fisheries, industry and recreation, and

iii) benefits to culture and heritage, and

iv) benefits to the Aboriginal people in relation to their spiritual, social, customary and economic use of land and water,

d) to recognise the role of the community, as a partner with government, in resolving issues relating to the management of water sources

e) to provide for the orderly, efficient and equitable sharing of water from water sources,

f) to integrate the management of water sources with the management of other aspects of the environment, including the land, its soil, its native vegetation and its native fauna,

g) to encourage the sharing of responsibility for the sustainable and efficient use of water between the Government and water users,

h) to encourage best practice in the management and use of water.

The Project would be consistent with the principles of ecologically sustainable development as outlined in Chapter 24 Justification for Approval. Chapter 3 Project Description demonstrates the project's sustainable and efficient design with respect to the use of water resources.

Mitigation measures, management and monitoring outlined in Chapter 10 Surface Water and Chapter 8 Biodiversity would be implemented to minimise potential impacts on downstream surface water flows, aquifers, water quality, soils, groundwater dependent ecosystems (GDEs) and biodiversity

The Project Site is not located within Environmentally Sensitive Land, and a Controlled Action Permit is therefore not required.

5.5.15 Murray Unregulated and Alluvial Water Sharing Plan

The Project is located in the Murray Unregulated and Alluvial Water Sharing Plan (WSP) area that commenced on 30 January 2012. The vision for this Plan is to provide for healthy and enhanced water sources and water dependent ecosystems and for equitable water sharing among users in these water sources. The vision will be achieved by meeting the following objectives:

a) protect, preserve, maintain and enhance the important river flow dependent and high priority groundwater dependent ecosystems of these water sources

b) protect, preserve, maintain and enhance the Aboriginal, cultural and heritage values of these water sources

c) protect basic landholder rights

d) manage these water sources to ensure equitable sharing between users

e) provide opportunities for enhanced market based trading of access licences and water allocations within environmental and system constraints

f) provide water allocation account management rules which allow sufficient flexibility in water use

g) contribute to the maintenance of water quality

h) provide recognition of the connectivity between surface water and groundwater

i) adaptively manage these water sources, and

j) contribute to the environmental and other public benefit outcomes identified under the Water Access Entitlements and Planning Framework in the Intergovernmental Agreement on a National Water Initiative (2004)

Chapter 10 Surface Water considers the objectives of the Murray Unregulated and Alluvial WSP within the assessment of potential impacts (section 10.4) and the subsequent mitigation measures (section 10.5) that will be implemented to ensure consistency with the objectives of the plan.

5.5.16 Murray-Darling Basin Plan

The Murray-Darling Basin Plan includes a Water Quality and Salinity Management Plan. The plan:

a) identifies the key causes of water quality degradation in the Murray–Darling Basin

b) includes water quality and salinity objectives and targets for the Basin's water resources.

The Water Quality and Salinity Management Plan aims to maintain appropriate water quality (including salinity levels), for environmental, social, cultural and economic activity in the Basin. Water quality objectives for the

Project are in accordance with the requirements of the Murray-Darling Basin Plan and are considered in section 10.4 of Chapter 10 Surface Water.

5.5.17 Water Sharing Plan for the Lower Murray Shallow Groundwater Source Sharing Plan

The vision for this Plan is to achieve healthy aquifer systems, sustaining communities and ecosystems. The Project area is located in the Lower Murray Shallow Groundwater Source Water Sharing Plan area but this plan is not applicable as no abstraction of groundwater is proposed as part of the Project.

5.5.18 Water Sharing Plan for the NSW Murray and Lower Darling Regulated Rivers Water Source

The Water Sharing Plan for the NSW Murray and Lower Darling Regulated Rivers Water Sources includes rules for protecting the environment, extractions, managing licence holders' water accounts, and water trading in the plan area. The Project is located in this Water Sharing Plan area and is considered in section 10.3.6 of Chapter 10 Surface Water. The plan is not considered to apply to the project as no significant waterways or waterbodies are located within the Project Site. The nearest major waterway, the Edward River, lies approximately 6 km north of the Project Site and there is no historic or anecdotal evidence suggesting that the Project Site is at flood risk. No extractions or water trading are proposed as part of the Project.

5.5.19 The Aquifer Interference Policy 2012

The Aquifer Interference Policy 2012 explains the process of administering water policy under the *Water Management Act 2000*. The Aquifer Interference Policy (2012) outlines minimal impact considerations that must be met as a result of the Project. There is no groundwater abstraction proposed as part of the Project and the Project will not significantly change groundwater flow or groundwater levels. Further discussion is provided in section 9.4.1 of Chapter 9 Groundwater.

5.5.20 The NSW State Groundwater Policy 1997

The NSW State Groundwater Policy (Framework Document) was adopted in 1997 and aims to manage the State's groundwater resources to sustain their environmental, social and economic uses. The policy has three component parts:

- The NSW Groundwater Quality Protection Policy, adopted in December 1998.
- The NSW State Groundwater Dependent Ecosystems Policy, adopted in 2002.
- The NSW Groundwater Quantity Management Policy.

There is no groundwater interaction proposed as part of the Project and the project will not significantly change groundwater quality, flow or groundwater levels. Further discussion is provided in section 9.4.1 of Chapter 9 Groundwater.

5.5.21 NSW Flood Prone Land Policy

The primary objective of the NSW Flood Prone Land Policy is to reduce the impact of flooding and flood liability on individual owners and occupiers of flood prone property, and to reduce private and public losses resulting from floods, using 'ecologically positive' methods where positive. Section 10.4.6 of Chapter 10 Surface Water considers the purpose of the policy as part of the assessment of potential flooding impacts as a result of the construction and operation of the Project.

5.5.22 Deniliquin Council Stormwater Drainage Asset Management Plan

One of the opportunities for demand management as identified in the Deniliquin Council Stormwater Drainage Asset Management Plan is to 'ensure large-scale new developments include stormwater detention in order to not increase the demand on the network'. A conceptual Stormwater Management Plan was developed as part of this study, in line with Deniliquin Council's Stormwater Drainage Asset Management Plan (refer to Surface Water and Groundwater Technical Report in Appendix L).

5.5.23 Work Health and Safety Act 2011

The *Work Health and Safety Act 2011* (WH&S Act) aims to ensure that appropriate consideration and planning is undertaken in the assessment of potential hazards and risks to workers and the public from the operation of industry and business. The WH&S Act makes provision for the ongoing improvement of safety from existing operations as well as the need to incorporate health and safety measures into projects that may present an increased risk to health and safety. The WH&S Act gives rise to the Work Health and Safety Regulation 2011.

The management of staff and activities during the construction and operations phases of the Project would be undertaken in accordance with this Act.

5.5.24 NSW Industrial Noise Policy 2000 and Industrial Noise Policy Application Notes

The Industrial Noise Policy (INP) was released in January 2000 and provides a framework and process for deriving noise criteria for consents and licences that will enable the EPA to regulate premises that are scheduled under the POEO Act.

The specific policy objectives are to:

- establish noise criteria that would protect the community from excessive intrusive noise and preserve amenity for specific land uses
- use the criteria as the basis for deriving Project specific noise levels
- promote uniform methods to estimate and measure noise impacts, including a procedure for evaluating meteorological effects
- outline a range of mitigation measures that could be used to minimise noise impacts
- provide a formal process to guide the determination of feasible and reasonable noise limits for consents or licences that reconcile noise impacts with the economic, social and environmental considerations of industrial development
- carry out functions relating to the prevention, minimisation and control of noise from the premises scheduled under the Act

These are considered as part of the noise assessment within Chapter 17 Noise and Vibration.

5.5.25 NSW Road Noise Policy 2011

Road traffic criteria are provided in the NSW Road Noise Policy (RNP), which was released in March 2011. The policy sets out noise criteria applicable to particular types of Projects, road category and land use for the purpose of defining traffic noise impacts. These are considered as part of the noise assessment within Chapter 17 Noise.

5.5.26 Local Government Act 1993 (New South Wales)

This Act provides the legal framework for local government within NSW in order to carry out their operations and activities.

Under Section 68 of this Act, approval is required to install, construct or alter an on-site sewage management system, to draw water from a Council water supply, to carry out water supply work, to carry out stormwater drainage work or to connect a private drain or sewer with a public drain or sewer under the control of a Council. This approval is required to ensure building standards are abided by and minimum health and safety standards are met.

The Project would be required to comply with the Act and obtain the approval from Deniliquin Council.

5.6 Regional and local plans

5.6.1 Regional Development Australia Riverina Regional Plan 2013-2016

The Regional Development Australia Riverina Regional Plan 2013 – 2016 (RDA Riverina) outlines the key emerging priorities and issues, along with the goals to be achieved through this plan. RDA Riverina has six key goals. The key emerging priorities and issues for the area are:

1) To proactively encourage greater economic growth, diversity and industrial innovation.
2) To nurture the development of a sustainable environment for future generations including the development of an innovative response to the water challenge.
3) To support education and skill development initiatives that enable all people to have the capacity and confidence to contribute to the region's growth.
4) To facilitate a collaborative approach between all tiers of government, business and community to solving the challenges of the region.
5) To encourage a proactive approach to health and living.
6) To act with honesty, integrity, transparency and in accord with relevant legal and financial obligations, sound corporate governance procedures and to fulfil Departmental funding requirements.

The Project aligns with aspects of these emerging priorities for the region, including encouraging economic growth, diversity and industrial innovation.

5.6.2 Murray Catchment Action Plan 2013 - 2023

The Murray Catchment Action Plan (MCAP) is a ten year strategic plan that was prepared by Murray Catchment Management Authority now known as the Murray Local Lands service (LLS). The MCAP helps to identify strategic programs to improve the health, productivity and resilience of the landscape and its communities.

The Project aligns with a number of strategic goals outlined in the MCAP including supporting productive and sustainable businesses and farming systems. The development permits and encourages diverse and profitable local economies built on sustainable and adaptive businesses and production systems.

5.6.3 Deniliquin Local Environmental Plan 2013

The Project is located in the Deniliquin LGA however approval under the Deniliquin Local Environmental Plan 2013 (Deniliquin LEP 2013) does not apply to the Project by virtue of the State Environmental Planning Policy (State and Regional Development) 2011. Under the SEPP, the Project is permissible with consent.

Pursuant to section 33A of the EP&A Act, Deniliquin Council has developed the Deniliquin LEP 2013. The LEP outlines local environmental planning provisions applicable to the Deniliquin Local LGA. The LEP governs land zoning and permissible activities within the Deniliquin LGA.

However, its consideration is required under the EP&A Act .The Deniliquin LEP 2013 contains details regarding designated land use zones within the Deniliquin electorate. Annexure B provides a series of Land Zoning Maps, of which Sheet LZN_003 includes the three lot areas (Lot 234, Lot 272 and Lot 273 on DP756325) that comprise the Project Site.

The land zoning for the Project Site, as detailed on the Land Zone Map – Sheet LZN_003 is as follows:

- Lot 234: SP2 Infrastructure (Sewerage Systems)
- Lot 272: SP2 Infrastructure (Sewerage Systems)
- Lot 273: RU1 Primary Production.

RU1 Primary Production

RU1 Primary Production zones are designated Rural Zones. The objective of the zone is:

- to encourage sustainable primary industry production by maintaining and enhancing the natural resource base
- to encourage diversity in primary industry enterprises and systems appropriate for the area
- to minimise the fragmentation and alienation of resource lands
- to minimise conflict land uses within this zone and land uses with adjoining zones
- to allow development of non-agricultural land uses which are compatible with the character of the zone
- to ensure that development in the area does not unreasonably increase the demand for public services or public facilities.

Extensive agriculture and home occupations are permitted in the zone without consent. Dwelling houses, extractive industries and open cut mining are permitted in the zone with consent. Any other type of development is prohibited.

The Project is defined as an agricultural produce industry, which is a type of rural industry as defined in the Dictionary of the Deniliquin Local Environmental Plan 2013.

Rural industries are permitted with consent within the RU1 zone in accordance with the provisions of clause 2.3 Zone Objectives and Land Use Table. Rural industries are listed in item 3 ‘permitted with consent’. However, consent under the LEP is not required for SSD.

SP2 Infrastructure

SP2 Infrastructure zones are designated Special Purpose Zones. The objective of the zone is:

- to provide for infrastructure and related uses
- to prevent development that is not compatible with or that may detract from the provision of infrastructure.

No development is listed as being permitted without consent.

Roads are permitted with consent, in addition to the purpose shown on the Land Zoning Map, including any development that is ordinarily incidental or ancillary to development for that purpose. Any other type of development is prohibited.

Only works related to the development of sewage treatment systems is permissible under this zoning and as such an ethanol plant would be prohibited under the Deniliquin LEP 2013.

However, Section 89E of the EP&A Act provides that development consent for SSD may be granted despite the development being partly prohibited by an environmental planning instrument. As the Project Site covers two land zonings, one where it is permitted (RU1) and one where it is prohibited (SP2), this development is considered to be partly prohibited. Consent may therefore be granted for this development as an SSD application under Section 89E.

A development application in respect to SSD that is wholly or partly prohibited may be considered in accordance with Division 4B of Part 3 in conjunction with a proposed LEP to permit the carrying out of the development. The Secretary may undertake the functions of the relevant planning authority under Part 3 for a proposed instrument if it is initiated for the purpose of permitting the carrying out of the development (whether or not it contains other provisions).

The rezoning of Lots 234 and 272 DP756325 would need to be undertaken prior to the construction of the Project.

Heritage Protection

The heritage protection objectives contained within Part 5.10 of the current 2013 LEP are as follows:

a) To conserve the environmental heritage of Deniliquin.

b) To conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric settings and views.

c) To conserve archaeological sites.

d) To conserve Aboriginal objects and Aboriginal places of heritage significance.

Part 5.10 also includes actions that require prior approval. Such actions include demolition, damage to archaeological sites, damaging a place or tree, erecting a building adjacent to or subdividing land on which a heritage item is sited. The proponent must consider the extent to which the proposed development would affect the heritage significance of the item and whether development on an adjacent property will impact on the heritage values of an item.

Schedule 5 of the LEP contains a list of identified heritage items within the Deniliquin LGA. There are no local heritage places in or adjacent to the Project Site.

5.7 Other standards, codes and guidelines

The following listed standards, codes and guidelines are of relevance to the Project and have been considered in the assessment of impacts where relevant.

5.7.1 International Standards

Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance (considered in Chapter 18 Cultural Heritage).

Originally created in 1979 by the Australian branch of the International Council on Monuments and Sites (ICOMOS), the Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance (or Burra Charter), provides the benchmark for cultural heritage management in Australia and is the basis for the majority of commonwealth, state and local heritage legislation and policy.

The Burra Charter defines a place as being of cultural significance if it possesses aesthetic, historic, scientific or social value and provides guidance on managing and conserving places in order to preserve this significance.

5.7.2 Australian Standards

Numerous Australian Standards are applicable to the design, construction, installation, commissioning and operation of the Project. Not all applicable standards for the Project have been listed below as the list is not exhaustive. Ethanol is the primary hazard on the Project Site and as such the standards related to this dangerous good have been listed.

- AS1940-2004,"The storage and handling of flammable and combustible liquids", Standards Association of Australia, Sydney (considered in Chapter 13 Hazard and Risk).

- AS2419.1-2005, “Fire Hydrant Installations Part 1: System Design, Installation and Commissioning”, Standards Association of Australia, Sydney (considered in Chapter 13 Hazard and Risk).
- AS60079.10-2004, “Electrical Apparatus for Explosive Gas Atmospheres – Classification of Hazardous Areas”, Standards Association of Australia, Sydney (considered in Chapter 13 Hazard and Risk).
- AS 1692-2006, “Steel tanks for flammable and combustible liquids”, Standards Association of Australia, Sydney (considered in Chapter 13 Hazard and Risk).
- AS IEC 61511.1 -2004, “Functional safety – Safety instrumented systems for the process industry sector” Standards Association of Australia, Sydney (considered in Chapter 13 Hazard and Risk).
- AS 4282 Control of Obtrusive Effects of Outdoor Lighting (considered in Chapter 15 Landscape and Visual Amenity).

5.7.3 Codes

The Australian Dangerous Goods Code (ADGC) Edition 7.3 (2014)

The purpose of ADG7.3 is to provide consistent technical requirements for the land transport of dangerous goods across Australia. The Code should be read in conjunction with relevant state or territory law.

5.7.4 Guidelines

- Draft Guidelines for Threatened Species Assessment under Part 3A of the EP&A Act (considered in Chapter 8 Biodiversity)
- Managing Urban Stormwater: Soils and Construction (Landcom 2004) (considered in Chapter 10 Surface Water and Chapter 14 Soils, Land Capability and Land Use)
- Managing Urban Stormwater: Treatment Techniques (DECC 1997) (considered in Chapter 10 Surface Water)
- Managing Urban Stormwater: Source Control (DECC 1998) (considered in Chapter 10 Surface Water)
- Managing Urban Stormwater: Environmental Targets (consultation draft) (DECC 2007) (considered in Chapter 10 Surface Water and Chapter 14 Soils, Land Capability and Land Use)
- Australian/New Zealand Standard; On-site domestic wastewater treatment units (AS/NZS 1546.1:2008) (considered in Chapter 10 Surface Water)
- Guidelines for Fresh and Marine Water Quality and Guidelines for Water Quality Monitoring and Reporting (ANZECC) (considered in Chapter 10 Surface Water)
- National Water Quality Management Strategy: Australian Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ) 2000 (considered in Chapter 10 Surface Water)
- Using the ANZECC Guideline and Water Quality Objectives in NSW (DEC) 2006 (considered in Chapter 10 Surface Water)
- Guidelines on Resource Recovery Exemptions (Land Application of Waste Materials as Fertiliser or Soil Amendment) (DECCW, 2011) (considered in Chapter 14 Soils, Land Capability and Land Use)
- Guide to Traffic Generating Development (RTA) (considered in Chapter 12 Traffic and Transport)
- Road Design Guide (RTA) (considered in Chapter 12 Traffic and Transport)
- Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (DECCW 2005) (considered in Chapter 18 Cultural Heritage)
- Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (DEC) (considered in Chapter 16 Air Quality, Odour and Emissions)
- Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (DEC) (considered in Chapter 16 Air Quality, Odour and Emissions)
- AGO Factors and Methods Workbook (AGO) (considered in Chapter 16 Air Quality, Odour and Emissions)
- Guidelines for Energy for Energy Savings Action Plans (DEUS, 2005) (considered in Chapter 16 Air Quality, Odour and Emissions)
- National Trust of Australia (considered in Chapter 18 Cultural Heritage)

- NSW Heritage Manual (NSW Heritage Office and NSW Department of Urban Affairs and Planning 1996) (considered in Chapter 18 Cultural Heritage)
- The National Trust of Australia (NSW Branch) maintains a register of items considered to be of heritage significance by its members. Listing on the National Trust Heritage Register does not impose statutory obligations and is more an indication of the esteem in which the item is held by the heritage community (considered in Chapter 18 Cultural Heritage)
- NSW Government Department of Planning Publications - Hazardous Industry Planning Advisory Papers (HIPAPs) (considered in Chapter 13 Hazard and Risk):
    - No.1 – Emergency Planning
    - No.2 – Fire Safety Study Guidelines
    - No.3 – Risk Assessment
    - No.4 – Risk Criteria for Land Use Safety Planning
    - No.5 – Hazard Audit Guideline
    - No.6 – Hazard Analysis
    - No.7 – Construction Safety
    - No.8 – HAZOP guidelines
    - No.9 – Safety Management
    - No.10 – Land Use Safety Planning
    - No.11 – Route Selection
    - No.12 – Hazards-Related Conditions of Consent
    - Other – Multi-level Risk Assessment
- Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites (ANZECC & NHMRC) (considered in Chapter 14 Soils, Land Capability and Land Use)
- National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPC) (considered in Chapter 14 Soils, Land Capability and Land Use)
- Draft Guidelines for the Assessment & Management if Groundwater Contamination (DECC) (considered in Chapter 14 Soils, Land Capability and Land Use)
- Environmental Noise Control Manual (DECC) (considered in Chapter 17 Noise and Vibration)
- Interim Construction Noise Guideline (DDCC, 2006) (considered in Chapter 17 Noise and Vibration)
- Assessing Vibration: a technical Guide (DEC, 2006) (considered in Chapter 17 Noise and Vibration)
- Rail Infrastructure Noise Guideline draft for Consultation (considered in Chapter 17 Noise and Vibration).

6.0 Stakeholder engagement

6.1 Procedures for consultation

This EIS has been prepared in accordance with Division 4.1, Part 4 of the EP&A Act and its Regulation. Part 4 ensures that the potential environmental effect of a project is properly assessed and considered in the decision making process. In preparing this EIS, the requirements of the Director General of the NSW DP&E (now the Secretary) were sought as required by Section 89G(b) of the EP&A Act. Each of the matters raised by the Director- General are considered in this EIS (refer to Table 6.).

6.1.1 Consultation with regulatory agencies and other relevant authorities

Planning focus meeting

The planning focus meeting (PFM) held on 2 December 2013 was attended by the following key Government agencies including:

- DP&E
- Environmental Protection Authority (EPA)
- Roads and Maritime Services (RMS)
- Agriculture NSW
- DP&I
- Office of Environment and Heritage (OEH).

Representatives from Dongmun Greentec and Deniliquin Council were also present. A site visit was undertaken as part of the PFM to inform participants of key elements of the Project in relation to the Project Site and the local context.

While the NSW Office of Water (NOW), NSW Transport, NSW Trade and Investment, Murray Catchment Management Authority, NSW Fire Brigade, Rural Fire Service and Vic Rail did not attend, DP&E consulted with these agencies during the preparation of the DGRs. Refer to Appendix A DGRs for further detail regarding feedback received during this period.

Preliminary Environmental Assessment and consultation

Prior to the submission of the PEA, Project briefings were provided to EPA, NOW, OEH and RMS. The PEA, which included a consideration of issues identified during these consultations, was subsequently submitted to DPE on 12 December 2013.

Project Director General's requirements

Following the PFM and the submission of the PEA report, DP&E compiled the DGRs for the Project. The key matters raised by the Director-General to be considered in the EIS are outlined in Table 6.1, together with the relevant section of the EIS which addresses that matter.

Table 6.1 Director General's Requirements issued 23 December 2013

DGR Technical Requirement	Reference in EIS
General Requirements	
The EIS must meet the minimum form and content requirements in clauses 6 and 7 of Schedule 2 of the EP&A Regulation.	Chapter 5 Statutory Controls and Approvals
Detailed description of the site, and any existing or approved operations	Chapter 2 Regional and Local Context
Detailed description of the development including: Need for the development	Chapter 4 Project Needs and Alternatives
Alternatives considered	Chapter 4 Project Needs and Alternatives
Engineering and/or architectural plans.	Appendix A Drawings and Plans
Justification for the development taking into consideration its location, environmental impacts of the development, the suitability of the site and whether	Chapter 25 Justification of the Project

DGR Technical Requirement	Reference in EIS
the development is in the public interest.	
Likely staging of the development.	Chapter 3 Project Description
Likely interactions between the development and existing, approved and proposed operations in the vicinity of the site including any grain storage and transport development.	Chapter 2 Regional and Local Context
Consideration of any relevant statutory provisions.	Chapter 5 Statutory Controls and Approvals
Risk assessment of the potential environmental impacts of the development, identifying the key issues for further assessment	Chapter 7 Issues Prioritisation and Appendix D Risk Assessment and Issues Prioritisation
Detailed assessment of the key issues specified below, and any other significant issues identified in this risk assessment , which includes: A description of the existing environment, using sufficient baseline data	Chapters 8 to 20
An assessment of the potential impacts of all stages of the development, including any cumulative impacts	Chapter 21 Cumulative Impacts
A description of the measures that would be implemented to avoid, minimise and if necessary, offset the potential impacts of the development, including proposals for adaptive management and/or contingency plans to manage significant risks to the environment	Chapter 24 Summary of Commitments
Consolidated summary of all the proposed environmental management, mitigation and management measures, highlighting all commitments included in the EIS	Chapter 24 Summary of Commitments
The EIS must be accompanied by a report from a qualified surveyor providing a detailed calculation of the capital investment value (CIV) of the development (as defined in clause 3 of the *Environmental Planning and Assessment Act Regulation 2000),* including details of all assumptions and components from which the CIV calculation is derived	Appendix C Capital Investment Valuation
A close estimate of the jobs that will be created by the development during construction and operation	Chapter 3 Project Description Section 3.3.13 and Section 3.4.2
Verification that the CIV was accurate on the date that it was prepared	Appendix C Capital Investment Valuation
Soils and Water	
Description of the water demands and a breakdown of water supplies	Chapter 10 Surface Water, Section 10.4.4
Description of the measures to minimise water use	Chapter 10 Surface Water, Section 10.5
A detailed water balance	Chapter 10 Surface Water, Section 10.4.4
Description of the construction erosion and sediment management controls	Chapter 10 Surface Water, Section 10.5 and Appendix L Surface Water and Groundwater Technical Report
A description of the surface stormwater management system including on site detention, and measures to treat of reuse water	Chapter 10 Surface Water, Section 10.4.6 and Appendix L Surface Water and Groundwater Technical

DGR Technical Requirement	Reference in EIS
	Report
An assessment of the potential surface and groundwater impacts associated with the development, the wastewater irrigation and the onsite water storage compounds, including the impacts on Groundwater Dependent Ecosystems (GDEs), and potentially affected groundwater users	Chapter 9 Groundwater, Section 9.3.5.r
Details of impact mitigation, management and monitoring measures.	Chapter 10 Surface Water, Section 10.5 and Chapter 24 Summary of Commitments
A technical assessment of the suitability of the soil use in the construction of the onsite water storage compounds to sustain ongoing wastewater irrigation	Not applicable to the Project based on project design change.
An assessment of any potential existing soil contamination	Chapter 14 Soils, Land Capability and Land use, Section 14.3.12
Wastewater	
A clear and detailed description of the wastewater treatment process for the development including details of the volume of wastewater generated, treated, reused/recycled, or stored on site	Chapter 10 Surface Water, Section 10.4.5 and Appendix L Surface Water and Groundwater Technical Report
Details of the key pollutant concentrations of the wastewater before and after treatment with reference to relevant water quality guidelines	Chapter 10 Surface Water, Section 10.4.5 and Appendix L Surface Water and Groundwater Technical Report
A full evaluation of options to manage any brine stream resulting from wastewater treatment and detailed assessment of the environmental impacts of each option	No brine stream will be produced as part of the Project operation.
An Irrigation Management Plan that details irrigation practices and include a detailed soil nutrient and water balance model	Not applicable to the Project based on project design change.
Air Quality and Odour	
Description of all potential odour sources and predicted odour emissions from the construction and operation of the ethanol plant and its wastewater treatment plant	Chapter 16 Air Quality, Section 16.4 and Section 16.5. Appendix P Air Quality Technical Report
A comprehensive air quality assessment of all potential air quality and odour impacts from the development , including details of air quality and odour impacts on private properties, in accordance with relevant Environmental Protection Authority guidelines	Chapter 16 Air Quality, Section 16.4 and Section 16.5. Appendix P Air Quality Technical Report
Details of mitigation, management and monitoring measures for preventing and/or minimising both point and fugitive emissions	Chapter 16 Air Quality, Section 16.6 and Appendix P Air Quality Technical Report
An assessment of the effectiveness of the proposed air quality and odour mitigation measures	Chapter 16 Air Quality, Section 16.5, Appendix P Air Quality Technical Report and Chapter 24

DGR Technical Requirement	Reference in EIS
	Summary of Commitments
Waste Management	
The quality and type of all liquid and solid wastes to be generated on site and how this waste would be handled, processed and , if necessary, disposed	Chapter 11 Co-products and Waste, Section 11.4
Investigation of appropriate options for sludge disposal	Chapter 11 Co-products and Waste, Section 11.4.2
Details of the measure to dispose/remove distillers grain, and details of contingency arrangements should these disposal measures become unavailable	Chapter 11 Co-products and Waste, Section 11.4.3
Noise	
Description of all potential noise sources such as construction, operational, on and off-site rail noise and traffic noise	Chapter 11 Co-products and Waste, Section 17.5 and Appendix Q Noise technical Report
A comprehensive noise impact assessment in accordance with relevant Environment Protection Authority guidelines	Chapter 11 Co-products and Waste, Section 17.5 and Appendix Q Noise technical Report
Details of noise mitigation, management and monitoring measures	Chapter 11 Co-products and Waste, Section 17.6, Appendix Q Noise technical Report and Chapter 24 Summary of Commitment's
Traffic and Transport	
Details of all traffic and transport demands likely to be generated during construction and operation, including a description of haul roads	Chapter 12 Traffic and Transport, Section 12.4 and Section 12.5 and Appendix M Traffic and Transport Technical Report
Details on access to the site from the road network including intersections location, design and sight distance	Chapter 12 Traffic and Transport, Section 12.4.2 and Appendix M Traffic and Transport Technical Report
An assessment of predicted impacts on road safety and the capacity of the road network to accommodate the project	Chapter 12 Traffic and Transport, Section 14.4.7 and Section 12.4. Appendix M Traffic and Transport Technical Report
Plans of any road upgrades, rail and other infrastructure works or new roads required for the development	Chapter 12 Traffic and Transport, Section 12.5 and Appendix M Traffic and Transport Technical Report
As assessment of where far-field road works are required as a result of traffic	No far field road works

DGR Technical Requirement	Reference in EIS
impacts from the development	required for the Project.
Details of any proposed rail siding and associated rail traffic and assessment of the predicted impact of this on the rail network	Chapter 12 Traffic and Transport, Section 12.5.7 and Appendix M Traffic and Transport Technical Report
Detailed plans of the proposed layout of the internal road network and parking on site in accordance with the relevant Australian standards	Chapter 12 Traffic and Transport, Figure 12.3 and Appendix M Traffic and Transport Technical Report
Hazard and Risk	
A Preliminary Hazard Analysis (PHA) in accordance with *Hazardous Industry Planning Advisory Paper No.6 – Guideline for Hazard Analysis* and *Multi-Level Risk Assessment*	Appendix N Preliminary Hazard Analysis Technical Report
Details for fire/emergency measures and procedures	Chapter 13 Hazard and Risk, Section 13.5
Detail contingency plans for any potential incident or equipment failure during the operation of the project	Chapter 13 Hazard and Risk, Section 13.5
Flora and Fauna	
Include an assessment of the potential impacts to threatened species, populations and communities, and their habitat(s), and if required describe how the principles of “avoid, mitigate, offset” have been used to minimise the impacts of the proposal on biodiversity	Chapter 8 Biodiversity and Appendix K Plain’s Wanderer Impact Assessment
Visual	
Including height, scale signage and lighting from: - Nearby public receivers; and - Significant vantage points of the broader public domain	Chapter 15 Landscape and Visual Amenity
Greenhouse Gas	
A full GHG assessment (including an assessment of the potential scope 1, 2 and 3 GHG emissions of the project, and an assessment of the potential impacts of these emissions on the environment)	Chapter 16 Air Quality, Section 16.5.3
A detailed description of the measures that would be implemented on site to ensure that the project is energy efficient	Chapter 16 Air Quality, Section 16.6.1 and Chapter 24 Summary of Commitment’s
Aboriginal and non-Aboriginal Cultural Heritage	
Detail not included.	Chapter 18 Cultural Heritage and Appendix R Cultural Heritage Technical Report
Plans and documents	
The EIS must include all relevant plans, architectural drawings, diagrams and relevant documentation required under Schedule 1 of the EP&A Regulation The documents should be included as part of the EIS rather than as separate documents.	Appendix B Drawings and Plans
Consultation	
During the preparation of the EIS, you should consult with the relevant local, State or Commonwealth Government authorities, service providers, community groups or affected landowners. In particular you must consult with: - Environment Protection Authority - Deniliquin Council	Chapter 6 Stakeholder Engagement

DGR Technical Requirement	Reference in EIS
- Department of Primary Industries including the NSW Office of Water, Agriculture NSW and NSW Trade and Investment - NSW Roads and Maritime Service - NSW Transport - Office of Environment and Heritage (including the Heritage Branch) - Murray Catchment Management Authority - NSW Fire Brigade - Rural Fire Service - Vic Rail - Local community and other stakeholders.	
The EIS must describe the consultation process and the issues raised, and identify where the design of the development has been amended in response to these issues. Where amendments have not been made to address an issue, a short explanation should be provided.	Chapter 6 Stakeholder Engagement
If you do not lodge an EIS for the development within 2 years of the issue date of these DGRs, you must consult with the Director-General in relation to the requirements for lodgement	Noted
The assessment of the key issues listed above must take into account relevant guidelines, policies and plans as identified. While not exhaustive, Attachment 1 contains a list of some of the guidelines, polices and plans that may be relevant to the environmental assessment of this development.	Noted

6.2 Stakeholder identification

Following the issuing of the Project DGRs, a stakeholder screening exercise was undertaken to further define and identify the Project's stakeholders. Stakeholders were defined as individuals and groups who have interest in and/or ability to influence the Project. They were divided into three categories based on their relationship to the Project:

1) Affected parties

2) Interested parties

3) Broader community.

6.2.1 Affected parties

Affected parties included property owners and tenants located within and adjacent to the Project as well as the registered Aboriginal Parties. Table 6.2 lists the affected parties relevant to the Project.

Table 6.2 Affected parties

Name	Role	Organisation
Landholders		
M and A Trotman	Landowner	100 Line Road Deniliquin, NSW
Registered Aboriginal Parties		
Rayna Egan	Registered Aboriginal Party representative	Deniliquin Local Aboriginal Land Council
Sean Williams	Registered Aboriginal Party representative	Albury Local Aboriginal Land Council
Davis Crew	Registered Aboriginal Party representative	Yarkuwa Indigenous Knowledge Centre Aboriginal Corporation
Local Government		
Clr Lindsay Renwick	Mayor	Deniliquin Council
Des Bilske	General Manager	Deniliquin Council

6.2.2 Interested parties

Interested parties are those individuals and groups deemed to have a potential interest in the Project and general activities in the geographical area or those who oversee the approval and regulation of the Project.

Table 6.3 Interested parties

Name	Role	Organisation
Government Organisations and Departments		
Chris Ritchie	Manager, Industry Assessments	DP&E
Craig Bretherton	Manager South West	EPA
Lisa Almond	Land Use Planning Coordinator	DPH
Mitchell Isaacs	Manager Strategic Stakeholder Liaison	NOW
David Davis	Unknown	Agriculture NSW
Andrew Helman	Geoscientist - Land Use Assessment	NSW Trade and Investment
Maurice Morgan	Unknown	RMS
Mark Ozinga	Manager - Land Use and Transport Planning	NSW Transport
Peter Ewin	Team Leader Planning – South West Region	OEH
Steve Hoare	Senior Land Services Officer	Murray Catchment Management Authority (now Murray LLS)
Stewart Alexander	Duty Commander	NSW Fire Brigade
Doug Adamson	Community Safety Officer	Rural Fire Service
Tony Hendwood	Network Services Manager	Vic Rail/VLine
Mark Dalzell	Director Technical Services	Deniliquin Council
Neighbouring Properties		
Ricegrowers Co-Operative Ltd	Landowner	Line Road Deniliquin, NSW
Cannard and Godden	Landowner	160 Line Road Deniliquin, NSW
Lavars	Landowner	144 Line Road Deniliquin, NSW
Portelli	Landowner	186 Barham Road, Deniliquin, NSW
Jansen	Landowner	52 Larcombe Land Deniliquin, NSW
Sun Centre Pastoral Co Pty Limited	Landowner	506 Barham Road Deniliquin, NSW
Western Ranges Pty Ltd	Landowner	244 Barham Road Deniliquin, NSW
Multiple	Landowners	Properties within a 3 km radius of the Project Site
Industry		
Geoff Hartley	Business Manager	QUBE Logistics
Dale Stacey	Manager Major Customers	Elgas Ltd

Name	Role	Organisation
Media		
Thyla Harrington	Journalist	The Pastoral Times
Larissa Smith	Journalist	ABC Rural

6.2.3 Broader community

The general public includes residents and businesses in and around the Deniliquin township.

6.3 Consultation with statutory authorities, agencies and industry

During the preparation of the EIS, Dongmun Greentec undertook additional consultation (briefings, presentations, meetings, email and phone calls) with key local and State government agencies as specified in the DGRs for the Project. The purpose of this consultation was to provide agencies with an overview of the Project allowing further detail to be provided relevant to that agencies area of interest, compared to information provided during the PFM. It also provided agencies an opportunity to discuss approach methodologies and raise any additional matters that need to be taken into consideration as part of the environmental assessment.

Dongmun Greentec held initial Project briefing meetings with the following departments:

- EPA
- NOW
- RMS
- Murray LLS
- NSW Fire Brigade
- NSW Rural Fire Service
- Vline/QUBE
- Deniliquin Council.

Issues raised during these consultations are summarised in Table 6.4.

Table 6.4 Government department briefings – summary of issues

Department	Summary of information and key issues discussed
State Government	
EPA	- Project briefing meeting • Discussion of potential impacts and assessment requirements • Discussion of relevant legislative requirements and guidelines applicable to the Project
NOW	- Project briefing meeting • Discussion of water supply and access licencing
RMS	- Project briefing meeting • Discussion of transport impacts and existing infrastructure
Murray LLS	- Project briefing meeting • Discussion of water management planning and regional planning instruments
NSW Fire and Rescue	- Project briefing meeting • Discussion of firefighting equipment and water supply to be provided on-site as well as access for firefighting appliances
NSW Rural Fire Service	- Project briefing meeting • Fire management requirements • Emergency response planning • Bushfire prone land

Department	Summary of information and key issues discussed
Local Government	
Deniliquin Council	- Project briefing meeting • Impacts on Deniliquin Council infrastructure • Utilities • Approvals processes • Water management and the on-site reservoir • Key contacts

The following agencies were also consulted by letter, phone and e-mail during the EIS preparation phase:

- DP&E
- OEH Heritage Branch
- Murray LLS
- NSW Transport
- EPA
- NOW.

The key issues canvassed are summarised in Table 6.5.

Table 6.5 Summary of additional consultation

Department	Summary of information and key issues discussed
State Government	
DP&E	- DGR requirements - Key technical reports • Traffic Impact Assessment Report • Surface Water and Groundwater Technical Report • Preliminary Hazard Assessment Technical Report. - Letter correspondence regarding the submission of technical studies
OEH	- Water impact assessment and management measures - Plain's Wanderer impact assessment and mapping
OEH Heritage Branch	- Aboriginal cultural heritage
NSW Transport	- Traffic impact assessment: • Road and rail impact assessment methodology. • Mitigation and management measures. • Rail siding impact assessment
NSW Office of Water	- Water impact assessment and management measures - Stormwater management plan - Waste water treatment planning - Letter correspondence regarding adequacy of assessment
EPA	- Water impact assessment and management measures - Waste management and co-products - Air quality and odour technical report - Noise technical report - Letter correspondence regarding adequacy of assessment
Murray LLS	- Project briefing email - Aboriginal cultural heritage - Flora and fauna species

Department	Summary of information and key issues discussed
Local Government	
Deniliquin Council	- Existing stormwater drainage - Mapping relating to stormwater management - Water balance modelling - Existing Deniliquin Council agreements - Water management planning - Potable water and sewage on site - Existing water infrastructure - LiDAR and ground survey records - Soil types - Land ownership and consent - Existing Deniliquin Council information and records on flooding and drainage - Stormwater management guidelines.
Industry	
Elgas Limited	- CNG supply to the Project Site
QUBE Logistics	- Correspondence regarding potential rail impacts and line capacity

Appendix E Stakeholder Register includes the consultation register, summarising key ongoing consultation activities and correspondence with all stakeholders including, various State and Local government departments, Registered Aboriginal Parties, land owners, local industry and the local community.

6.4 Community consultation

6.4.1 Approach

The approach to community consultation included:

- identification of key stakeholder groups relevant to the Project (refer to Section 6.2)
- management and facilitation of the means of engagement with identified stakeholders
- setting out procedures for communication with the identified stakeholders
- defining the means by which Dongmun Greentec and its consultants would record and respond to feedback received from identified stakeholders
- monitoring and reporting of community initiated enquiries and contact appropriately
- defining the key messages, and communication tools and techniques to be used by Dongmun Greentec and its consultants during the EIS phase of the Project and related exhibition phase, to disseminate information and provide opportunity for feedback.

6.4.2 Consultation activities

Community consultation occurred during the early stages of the preparation of the EIS. Consultation activities included the following:

- Letters were sent on 6 February 2014 to all landholders of properties within a 3 km radius of the subject site. The letter contained an outline of the proposal, a map showing its location, general details of the approval process, and contact details for nghenvironmental.
- Ongoing negotiation and consultation via phone and email has been undertaken with M&A Trotman who own the property on Lot 273 DP 756325.
- An advertisement was placed in The Pastoral Times newspaper on Tuesday 20 May 2014 and Friday 23 May 2014. The advertisement included an outline of the Project and contact details for nghenvironmental.

Copies of the letter and the advertisement are contained in Appendix F Consultation Materials. Landowner consent letters from M&A Trotman and Deniliquin Council are provided in Appendix G Landholder Consent Letters.

6.4.3 Aboriginal heritage consultation

Consultation with the relevant Deniliquin Aboriginal stakeholders was undertaken as required under the Department of Environment and Conservation's 2005 Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation, using the process outlined in the OEH 2010 Aboriginal Cultural Heritage Consultation Requirements for Proponents. Details regarding the Aboriginal consultation process are included in Chapter 18 Cultural Heritage and Appendix R Cultural Heritage Technical Report.

6.5 Community consultation themes, issues and design implications

Stakeholders raised a number of issues during the consultation period. Some of these issues had implications on the final design of the Project which resulted in a number of amendments. The issues and implications are summarised in Table 6.6.

Table 6.6 Summary of consultation themes, issues and design implications

Stakeholder	Issues raised	Response
Community		
Landholder	Requested more information, specifically a site plan showing the proposed railway siding.	A detailed plan was provided at the time. However, since then, the railway siding has been removed from the proposal.
Broader Community	No feedback was received form the broader local community.	
Local Government Agency		
Deniliquin Council	Water availability and discharge	All water to be sourced Deniliquin Council via existing truck infrastructure. No discharges to the Barham ERS Pond or to Warbreccan Farm. No irrigation of water.
State Government Agency		
NSW Rural Fire Service	Require adequate firefighting equipment and water supply to be provided on site, access for firefighting appliances and staff evacuation procedures as required by the BCA.	Inclusion of firefighting equipment and consideration of required water supply as part of design.
EPA and NOW	Incomplete water balance model	The water balance model has since been amended and is now correct.
NOW	Surface water management	Inclusion of a bioretention and flood detention basin to accommodate increase surface stormwater runoff.
OEH	Plain's Wanderer habitat and impact	Revision and consolidation of the Project layout and footprint in order to minimise the habitat impacted. Preparation of SIS and offsets strategy.
NSW Transport	Access and safety	The entry and exit points of the Project have been re-configured to ensure the one way flow or traffic and the safe entry and exit from Deniliquin Barham Road.
DP&E	**Draft Technical Report (Water)**	
	Design of the wastewater treatment system, including management of odours and solid waste, removal of contaminants and contingencies in the event of system failure or inefficient operation	Based on a full review of the originally proposed wastewater treatment and disposal system, in the context of the comments provided by the DP&E, Dongmun Greentec is now proposing a closed system that will see all wastewater treated and

Stakeholder	Issues raised	Response
		recycled for use in the plant. As a closed system there will be no treated water discharges to the environment (no irrigation). Additional description of the wastewater treatment process will be included in the technical report and EIS. This additional description will include measures to reduce potential odour effects (such as covering of treated water basins) and details of aerators sized to ensure the wastewater can maintain aerobic conditions. The revised technical report will also outline controls to be put in place to identify and manage potential system upsets. These controls will include real-time online monitoring of water and gases in the anaerobic and aerobic treatment steps along with retreatment options in the case of treatment system failure. The revised report is contained in Appendix L Surface Water and Groundwater technical Report
	Management of the liquid fertiliser output, including proposed storage/use/disposal of this material, and suitability of soils to sustain ongoing wastewater irrigation	The liquid fertiliser output will be a saleable product. Liquid Fertiliser will be stored in a tank with capacity of 100 kL which is enough for four days storage. Construction of the storage will be in accordance with Australian Codes (such as Fertiliser Australia-Fertiliser handling Code of Practice Additional information will be provided on the base composition of the liquid fertiliser, what form it takes and how this is enhanced as a saleable product. The market for the product will be discussed as well and how it is transported. There will be no wastewater irrigation as part of the Proposal.
	An Irrigation Management Plan that details irrigation practices and includes a detailed soil nutrient and water balance	There will be no irrigation of treated wastewater as part of the proposal. Final treated water from the wastewater treatment plant will be recycled to the ethanol production process and is no longer to be discharged to the Deniliquin Council reservoir adjacent to the site (as was described in the draft technical report).
	Sizing of stormwater treatment train components	This information will be included in the revised technical report. The stormwater treatment train, including indicative sizing of storages and water quality devices, will be described in line with Managing Urban Stormwater (DECC, NSW). Detention facilities retaining stormwater runoff shall be conceptually designed so that peak discharges from the Project are not increased beyond that of the pre-development environment nominally for the critical 1, 10 and 100 year ARI storm events. The revised report is contained in Appendix

Stakeholder	Issues raised	Response
		L Surface Water and Groundwater technical Report
	Design of the proposed clay liners for the storage ponds (description and concept drawings)	Dongmun Greentec will construct storage ponds out of concrete to prevent potential infiltration to underlying soils.
	Effectiveness of the plant in terms of water consumption versus ethanol production in litres	Approximately 52 per cent of the required water during operation is recycled through the on-site wastewater treatment system and reused in the ethanol production process. Approximately 3.65 ML freshwater is required for producing 1 ML ethanol.
	Confirmation of water supply arrangements with Deniliquin Council and impacts during a range of climatic scenarios, including an extended dry period	Deniliquin Council has the ability to provide 25 ML/day from its water treatment plant. Peak use in summer has been 17ML/day. Deniliquin Council has confirmed that there is capacity for both growth in town use and industrial use (such as for the proposed ethanol plant). The Project requires approximately 1.3 ML/day of raw water. When the Project becomes part of the Deniliquin Council water supply system, the Plant would be supplied with sufficient water during normal drought periods. In the event of a severe drought Deniliquin Council may be unable to provide sufficient water to all users. Deniliquin Council has an Integrated Water Catchment Management Plan and a Drought Management Plan which would be updated to integrate the ethanol plant supply once Project approval has been gained and detailed design initiated.
	Potential drawdown impacts caused by the proposed bore.	With the confirmation from Deniliquin Council that the required water demand for the Project can be met, Dongmun Greentec will not require a groundwater borehole for supply. This has been removed from the proposal.
	EPA comment related to measures ensuring that construction activities do not extend to the water table in particular the construction of storage and containment dams and footings for large infrastructure.	The highest water table is expected to be at approximately 10 m depth. The proposed plant and associated storage structures and basins will not extend to 10 m depth.
	Draft Traffic Assessment Report	
	Intersection designs and sight distances for site access	The design of the site access configurations will be carried out as part of the next design phase. The access driveways will be designed in accordance with Australian Standards AS 2890 and council/RMS requirements for the vehicular access to the car park as well as the heavy vehicle access points to and from the Project allowing access for heavy rigid and articulated vehicles. In terms of the available sight distances, these are over 250 m in both directions at each of the access points along Deniliquin Barham Road. The available sight

Stakeholder	Issues raised	Response
		distances will more than satisfy the requirement of 222 m for a 100 km/hr road (based on an 8 second gap).
	Impacts on existing intersections external to the site, including the intersection of the Deniliquin Barham Road and Boundary Line Road, the rice growers rail siding, the Cobb Highway and Riverina Highway	The key intersections along the preferred transport routes accessing the rail siding and the highways have been designed to cater for and are already being used by B-Doubles. The Line Road intersection with Deniliquin Barham Road will be used by exiting vehicles only (there will be no left and right hand turn from Deniliquin Barham Road to Line Road). Detailed intersection analysis would be undertaken in consultation with Deniliquin Council as part of the future detailed design. The revised report is contained in Appendix M Traffic and Transport Technical Report.
	Evidence of consultation with Public Transport Victoria and V/Line to confirm capacity of the rail system and any specific requirements for the transportation of hazardous material	Dongmun Greentec has consulted with QUBE Logistics the sole operator of the rail line into Deniliquin. QUBE Logistics has provided correspondence confirming the available capacity of this line for all of the Proposal's rail freight needs. Details around the specific requirements for transporting the product and co-products will be defined at the detailed design stage.
	Plans of the proposed layout of the internal road network and parking onsite in accordance with relevant Australian Standards	Preliminary internal road layout and onsite parking has been provided in the site layout figures. The plans show ingress and egress locations, internal road layout for safe manoeuvrability of trucks and other vehicles and designated car parking areas. Dongmun Greentec commits to designing the road layout and parking in accordance with the relevant Australian Standards and Deniliquin Council requirements during detailed design. Adequate parking will be provided for all employees and trucks within the site boundary in accordance with AS2980 and Council standards. The revised report is contained in Appendix M Traffic and Transport Technical Report
	Further explanation and detail on Plates 4 and Plate 5.	These Plates have been enhanced by adding indicative road lines to clearly indicate how the schematic representation of vehicle flows relates to the Project and the Deniliquin Barham Road as discussed in the meeting.
	Draft Technical Report – Preliminary Hazard Analysis	
	Confirmation that the dangerous goods storage locations and quantities will not significantly change as a result of the final design	Dongmun Greentec is at a pre-feasibility/feasibility stage of Project design and subsequent detailed design work or conditions of an approval may modify certain aspects of the proposal. Any significant change to dangerous goods storage quantities and locations will be assessed in accordance with the provisions of the

Stakeholder	Issues raised	Response
		applicable Australian Standards and Safety in Design principles prescribed under the Safe Design of Structures Code of Practice to ensure, so far as is reasonably practicable (SFARP), that the design is without risks to health and safety. We note that this approach to design is consistent and in accordance with the performance based duties of persons conducting a business or undertaking under the *Work Health and Safety Act 2011*.
	Details on the methods to be used for storage and handling of Liquid Natural Gas (LNG): i) Section 4.3.2 of the PHA suggests that the refrigeration will be used. The quantity of the refrigerant should be specified in the PHA and considered in the assessment; and ii) Taking into account that the LNG will be stored as a cryogenic liquid, it is assumed that a vaporisation plant/unit will also be built. Additional information in relation to this plant (such as capacity, equipment and location) should be provided.	The principles of risk minimisation been followed in the preliminary design of the Project namely through the elimination of the largest significant off site risk with the storage and handling of LNG (Liquefied Natural Gas) which had previously been considered. This risk has been removed by substituting the storage and transport of large quantities of LNG with a gas pipeline supplying CNG to the Project Site. The risk associated with the gas supply on the Project Site have been evaluated in Appendix N Preliminary Hazard Analysis Technical Report
	Separation distances determined using the "sensitive uses" line in Figures 7 and 8 of Applying SEPP33 (NSW Planning, 2011)	Appendix N Preliminary Hazard Analysis Technical Report has been updated to include these separation distance requirements.
	The quantity of hydrochloric acid to be stored on site for use in the pre-fermentation process should be specified in Table 2	The likely maximum quantity of hydrochloric acid will be very low and will be confirmed with Dongmun Greentec. Appendix N Preliminary Hazard Analysis Technical Report has been updated to include a description of the likely quantities.
	An estimate of the quantities of ammonia and hydrogen produced in the anaerobic filter	AECOM sought clarification regarding DP&E's primary concern with estimating the quantities of ammonia and hydrogen, as these are intermediate products which form part of the anaerobic digestion process, where biogas is generated. The PHA has considered the quantities and hazards associated with the biogas. Considering that the design has not progressed past the pre-feasibility stage, quantifying the rate of production of such intermediates is not practical. Further, considering that these intermediates are generated through a biological reaction process, the quantities would vary significantly and be difficult to predict. It is not expected that these intermediates will be generated in any significant quantities (at a given time), and therefore are not considered to present any significant off-site impacts from a land use safety planning

Stakeholder	Issues raised	Response
		perspective. Further reference with respect to this biological reaction has been provided in Appendix N Preliminary Hazard Analysis Technical Report.
	Details of the proposed location of the road tanker loading bay transporting ethanol from the site to the rail siding and an estimate of the total number of road tanker movements from the development is required to establish if the proposed development would be potentially hazardous with respect to transportation. Figure 4 of the PHA should be updated accordingly	The road tanker loading bay is located at point 21 on Figure 4 Appendix N Preliminary Hazard Analysis Technical Report. The estimated average number of ethanol road tanker movements to transport ethanol from the site to the rail siding per day is nine (9) of 32 tonnes capacity. Appendix N Preliminary Hazard Analysis Technical Report includes commitments that Dongmun Greentec is to develop a Traffic Risk Assessment and a detailed Route Selection study for the dangerous goods transport activities.
	Confirmation of the average number of LNG tankers per day (the number quoted in Table 2 appears to be too high for the onsite storage capacity)	LNG is no longer being transported, used or stored in relation to the Project. CNG will now be piped directly to the Project Site
	The UN number of the organic liquid fertiliser	The liquid fertiliser is not likely to have a UN number as it will not be classified as a dangerous good. Details of the production process is given in Chapter 3 Project Description.
	It is noted that all dangerous goods are clustered in one location of the site. The updated PHA should also: a) Clarify if the provision of the relevant standards (particularly related to the separation distances) have been considered during the selection of the dangerous goods storage locations; b) Clarify if the provisions of Clause 2.6 of AS3961-2005 have been considered in the selection of the LNG storage tank; and c) Justify the decision to locate the LNG tank in the vicinity of the ethanol storage tanks, taking into account that “all avoidable risks should be avoided”.	Appendix N Preliminary Hazard Analysis Technical Report of this EIS includes clarification on separation distances, with specific reference to the relevant Australian Standards. Reference has been made to the additional studies, which will form part of the detailed design progression (eg Fire Safety Studies), and how these will be used to inform the location and required separation distance requirements between storage and process units. This will also include further clarification on designers’ responsibilities under the WHS Regulations, and specifically safety in design considerations. LNG is no longer being transported, used or stored in relation to the Project. CNG will now be piped directly to the Project Site.

6.6 Public exhibition

6.6.1 Statutory requirements

The DP&E will make the EIS publicly available for a minimum period of 30 days. During this period, it will be available for inspection at a number of public locations. These will likely include the DP&E offices, Deniliquin Council offices and other locations such as public libraries in the Deniliquin region.
The environmental impact statement document will also be available to view and download from:

- The DP&E webpage www.planning.nsw.gov.au
- Dongmun Greentec webpage http://www.dongmungreentec.com/

Dongmun Greentec will hold public displays during the exhibition of the EIS at locations readily accessible to the Deniliquin community and other interested stakeholders to promote access to Project information and EIS documentation. These displays will provide opportunity for members of the community to ask questions of the project team and help to further inform the development of formal submissions regarding the proposal.

Details of the locations of displays will be provided in a community update, advertised in local and metropolitan media and via an email notification to registered stakeholders.

Following the submission of the EIS, there will be a period of public comment and submissions. During the comment period, which is a minimum of 30 business days, government agencies and the public are invited to make submissions on the EIS.

In accordance with the EP&A Regulation, the following requirements must also be met:

- Give written notice of the public submission period to each affected and interested person and any other person decided by the Director General
- Advertise the Project in a local newspaper
- Ensure the EIS in available for public viewing at the prescribed locations

6.6.2 EIS consultation activities

Further stakeholder and community engagement on the Project will be undertaken with the release of the EIS through a number of activities which include:

- The EIS will be hosted on the DP&E Major Projects website during the Public Exhibition phase
- Advertisement in The Deniliquin Pastoral Times
- A letter to affected and interested persons and other persons decided by DP&E
- Copies of the EIS to landholders on or adjacent to the Project Site
- Copies of the EIS will be available in a number of public locations, likely local libraries and Deniliquin Council offices.

6.6.3 Response to submissions

The DP&E will issue a copy of all accepted submissions to Dongmun Greentec at the end of the public comment period. Dongmun Greentec will be required to summarise and respond to submissions, providing DP&E with any amendments to the EIS.

7.0 Issues prioritisation

An environmental risk analysis was conducted as part of this EIS. This chapter outlines the environmental risk analysis process and identifies the key environmental issues.

7.1 Director General's Requirements

Table 7.1 sets out the DGRs as they relate to risk analysis. This chapter and Appendix D Risk assessment and issues prioritisation address this requirement.

Table 7.1 DGRs for the assessment of environmental risk analysis

DGRs – environmental risk analysis
- Risk assessment of the potential environmental impacts of the development identifying key issues for further assessment.

7.2 Environmental risk analysis process

An environmental risk analysis has been carried out to identify and confirm the key environmental issues for the Project. Key environmental issues are those that may have major or moderate impacts (actual or perceived) and require detailed assessment to determine the level or severity of potential effects and to identify appropriate mitigation and management measures.

The environmental risk analysis process carried out for the Project included:

- Preliminary environmental assessment (PEA) carried out to help identify the key environmental issues and to inform the EIS and the subsequent State significant development application report.
- An assessment of the key issues identified in the DGRs for the Project (refer to Appendix A DGRs).
- An environmental risk review to confirm the key environmental issues based on the results of the detailed investigations presented in this EIS.

7.3 Preliminary environmental assessment

A PEA was initially undertaken prior to the preparation of this EIS to inform the EIS scoping report for the Project. The outcomes of this preliminary assessment identified the following key environmental issues for the Project:

- Surface water
- Air quality and odour.

The following non-key issues were also identified:

- Traffic and transport
- Hazard and risk
- Waste
- Noise and vibration
- Soils and land
- Flora and fauna
- Non-Aboriginal heritage
- Aboriginal heritage
- Landscape character and visual amenity.
- Greenhouse gas.

The outcomes of the PEA were documented in the PEA report, which was submitted to the Director General of the DP&E on 12 December 2013. The purpose of the PEA report was to assist the Director General in identifying the environmental impact assessment requirements for the Project, including the key issues to be addressed in the EIS.

7.4 Assessment of the key issues identified in the DGRs

The list of key issues identified in the DGRs is consistent with those identified in the PEA but prioritise a larger number of issues as key. The DGRs identified the following as the key issues to be addressed in the EIS for the Project:

- Traffic and transport
- Water management
- Waste management
- Hazard and risk
- Flora and fauna

Other non-key issues raised in the DGRs and addressed in the EIS include:

- Soils
- Wastewater
- Air quality and odour
- Noise
- Visual
- Greenhouse gas
- Aboriginal heritage and non-Aboriginal cultural heritage
- Consultation.

The issues listed above have been assessed in detail as part of the preparation of this EIS. The results of this assessment are presented in Volume 1 of the EIS.

7.5 Risk analysis framework

The environmental risk analysis has been undertaken in accordance with the principles of the Australian and New Zealand standard AS/NZS ISO 31000: 2009 Risk Management – Principles and Guidelines. The risk analysis of potential environmental impacts involved:

- Identifying consequences of potential impacts (using Table 7.2)
- Identifying likelihood of potential impacts (using Table 7.3).
- Ranking or rating the risk in the absence of mitigation measures (using Table 7.4 and Table 7.5)
- Considering the probable effectiveness of the proposed mitigation measures
- Determining the likely residual risk of each potential impact using the same tables.

Table 7.2 Risk analysis consequence definitions

Consequence level	Definition
Catastrophic	Long term (greater than three months) and irreversible impacts. Resulting in a major prosecution under relevant environmental legislation.
Major	Medium term (between one month and three months) and potentially irreversible impacts. Resulting in a fine or equivalent penalty notice under relevant environmental legislation.
Moderate	Moderate and reversible impacts, or medium term (between one and three months).
Minor	Minor and reversible, or short term impacts (less than one month)
Insignificant	Minor, negligible impacts.

Table 7.3 Risk analysis likelihood definitions

Likelihood	Definition	Probability
Almost certain	The event is almost certain to occur in the course of normal or abnormal construction / operational circumstances.	>90%
Likely	The event is more likely than not to occur in the course of normal construction / operational circumstances.	51% - 90%
Possible	The event may occur in the course of normal construction / operational circumstances.	26% - 50%
Unlikely	The event is unlikely to occur in the course of normal construction / operational circumstances.	5% - 25%
Very unlikely	The event may occur in exceptional construction / operational circumstances only.	<5%

Table 7.4 Risk matrix

Consequences	Likelihood				
	Very unlikely	Unlikely	Possible	Likely	Almost certain
Catastrophic	15	19	22	24	25
Major	10	14	18	21	23
Moderate	6	9	13	17	20
Minor	3	5	8	12	16
Insignificant	1	2	4	7	11

Table 7.5 Risk rating categories

Risk rating score	Risk category	Comments
23 - 25	Extreme	Irreversible, extensive effect or implications on the environment. Other criteria: Death, huge financial loss (>$100m), business ops forced to cease for weeks, significant negative env. impacts off site, sustained bad press, sustained complaints and community outrage, major liability, probable prosecution, imprisonment of directors/managers Irreversible and extensive: - impact on a listed species; or - damage to the values of a listed or indigenous heritage site
19 – 22	Very high	Long term effect or implication on the environment. Other criteria: Extensive injuries, business ops forced to cease for days, major financial loss (>=$5m, <$100m), Significant env. damage on site, very bad press coverage, community outrage, complaints peak then fall off, significant legal liability, possible prosecution, fines for directors/managers Irreversible and extensive damage to heritage, the environment or native fauna. Or Extensive and reversible or irreversible and localized: - impact on a listed species; or - damage to the values of a listed or indigenous heritage site. Or Extensive unnecessary production of waste or consumption of resources.

Risk rating score	Risk category	Comments
13 – 18	High	Moderate, medium term effect or implication on the environment. Other criteria: Medical treatment required, Containable localised environmental damage on site, moderate financial loss (>=$50k, <$5m), legal liability exists - prosecution unlikely, minimal fines, occasional complaints, possible press interest Extensive and reversible or irreversible and localized damage to heritage, the environment or native fauna. Or Localized and reversible: - impact on a listed species; or - damage to the values of a listed or indigenous heritage site. Or Production of waste or consumption of resources substantially higher than necessary.
8 – 12	Moderate	Minor effect or implication on the environment. Other criteria: First aid required, on site damage immediately contained with no long term impacts, minor financial loss (>=$5k, <$50k), occasional complaints, possible press interest Localized and reversible damage to heritage, the environment or native fauna. or Production of waste or consumption of resources that is slightly higher than necessary.
1 - 7	Low	Negligible effect or implication on the environment. Other criteria: No injury, insignificant financial loss <$5k, minimal environmental damage, no complaints Environmental or heritage impact, production of waste or consumption of resources that would not be of concern to a reasonable person.

7.6 Environmental risk analysis

Using the risk framework, an environmental risk analysis has been undertaken for the Project including a consideration of the key and non-key issues without the application of mitigation measures. The results of the risk analysis are presented in Appendix D Risk Assessment and Issues Prioritisation and summarised in Table 7.6 below. The analysis is structured towards risk minimisation outcomes.

A residual risk rating has been arrived at after the application of mitigation measures developed and recommended by this EIS (refer to Chapter 24 Summary of Commitments and Appendix D Risk Assessment and Issues Prioritisation).

Table 7.6 presents the findings of the environmental risk assessment undertaken for the Project without the application of mitigation measures.

Table 7.6 Environmental risk analysis (without mitigation measures)

Issue	Potential Adverse Impacts	Consequence	Likelihood	Risk Rating
Traffic	Project related traffic impact in surrounding road network (construction).	Moderate	Likely	17 High
	Project related traffic impact in surrounding road network (operation)	Minor	Likely	12 Moderate
	Project related impacts on rail network (operation only)	Insignificant	Likely	7 Low

Issue	Potential Adverse Impacts	Consequence	Likelihood	Risk Rating
	Deterioration of the road surface condition.	Minor	Likely	12 Moderate
Surface water	Exposure of soils leading to erosion and associated impacts to local watercourses.	Moderate	Possible	13 High
	Potential to impact surrounding watercourse through stormwater runoff and contamination.	Moderate	Possible	13 High
	Spills or leaks of ethanol, fuels or other hazardous substances and dangerous goods from plant and equipment.	Major	Possible	18 High
Groundwater	Impacts on groundwater quality and quantity including drawdown.	Moderate	Very unlikely	6 Low
Waste	Impacts associated with the incorrect disposal of waste material.	Moderate	Possible	13 High
	Inadequate re-use or recycling.	Minor	Possible	8 Moderate
Hazards and risk	Impacts from handling, storage and transport of dangerous goods and hazardous substances.	Major	Possible	18 High
	Occupational health and safety hazards, such as dangers to workers and road users.	Major	Possible	18 High
	Bushfires.	Major	Very Unlikely	10 Moderate
Flora and fauna	Loss of or disturbance to native vegetation	Minor	Almost certain	16 High
	Impacts to threatened flora species.	Minor	Very unlikely	3 Low
	Impact to threatened fauna species.	Major	Possible	18 High
	Loss of fauna habitat values from impacts to and direct removal of vegetation.	Major	Possible	18 High
	Construction activities resulting in the potential spread of weeds and/or sedimentation and erosion.	Minor	Likely	12 Moderate
	Noise and vibration impacts on fauna (construction)	Minor	Likely	12 Moderate
Air quality	Impacts to surrounding receivers from emissions during construction	Minor	Possible	8 Moderate
	Impacts to surrounding environment from emissions during operation	Moderate	Possible	13 High
Noise and vibration	Airborne noise impacts from site activities during construction	Moderate	Likely	17 High
	Airborne noise impacts from site activities during operation	Moderate	Likely	17 High
	Vibration impacts from the Project.	Moderate	Unlikely	9 Moderate
Land and soil	Exposure of soils leading to erosion impacts from construction and operational activities	Moderate	Possible	13 High
Landscape character and visual amenity	Reduction of visual amenity as a result of vegetation clearance (construction).	Moderate	Likely	17 High

Issue	Potential Adverse Impacts	Consequence	Likelihood	Risk Rating
	Impacts to landscape character and views as a result of construction activities.	Moderate	Likely	17 High
	Reduction in landscape character due to operations	Moderate	Likely	17 High
Greenhouse gas and climate change	Emissions of greenhouse gases during construction.	Insignificant	Almost certain	11 Moderate
	Emissions of greenhouse gases during operation.	Minor	Almost certain	16 High
Non-Aboriginal heritage	Impacts on non-indigenous heritage sites, including damage or alteration to items of heritage or archaeological significance.	Insignificant	Possible	4 Low
Aboriginal heritage	Impacts on culturally sensitive Aboriginal heritage sites.	Moderate	Likely	17 High

7.7 Confirmation of key environmental issues

Based on the results of the environmental risk analysis, consultation with DP&E and information presented in the EIS, the following issues have been confirmed as the key environmental issues for the Project:

- Traffic and transport
- Hazard and risk
- Waste management
- Flora and fauna
- Surface water
- Aboriginal heritage.

The following non-key issues were also identified:

- Landscape and visual impact assessment
- Groundwater
- Noise and vibration
- Air quality
- Land and soils
- Non-aboriginal heritage.

After the environmental impact assessment considerations and the incorporation of the proposed mitigation measures the environmental issues have a residual risk rating of low or moderate. All issues, both key and non-key, have been addressed in the following sections of this EIS.

8.0 Biodiversity

This chapter provides an assessment of the potential impacts of the Project on biodiversity and is supported by the:

- Plains wanderer SIS
- Plains wanderer Offset Strategy

Further detail on these can be found in Appendix K Plains Wanderer Impact Assessment.

8.1 Director General Requirements

The assessment addressed the DGRs as detailed in detailed in Table 8.1.

Table 8.1 DGRs for the assessment of biodiversity

DGRs - Biodiversity
Flora and Fauna
- an assessment of the potential impacts to threatened species, populations and communities, and their habitat(s), and if required describe how the principles of “avoid, mitigate, offset” have been used to minimise the impacts of the proposal on biodiversity.
Soil and Water
- an assessment of the potential surface and groundwater impacts associated with the development, the wastewater irrigation and onsite water storage compounds, including the impacts on Groundwater Dependent Ecosystems (GDEs), and potentially affected groundwater users.

8.2 Methodology

To identify and describe the biodiversity values of the Project Site, a combination of desktop and field assessments were undertaken.

8.2.1 Desktop assessment

Publically available datasets, government publications, other published literature and previous field studies (unpublished) were consulted to identify the existing environmental values of the Project Site. Database searches included a 10-20 km buffer around the centre point of the Project Site (-35.5584, 144.9077, GDA ’94, Zone 55H). The information sources included, but are not limited to:

- ‘Protected Matters Search Tool’ (PMST) for modelled habitat of threatened species and ecological communities and migratory species, protected under the EPBC Act (DoE, 2015).
- OEH ‘BioNet’ for records of threatened and migratory species and endangered populations (OEH, 2015).
- Atlas of Living Australia (ALA) database for records of threatened and migratory species (ALA, 2015).
- NSW Vegetation Information System (VIS) maps for location of modelled remnant vegetation.

Applicable search results are provided in Appendix H Flora and Fauna Desktop Searches.

8.2.2 Flora survey

A flora field survey was undertaken by AECOM on the 1 and 2 June 2015, in accordance with the Office of Environment and Heritage (OEH) field survey methods. The purpose of this survey was to describe the terrestrial flora and vegetation within the Project Site. The Project Site was traversed and the vegetation sampled at seven locations. Three detailed grassland sites were sampled, as well as two rapid grassland sites. A further two detailed cover transects were established in each of the two woodland patches identified within the Project Site. A description of the sampling methods and the flora survey field data are presented in Appendix J Flora and Fauna Field Survey Results.

Limitations

The timing of the survey was undertaken in early June (winter). The entire Project Site was accessible for the survey and was adequately covered as part of the current survey. The survey intensity was adequate for the Project Site and the plant communities identified.

8.2.3 Fauna survey

A fauna survey was also undertaken by AECOM on the 1 and 2 June 2015 in accordance with OEH field survey methods to the level of 'Habitat Assessment'. No intensive fauna surveys were undertaken. The survey was completed to characterise the fauna assemblages in the Project Site and the types of habitat available for threatened fauna. The survey was completed by walking and recording all vertebrate species encountered. All fauna observations were made visually or audibly and no animals were captured or handled.

Areas of interest identified as part of the desktop survey were visited and assessed on the ground for the presence of habitat for threatened fauna. Consideration was given to the quantity of suitable habitat for each threatened species within, and adjacent to, the Project Site and its degree of connectivity to similar habitat. Areas of interest for habitat and its immediate surrounds were searched for general signs of fauna, such as nests, feathers and scats and the woody debris and loose rocks were lifted to search for herpetofauna (reptiles and frogs) and small mammals.

A detailed description of the sampling methods and fauna survey field data are presented in Appendix J Flora and Fauna Field Survey Results.

Limitations

Due to the timing and duration of the field assessment, it was not possible to provide a definitive list of all species that occupy the Project Site. As such, a likelihood of occurrence rating was assigned to each threatened or migratory species raised during the desktop assessment.

8.2.4 Threatened and migratory species likelihood assessment

The likelihood of occurrence assessment was based on:

- previous records of threatened species from database searches
- habitat data collected during the field survey
- the current (known) distribution range of these species
- the presence and condition of suitable habitat occurring within the locality.

The criteria to assess the likelihood of threatened flora, fauna and migratory species is presented in Table 8.2.

Table 8.2 Likelihood assessment criteria

Likelihood	Assessment Criteria
Present	- Species observed within the Project Site or recently recorded. - Preferred habitat is present within the Project Site.
High	- Species has been recently recorded within the Project Site or adjoining landscape. - The Project Site contains the species' preferred habitat and is likely to support a population of the species.
Moderate	- Species has not been recorded within the Project Site but previously recorded in the surrounding landscape. - The Project Site contains the species' preferred habitat although generally it is in a poor or modified condition.
Low	- Species has not been recorded within the Project Site, and has not been observed in the surrounding landscape or at least not recently. - Some habitat is present in the Project Site although it is generally of poor or modified condition. - The species may infrequently visit the Project Site, or overfly the Project Site, but would not reside, roost or otherwise depend on habitats within the Project Site.
Unlikely	- Species has not been recorded within the Project Site or observed in the surrounding landscape, and there is no habitat available within the Project Site to suggest the species may occur even on a temporary basis.

8.2.5 Impact assessment

Impacts on flora, fauna and communities have been assessed primarily based on their status under the TSC Act, the EPBC Act, and international agreements and treaties (JAMBA/CAMBA). Assessment of potential impacts on State threatened species, populations and ecological communities and their habitats have been undertaken in accordance with Section 5A of the EP&A Act, the *Threatened Species Assessment Guide: assessment of significance* (DECC, 2007).

The significance of potential impacts on EPBC Act listed flora, fauna and ecological communities has been determined by applying the 'Significant Impact Criteria' guidelines in the document Significant Impact Guidelines 1.1 - Matters of National Environmental Significance (DoE, 2013).

8.3 Existing environment

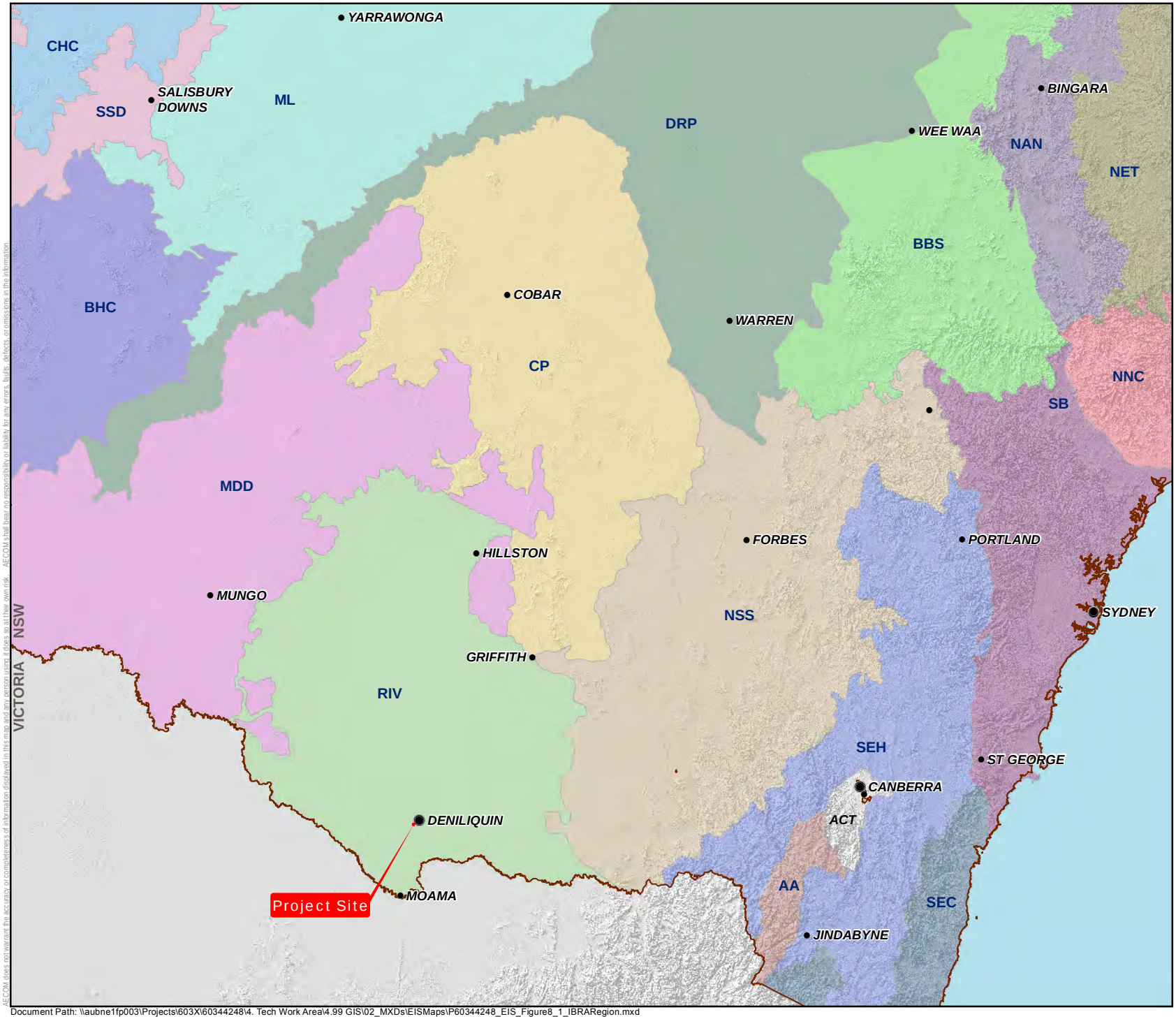
8.3.1 Regional ecological context

The Project Site is located within the central portion of the Riverina Interim Biogeographical Regionalisation for Australia (IBRA) Region (Thackway and Cresswell V. 8.0) in south west NSW, within the Murray Fans Subregion (Refer to Figure 8.1). The Murray and Murrumbidgee Rivers and their major tributaries, flow from the highlands in the east, westwards across the Riverina Plain. This bioregion is dominated by river channels, floodplains, backplains, swamps, lakes and lunettes that are all of Quaternary age. The region comprises three overlapping alluvial fans centred on the eastern half of the Murray Basin.

The vegetation of the Riverina Bioregion is comprised of river red gum (*Eucalyptus camaldulensis*) along the river channels and river cooba (*Acacia stenophylla*) communities (Eardley, 1999). On the higher, more saline heavy grey and brown clays towards the outer perimeter of the floodplains, black box (*Eucalyptus largiflorens*) woodlands dominate with an understorey of salt-tolerant grasses, saltbushes and daisies (Eardley, 1999). Further from the rivers, many plains are treeless and carry saltbush shrubland, composed of old man saltbush (*Atriplex nummularia*), bladder saltbush (*Atriplex vesicaria*), cotton bush (*Maireana aphylla*) and native grasslands (*Rytidosperma* spp. and *Austrostipa* spp.) (Eardley, 1999).

The Murray Valley Regional and National Park system is the closest protected area to Deniliquin (Figure 8.2), extending from the Deniliquin townsite, 6 km to the east of the Project Site, south and east along the Edward and Murray Rivers, and joining up with the Barmah National Park, over the border in Victoria. The Murray Valley Regional and National Park is characterised by river red gum forests, which, together with the Barmah National Park form Australia's largest area of river red gum forest.

The Murray Valley system, along with the Koondrook Forests and Werai Forests to the west of the Project Site form the NSW Central Murray Forests RAMSAR site.



Deniliquin Ethanol Plant
Environmental Impact Statement

FIGURE 8.1
Interim Biogeographical Regionalisation for Australia (IBRA) Region

DATUM GDA 1994, PROJECTION MGA ZONE 55

0 50 100 150
Kilometres

LEGEND

- Cities / Towns (selection)
- Project Site
- State Boundary

Riverina Interim Biogeographical Regionalisation for Australia (IBRA) Region

- AA, Australian Alps
- BBS, South Brigalow
- BHC, Broken Hill Complex
- CHC, Channel Country
- CP, Cobar Peneplain
- DRP, Darling Riverine Plains
- MDD, Murray-Darling Depression
- ML, Mulga Lands
- NAN, Nandewar
- NET, New England Tableland
- NNC, NSW North Coast
- NSS, NSW SouthWestern Slopes
- RIV, Riverina
- SB, Sydney Basin
- SEC, South East Corner
- SEH, South Eastern Highlands
- SSD, Simpson-Strzelecki Dunefields

Data Sources:
1. Roads, Railway, Parks, Drainage, Suburbs: @ Street Pro, 2011
2. Base Map Layer: Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community
3. NSW Interim Biogeographic Regionalisation of Australia (IBRA), Version 4.1 @ Office of Environment and Heritage (OEH) 2012-11-21

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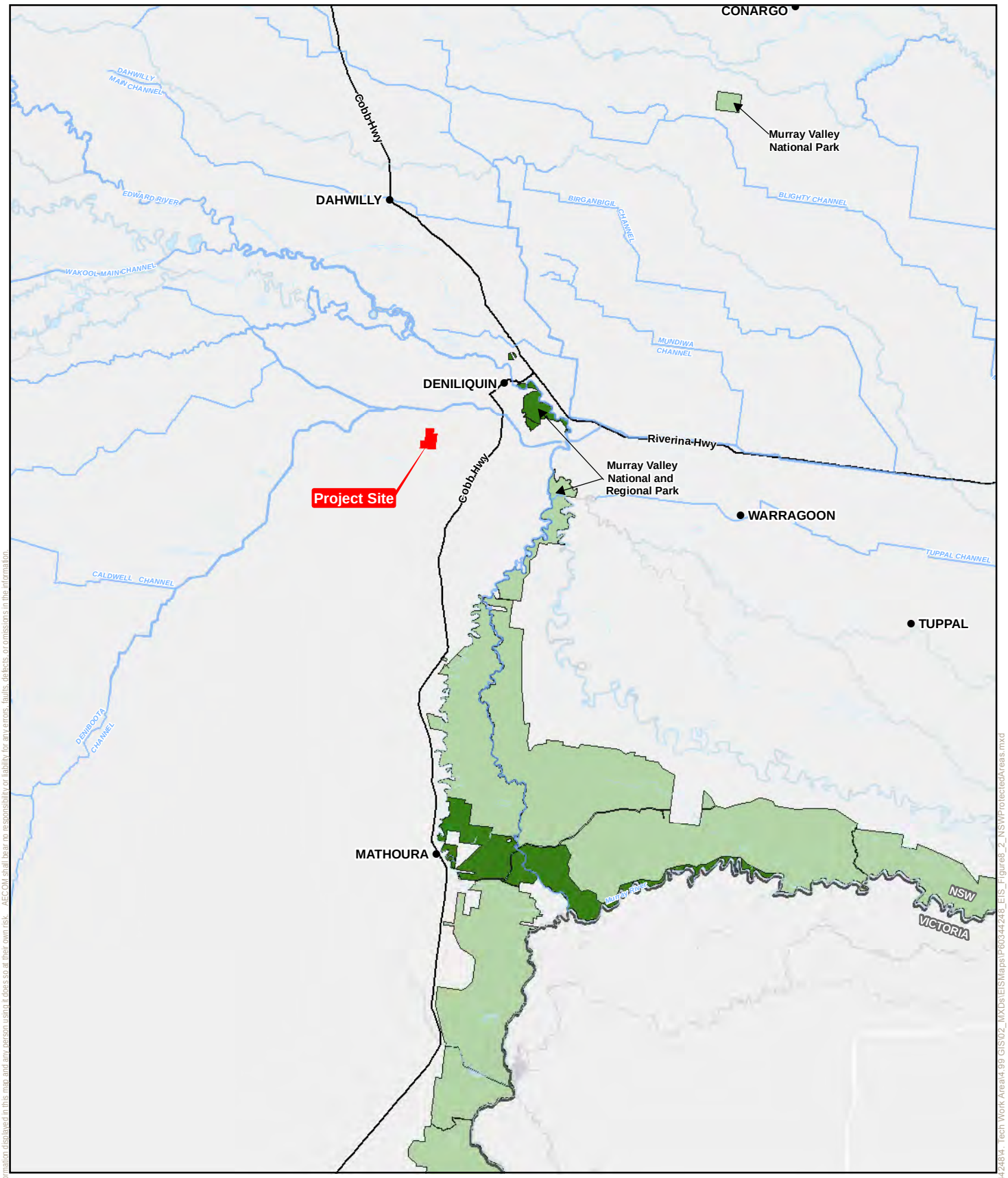
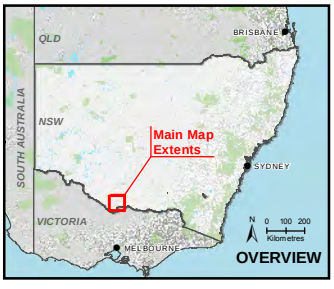
Document Path: \\aubne1fp003\Projects\603X\60344248\4. Tech Work Area\4.99 GIS\02_MXDs\EISMaps\P60344248_EIS_Figure8_1_IBRARegion.mxd

A4 size

NSW Protected Areas





LEGEND

- Locality
- Major River / Watercourse
- Minor Watercourse
- Highway; Freeway
- Project Site
- State Boundary

NSW Protected Areas

- Regional Park
- National Park
- Nature Reserve

Data Sources:
1. Roads, Railway, Parks, Drainage, Suburbs: @ Street Pro, 2011
2. Base Map Layer: Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community
3. Parks and Reserves: An area of land, the boundaries of which have been determined by the Governor by proclamation in the Government Gazette, which has been reserved for various protection purposes defined in instruments administered by Department of Environment and Climate Change (Parks & Wildlife Division).

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DATUM GDA 1994, PROJECTION MGA ZONE 55

N 0 2.5 5 7.5
Kilometres

FIGURE 8.2

A4

8.4 Terrestrial flora

8.4.1 NSW vegetation

NSW vegetation mapping for the Project Site and surrounds is provided as Figure 8.3 (Vegetation Classes of NSW V 3.03) (Keith and Simpson 2011). The mapping shows that the Project Site and surrounds is 'Cleared' vegetation. Vegetation formation and classes mapped within 5 km of the Project Site include:

- semi-arid woodland (grassy) formation, Inland Floodplain woodland class
- arid shrubland (chenopod) formation, Riverine chenopod shrublands class
- forested wetlands formation, Inland riverine forests class
- grassland formation, Riverine plain grassland class.

8.4.2 Field verified plant communities and condition

The field survey identified four native plant communities as well as areas of non-native vegetation within the Project Site. The distribution of plant communities across the Project Site is illustrated on Figure 8.4 and the plant communities and their condition are described as follows:

1) **Plant Community 1 (PC1)** (101.1 ha) - Derived native tussock grassland of *Enteropogon ramosus*, *Chloris truncata*, *Rytidosperma* spp. and *Austrostipa* spp. on orange-brown clay loam plains (Plate 8.1).

- *Condition* – 'Poor': The grassland has been subject to multiple disturbances including clearing, grazing, irrigation and the cultivation of wheat (refer to Chapter 18 Cultural heritage). These disturbances have resulted in low native species richness (11 species in best condition grassland site G2, Figure 8.4) and the presence of introduced species (15-20 percent cover).

2) **Plant Community 2 (PC2)** (1.3 ha) - Woodland of *Eucalyptus largiflorens* over open shrubland of **Lycium ferocissimum* over grassland of *Poaceae* sp. (new annual grass) and *Cyperus* sp. with scattered tussocks of *Enteropogon ramosus* (Plate 8.2).

- *Condition* – 'Poor': tree layer present, but very poor tree structural diversity, with no native mid to lower tree or shrub strata, and a ground layer dominated by weedy annual grasses. The noxious weed African boxthorn (*Lycium ferocissimum*) was recorded as the only shrub layer. The understorey has been heavily grazed by rabbits and macropods.

3) **Plant Community 3 (PC3)** (2.2 ha) - Open sedgeland of *Eleocharis pusilla* and *Juncus* sp., with scattered *Enchylaena tomentosa* and *Sclerolaena muricata* (Plate 8.3).

- ***Condition*** – 'Poor': This community has low species diversity (two main sedge species) with up to 20 percent weed cover. This community also recorded the noxious weed *Xanthium spinosum.* The area has been grazed and subject to multiple past disturbances.

4) **Plant Community 4 (PC4)** (1.8 ha) - Low open forest of *Eucalyptus camaldulensis* (regrowth) over grass and herb land of **Romulea rosea* and *Einadia nutans* (Plate 8.4).

- *Condition* – 'Poor' to 'Very Poor': The regrowth (5-7 m) *Eucalyptus camaldulensis* woodland retains little structural diversity, and has an understorey dominated by exotic grass and forb species. A high level of grazing was observed.

5) **Non-native** (10.5 ha) - Areas that retain no, or limited native species, including clearing around the dam and house.

- *Condition* – 'Very Poor': No, or scattered native species, with a vegetation structure that has been entirely modified or destroyed.

The survey confirmed that the Project Site has been almost entirely cleared of woody vegetation, excluding a small patch of black box (*Eucalyptus largiflorens*) woodland within the centre of the site (PC2) and a small patch of regrowth river red gum (*Eucalyptus camaldulensis*) in the south western corner of the site (PC4). The remaining areas within the Project Site are composed of predominately native, derived grasslands (PC1) and a small depression, which is dominated by the sedge species *Eleocharis pusilla* and *Juncus sp*. (PC3). The derived grasslands, which cover the majority of the Project Site, are dominated by *Enteropogon ramosus*, *Chloris truncata*, *Rytidosperma spp*., and *Austrostipa spp*., with non-native grass species *Lolium rigidum* and *Hordeum leporinum*. Field survey data collected is located in Appendix J Flora and Fauna Field Survey Results.

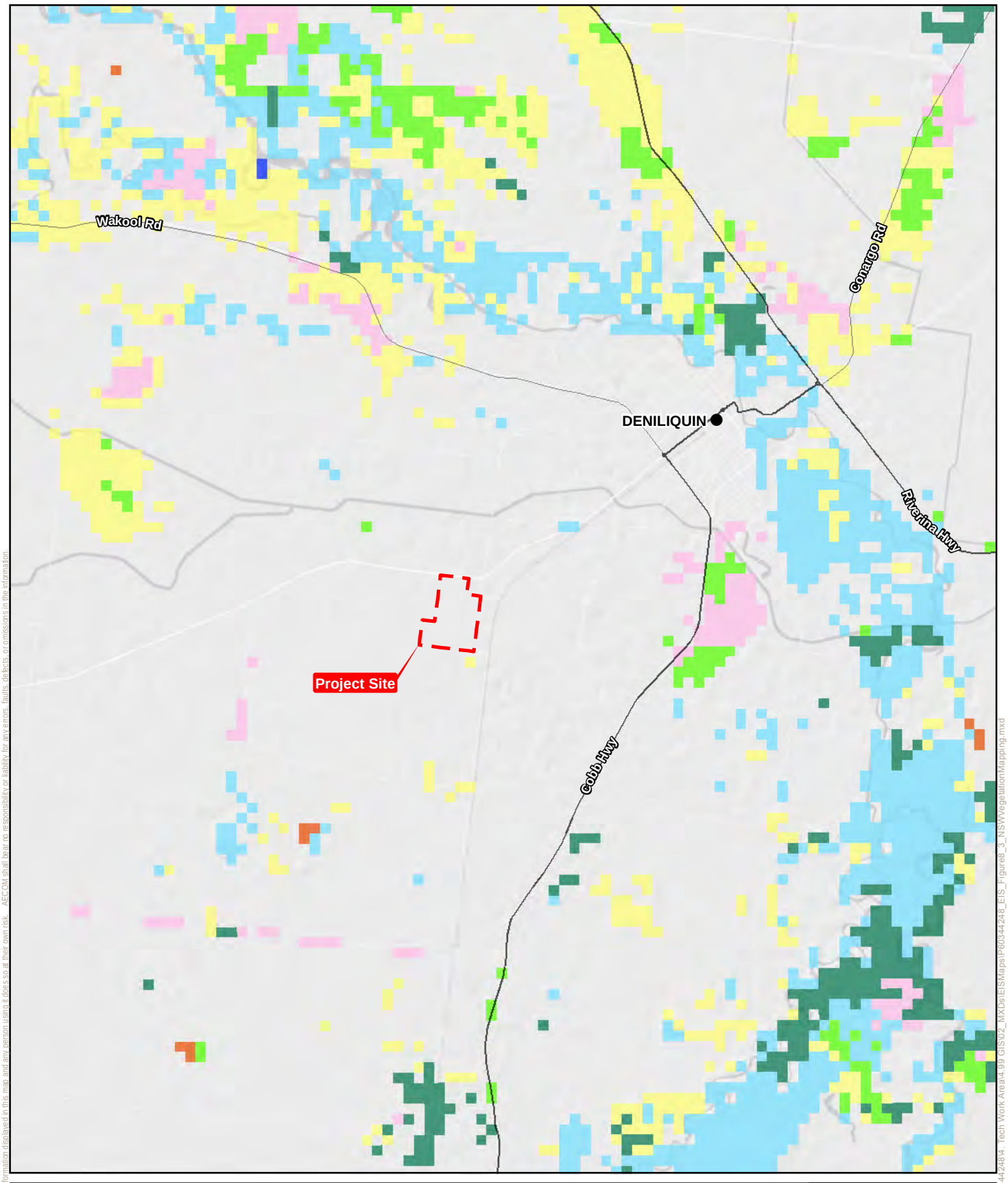
Plate 8.1 Plant Community 1 (PC1): Derived native tussock grassland

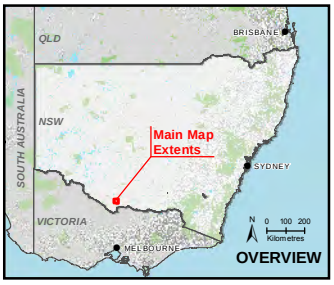
Plate 8.2 Plant Community 2 (PC2): Woodland of *Eucalyptus largiflorens*

Plate 8.3 Plant Community 3 (PC3): Open sedgeland of *Eleocharis pusilla* and *Juncus* sp.

Plate 8.4 Plant Community 4 (PC4): Low open forest of *Eucalyptus camaldulensis* (regrowth)

NSW Vegetation Mapping





LEGEND

- Project Site

NSW Vegetation Formations

- Alpine complex
- Arid shrublands (Chenopod subformation)
- Forested wetlands
- Freshwater wetlands
- Grasslands
- Grassy woodlands
- Semi-arid woodlands (Grassy subformation)
- Semi-arid woodlands (Shrubby subformation)

Data Sources:
1. Roads, Railway, Parks, Drainage, Suburbs: © Street Pro, 2011
2. Canvas/World_Light_Gray_Base: Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community
3. Vegetation Formations of NSW (version 3.0 - 200M RASTER): Published 2012-06-06, Office of Environment and Heritage (OEH) NSW

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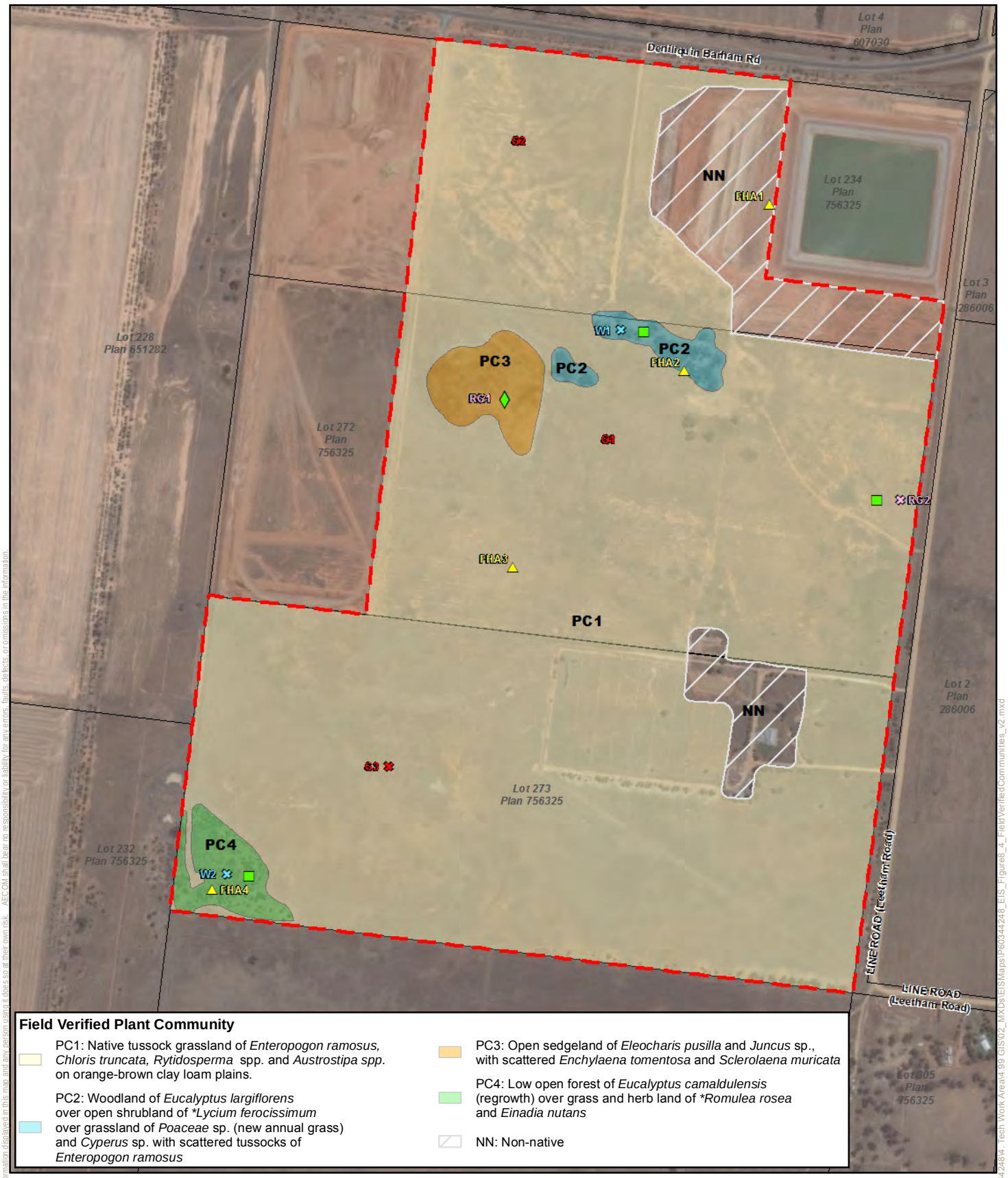
DATUM GDA 1994, PROJECTION MGA ZONE 55

N 0 0.5 1 1.5 Kilometres

FIGURE 8.3

A4

Field Verified Plant Communities, Flora and Fauna Survey Locations



Field Verified Plant Community

- PC1: Native tussock grassland of *Enteropogon ramosus, Chloris truncata, Rytidosperma* spp. and *Austrostipa spp.* on orange-brown clay loam plains.
- PC2: Woodland of *Eucalyptus largiflorens* over open shrubland of **Lycium ferocissimum* over grassland of *Poaceae* sp. (new annual grass) and *Cyperus* sp. with scattered tussocks of *Enteropogon ramosus*
- PC3: Open sedgeland of *Eleocharis pusilla* and *Juncus* sp., with scattered *Enchylaena tomentosa* and *Sclerolaena muricata*
- PC4: Low open forest of *Eucalyptus camaldulensis* (regrowth) over grass and herb land of **Romulea rosea* and *Einadia nutans*
- NN: Non-native

LEGEND

- Fauna Habitat Locations
- Cadastral Boundaries
- Project Site

Flora Survey Location

- Detailed Grassland
- Rapid Grassland
- Detailed Woodland

Weed Species

- African Boxthorn
- Bathurst Burr

Data Sources:
1.Imagery: © 2015 DigitalGlobe © 2015 GeoEye Earthstar Geographics SIO © 2015 Microsoft Corporation
2. Roads, Railway, Drainage, Suburbs, Parks, Localities: @ Street Pro, 2011
3. Key Map Base Layer: ESRI Online
4. Site Boundary: based on CAD Drawingd prepared by DONGMUN I.R.S. Co. Ltd.
5. Environmental Data: AECOM, 2015

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DATUM GDA 1994, PROJECTION MGA ZONE 55

N 0 50 100 150 Metres

FIGURE 8.4

A4

8.4.3 State threatened ecological communities

Five Threatened Ecological Communities (TECs) listed under the TSC Act were identified on the 'BioNet' search tool (OEH, 2015), as occurring or potentially occurring within 20 km of the Project Site (refer to Appendix H Flora and Fauna Desktop Searches for further detail). These communities are:

- *Acacia melvillei* shrubland of the Riverina and Murray-Darling Depression Bioregions
- *Allocasuarina luehmannii* woodland in the Riverina and Murray-Darling Depression Bioregions
- Inland Grey Box Woodland in the Riverina, NSW South Western slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions
- Myall woodland in the Darling Riverine Plains, Brigalow Belt south, Cobar Peenplain, Murray Darling Depression, Riverina and NSW South Western Slopes Bioregions
- Sandhill Pine Woodland in the Riverina, Murray – Darling Depression and NSW South Western Slopes Bioregions.

The plant communities identified in the Project Site consist of black box woodlands, regrowth river red gum woodland and derived native grasslands, and do not correspond to the five TECs identified.

8.4.4 Commonwealth threatened ecological communities

Six TECs listed under the EPBC Act were identified using the PMST (DoE, 2015) as occurring or potentially occurring within 15 km of the Project Site (Appendix H Flora and Fauna Desktop Searches). Based on the field survey and referencing the structural and floristics attributes and formal condition thresholds of the approved Federal listing advice, the plant communities within the Project Site have been assessed and are not considered to represent any of the EPBC Act listed TECs. Refer to Appendix I Flora and Fauna Likelihood Assessments for the full assessment.

8.4.5 Flora

A total of 39 flora species from 33 genera and 15 families were identified during the field survey undertaken in June 2015. The dominant plant families identified were Poaceae (10 taxa), Chenopodiaceae (8 taxa) and Asteraceae (6 taxa). Of the 39 flora species identified, 28 were native species and 11 non-native. Refer to Appendix J Flora and Fauna Field Survey Results for a full species list.

8.4.6 Threatened flora

No threatened flora species were identified during the field survey. Database searches were conducted using the 'BioNet', 'Atlas of Living Australia' and PMST (OEH, 2015; ALA, 2015; DoE, 2015) and the results of these searches identified eight threatened flora species occurring or potentially occurring within a 10 - 20 km radius of the Project Site (refer to Appendix H Flora and Fauna Desktop Searches for further detail).

The location of the threatened species database records are provided on Figure 8.5 and a likelihood assessment, using the criteria described in Section 8.2.4, was undertaken for these species (Refer to Appendix I Flora and Fauna Likelihood Assessments for the full assessment). It has been determined that five species have a 'Low' chance of occurring within the Project Site, while the remaining three species are 'Unlikely'. The species with 'Low' likelihoods are:

- Mossgiel daisy (*Brachyscome papillosa*)
- Winged peppercress (*Lepidium monoplocoides*)
- Chariot wheels (*Maireana cheelii*)
- Slender Darling pea (*Swainsona murrayana*)
- Silky Swainson-pea (*Swainsona sericea*).

While records of the above five species have been identified in the local area (Figure 8.5), these records date back to the 1940-1970s with no recent sightings of these species identified. In addition, these species are largely grassland species, and while grassland does occur across the Project Site, it is in a 'Poor' condition, and has been subject to multiple disturbances, including grazing and cropping, which significantly reduces the likelihood that these species occur within the Project Site. Thus they have been assigned a 'Low' likelihood of occurrence.

8.4.7 Flora species of other significance

All of the flora species identified within the Project Site are common NSW species that occur well within their known distribution ranges.

8.4.8 Noxious and environmental weeds

Noxious weeds are declared under the NW Act. Under this Act landholders must control these weeds in certain areas, dependent on their Control Class. Two declared noxious weed species within NSW were observed onsite. These species are:

- African boxthorn (*Lycium ferocissimum*) (Class 4)
- Bathurst burr (*Xanthium spinosum*) (Class 4).

These species were recorded at low densities, and their locations are shown on Figure 8.4. A Class 4 weed means they are a locally controlled weed, and the growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed. African boxthorn is also listed as a weed of national significance (WONS).

8.4.9 Connectivity

The Project Site has been extensively cleared and sits within an extensively cleared agriculture landscape and as such does not retain significant connectivity within the landscape. Within an approximate 5 km radius of the Project Site, the only woody vegetation remaining is widely scattered trees and sparse vegetation in road and rail verges (Figure 8.3). Therefore limited connectivity of vegetation occurs between the Project Site and surrounding landscape.

The closest remaining significant patches of vegetation occur around the Edward River Floodplain and the Murray Valley National Park. These riverine corridors represent significant regional corridors through the wider landscape.

8.5 Terrestrial fauna

8.5.1 Fauna habitat and condition

Four distinct fauna habitat areas were identified during the assessment, located at fauna sites FHA1-FHA4 (refer to Figure 8.4). Field data and detailed habitat descriptions are provided as Appendix J Flora and Fauna Field Survey Results.

The Project Site is heavily degraded and is predominantly agricultural land used for grazing. Due to the historic clearance of large woody vegetation throughout the entire Project Site, ecological values were mostly confined to the grass and rush ground-layers and mature scattered trees.

8.5.2 Critical habitat

No areas of critical habitat under Sections 53-55 of the TSC Act occur within or within close proximity of the Project Site.

8.5.3 Koala habitat

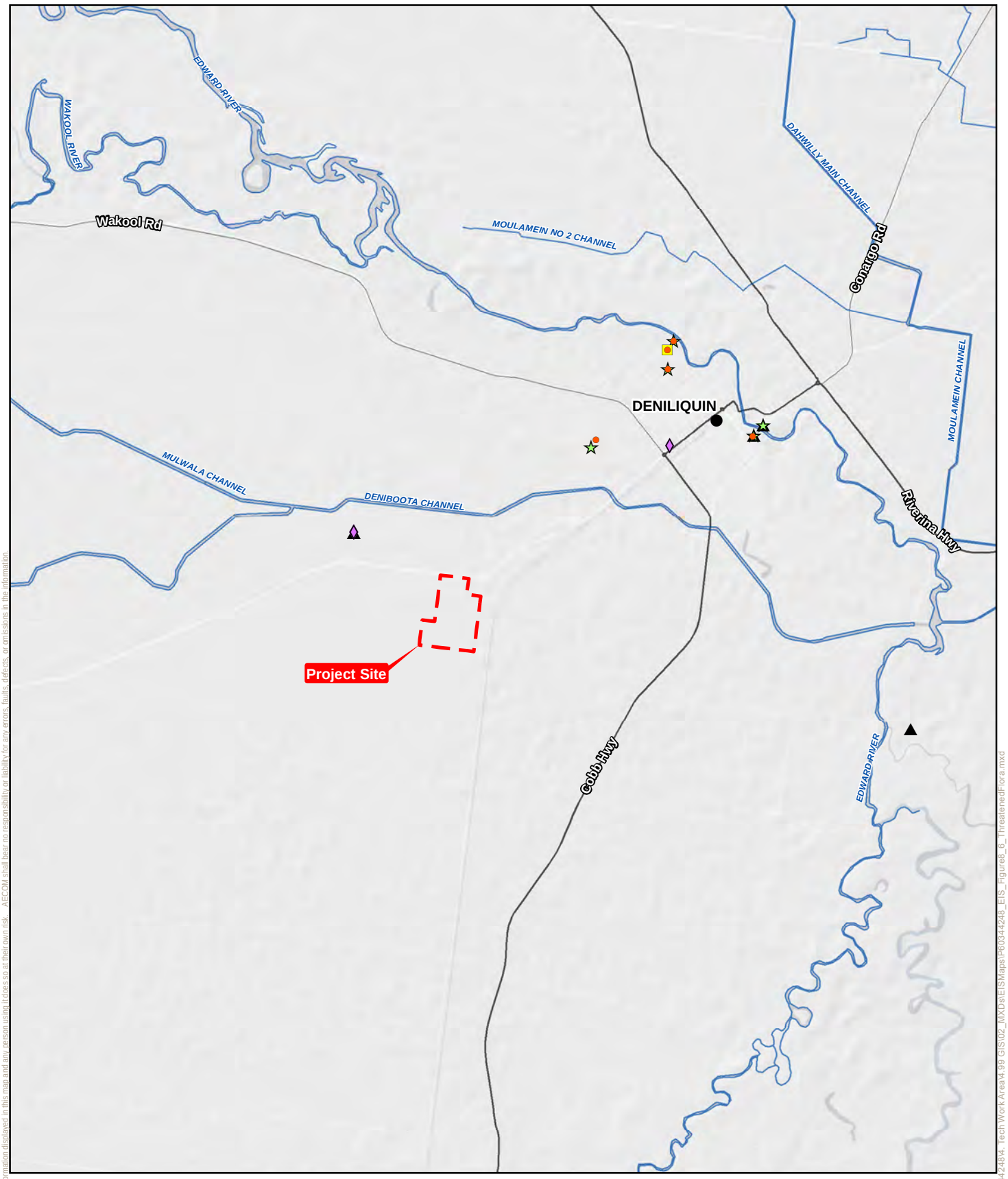
The *State Environmental Planning Policy No 44 – Koala Habitat Protection* (SEPP No 44) defines 'core koala habitat' and 'potential koala habitat' as follows:

- 'Core koala habitat' is defined as an area of land with a resident population of Koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population.
- 'Potential koala habitat' is defined as areas of native vegetation where the tree species listed in Schedule 2 of the policy constitute at least 15 per cent of the total number of trees in the upper or lower strata of the tree component and where the area of native vegetation is equal to or greater than one hectare.

The field survey did not observe any koala's onsite and no records of koala occur within close proximity of the Project Site (Figure 8.6). The only plant community onsite that has appropriate koala feed tree species (as listed in Schedule 2 of SEPP No. 44), and thus could sustain koalas is PC4 - Low open forest of *Eucalyptus camaldulensis* (regrowth) over grass and herb land of **Romulea rosea* and *Einadia nutans.* This community type covers an area of 1.8 ha and is a regrowth community.

Based on the definitions above, no 'core koala habitat' occurs within the Project Site, however, plant community PC4 would be considered 'potential koala habitat'.

Threatened Species Records - Flora



LEGEND

- Locality
- Major River / Watercourse
- Minor Watercourse
- Project Site

Threatened Species Records - Flora

- Chariot Wheels
- Mossgiel Daisy
- Silky Swainson-pea
- Slender Darling Pea
- Winged Peppercress

Data Sources:
1. Roads, Railway, Parks, Drainage, Suburbs: @ Street Pro, 2011
2. Canvas/World_Light_Gray_Base: Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community
3. Threatened Flora: based on BioNet, 2015 and Atlas of Living Australia, 2015

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DATUM GDA 1994, PROJECTION MGA ZONE 55

N 0 0.5 1 1.5 Kilometres

FIGURE 8.5

A4

8.5.4 Fauna

A total of 31 fauna species were recorded during the field survey, including five mammals and 26 birds (refer to Appendix J Flora and Fauna Field Survey Results for a full species list). The fauna species recorded within the Project Site are those species that are capable of traversing and persisting within a modified agricultural landscape. Such species are necessarily tolerant of disturbance, and are typically common and widespread.

8.5.5 Threatened and migratory fauna

No threatened or migratory fauna species were recorded during the field survey. Database searches were conducted using the 'BioNet', 'Atlas of Living Australia' and PMST (OEH, 2015; ALA, 2015; DoE, 2015), and the results of these searches identified 56 threatened and migratory fauna species occurring, or potentially occurring within a 10 - 20 km radius of the Project Site (refer to Appendix H Flora and Fauna Desktop Searches for futher detail). The 56 fauna species comprise of:

- Six mammals
- 45 birds
- Four fish
- One amphibian.

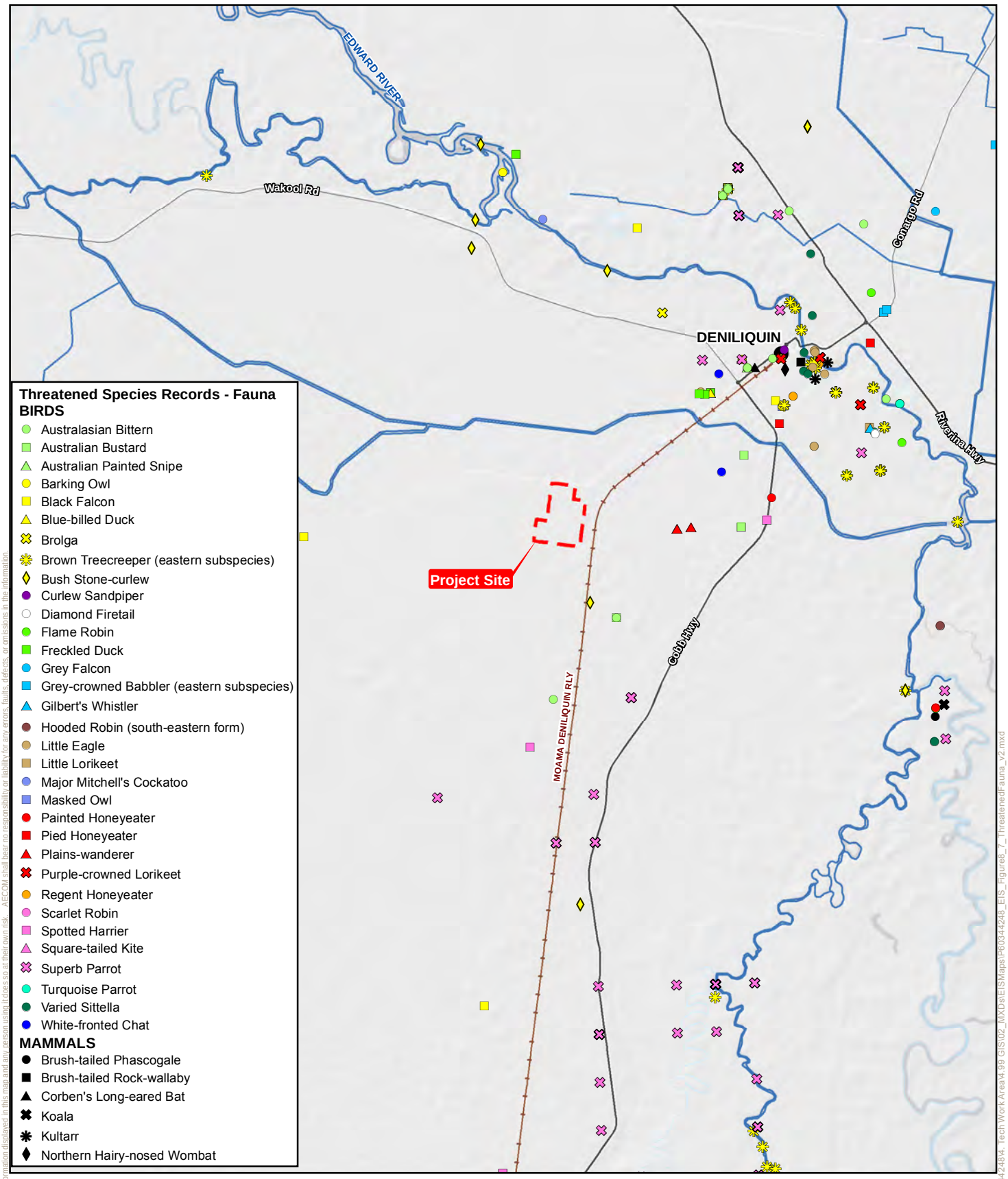
This list includes thirteen birds that are migratory species, two of which are also listed as 'Endangered' under the EPBC Act. The full list of species and the likelihood assessment are located in Appendix I Flora and Fauna Likelihood Assessments. The location of threatened species records (from the searches that provide locational data) are shown on Figure 8.6.

Of the 56 threatened and migratory species identified, the majority have an 'Unlikely' or 'Low' likelihood of occurring within the Project Site. Only one species, the plains wanderer (*Pedionomus torquatus*), was considered to have a 'Moderate' likelihood of occurrence within the Project Site, based on areas of suitable habitat present within the Project Site (refer to Appendix I Flora and Fauna Likelihood Assessments for further detail). A detailed species profile of the plains wanderer is provided in Appendix K Plains Wanderer Impact Assessment.

8.5.6 Pest species

Two pest species, the European fox and the European rabbit were observed at fauna habitat sites FHA1 and FHA2 during the field survey. The European fox is likely to be impacting on local small-medium sized ground-dwelling vertebrates. The presence of exotic pests compounds impacts on native animal survivorship in the fragmented and degraded habitat through resource competition and further reducing habitat suitability for native species.

Threatened Species Records - Fauna



Threatened Species Records - Fauna

BIRDS

- Australasian Bittern
- Australian Bustard
- Australian Painted Snipe
- Barking Owl
- Black Falcon
- Blue-billed Duck
- Brolga
- Brown Treecreeper (eastern subspecies)
- Bush Stone-curlew
- Curlew Sandpiper
- Diamond Firetail
- Flame Robin
- Freckled Duck
- Grey Falcon
- Grey-crowned Babbler (eastern subspecies)
- Gilbert's Whistler
- Hooded Robin (south-eastern form)
- Little Eagle
- Little Lorikeet
- Major Mitchell's Cockatoo
- Masked Owl
- Painted Honeyeater
- Pied Honeyeater
- Plains-wanderer
- Purple-crowned Lorikeet
- Regent Honeyeater
- Scarlet Robin
- Spotted Harrier
- Square-tailed Kite
- Superb Parrot
- Turquoise Parrot
- Varied Sittella
- White-fronted Chat

MAMMALS

- Brush-tailed Phascogale
- Brush-tailed Rock-wallaby
- Corben's Long-eared Bat
- Koala
- Kultarr
- Northern Hairy-nosed Wombat

LEGEND

- Locality
- Major River / Watercourse
- Minor Watercourse
- Railway
- Project Site

Data Sources:
1. Roads, Railway, Parks, Drainage, Suburbs: @ Street Pro, 2011
2. Base Map Layer: Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community
3. Threatened Fauna: based on BioNet, 2015 and Atlas of Living Australia, 2015

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DATUM GDA 1994, PROJECTION MGA ZONE 55

N 0 1 2 3 Kilometres

FIGURE 8.6

A4

8.6 Aquatic ecology

8.6.1 Wetlands and waterways

No permanent wetlands or waterways occur within the Project Site (Figure 8.7). The closest waterway is the Edward River, which occurs approximately 5 km to the north of the Project Site.

8.6.2 Aquatic habitat

Due to the lack of wetlands and waterways within the Project Site, no fish or fish habitat as defined in the *Policy and guidelines for fish habitat conservation and management* (DPI 2013 update) occur within the Project Site.

8.6.3 Internationally important wetlands

A search of the PMST identified that the Project Site occurs within the wider NSW Central Murray State Forests RAMSAR site. This RAMSAR site is located on the floodplain of the Murray River, and comprises three geographically distinct but interrelated units: the Murray Valley National Park and Murray Valley Regional Park (Millewa Forest), Werai Forests, and Koondrook – Perricoota Forests (Figure 8.7).

The Project Site does not occur within any of the boundaries of these three wetlands, with the closest wetland to the Project Site being the Murray Valley National and Regional Park, 8 km to the east, south east.

8.6.4 Nationally important wetlands

Nationally Important Wetlands are wetlands that have been listed in the *Directory of Important Wetlands in Australia* (DWA). No Nationally Important Wetlands occur within the Project Site. The closest nationally important wetland is Millewa Forest. The Project Site is downstream of these wetlands and no watercourses occurring within, or affected by, the Project are connected to this nationally important wetland.

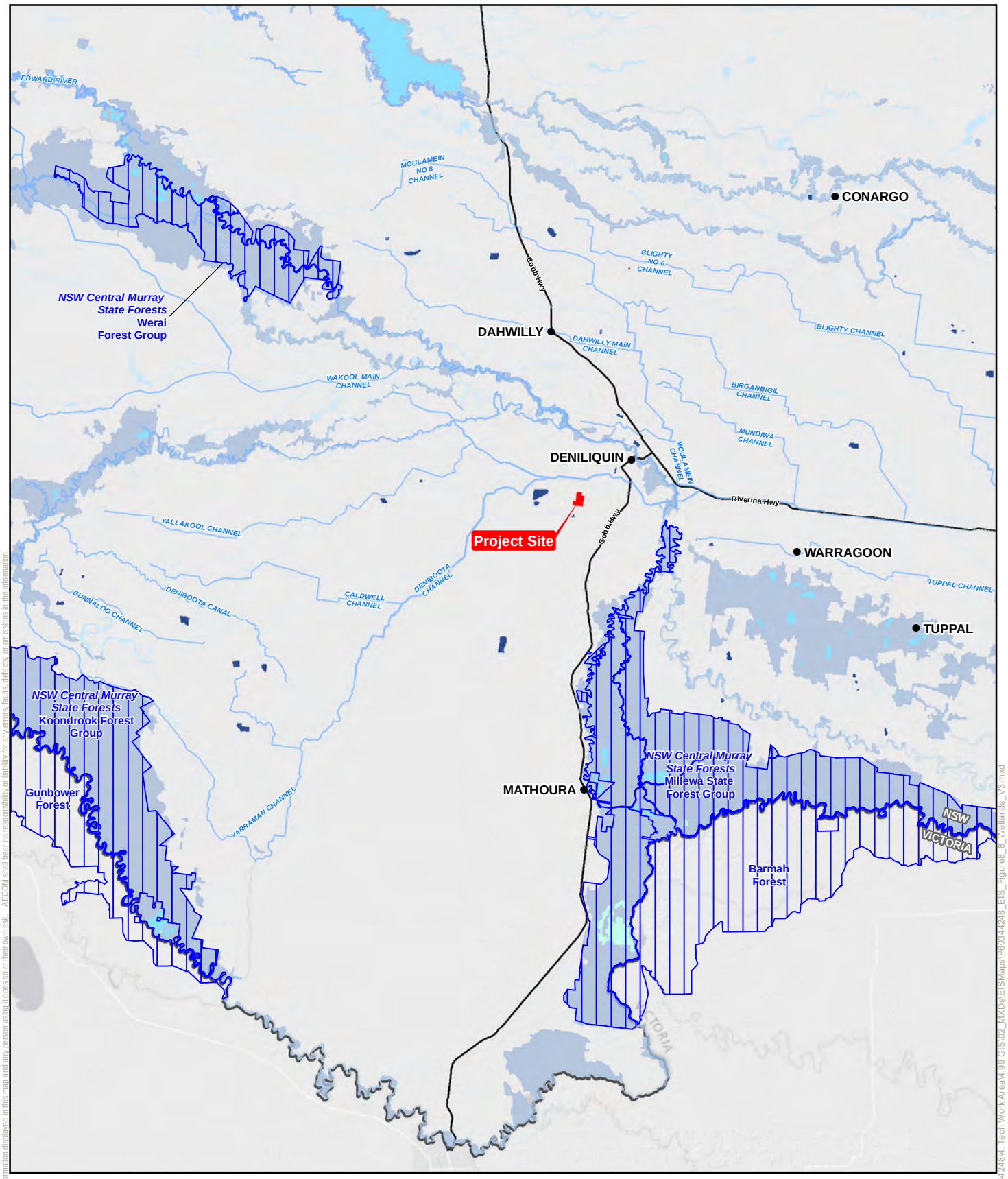
8.6.5 Groundwater dependant ecosystems

Groundwater dependant ecosystems are defined as: '*ecosystems which require access to groundwater 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, 2011).

Reference to Schedule 4 of the Water Sharing Plan for the Murray Unregulated and Alluvial Water Sources (accessed 12 May 2015), which includes the Deniliquin area and Project Site, indicates there are no high priority Groundwater dependant ecosystems within the Schedule.

There is no extensive alluvium deposits mapped for the Project Site, which indicates that the Project Site does not constitute one of the five broad groundwater systems associated with Groundwater dependant ecosystems as defined within the NSW State Groundwater Dependent Ecosystem Policy (DLWC, 2002). In addition, no significant waterways or water bodies are present within the Project Site. Based on the underlying geology of the Project Site and the lack of wetlands and waterways, it is concluded that there are no terrestrial or surface expression (e.g. wetland/base-flow) Groundwater dependant ecosystems within the Project Site or in close proximity.

Wetlands and Waterways



LEGEND

- Locality
- Major River / Watercourse
- Minor Watercourse
- Highway; Freeway
- Project Site
- State Boundary
- RAMSAR Wetlands

NSW Wetlands

- Floodplain Wetland
- Freshwater Lake
- Non-Wetland
- Reservoir

Data Sources:

1. Roads, Railway, Parks, Drainage, Suburbs: @ Street Pro, 2011
2. Base Map Layer: Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community
3. Parks and Reserves: An area of land, the boundaries of which have been determined by the Governor by proclamation in the Government Gazette, which has been reserved for various protection purposes defined in instruments administered by Department of Environment and Climate Change (Parks & Wildlife Division).

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DATUM GDA 1994, PROJECTION MGA ZONE 55

N 0 2.5 5 7.5 Kilometres

FIGURE 8.7

A4

8.7 Assessment of potential construction impacts

The Project has the potential to impact on biodiversity values of the Project Site during the site preparation and construction phase of the Project.

8.7.1 Flora

Site preparation and construction activities may give rise to impacts to flora including:

- removal of native vegetation
- potential removal of threatened flora species
- spread of weeds

Removal of native vegetation

In total the Project Footprint is 25.6 ha in size. Within this footprint, the Project would require the removal of 17.8 ha of 'Poor' condition native vegetation, (refer to Figure 8.8), which would consist of:

- 17.3 ha of 'Poor' condition derived native grassland (PC1)
- 0.5 ha of 'Poor' condition black box woodland (PC2)

These plant communities are not identified as TECs. The removal of native vegetation would be undertaken in accordance with a vegetation management plan as part of the CEMP and would be contained to the Project Footprint (refer to Section 8.9). Significant impacts to native vegetation are not considered to occur from the Project.

Removal of threatened flora

No threatened flora species were recorded within the Project Site during the field survey. Based on the likelihood assessment (Appendix I Flora and Fauna Likelihood Assessments), there is a 'Low' chance that five threatened species occur within the Project Site. These species are:

- Mossgiel daisy (*Brachyscome papillosa*) (TSC V, EPBC V)
- Winged peppercress (*Lepidium monoplocoides*) (TSC E, EPBC E)
- Chariot wheels (*Maireana cheelii*) (TSC V, EPBC V)
- Slender Darling-pea (*Swainsona murrayana*) (TSC V, EPBC V)
- Silky Swainson-pea (*Swainsona sericea*) (TSC V).

If present, the appropriate habitat for these species would be the grassland plant community (PC1), of which 17.3 ha in 'Poor' condition would be removed. A 'Low' likelihood does not trigger the need to undertake an impact assessment under the TSC Act or EPBC Act. Pre-clearance surveys would be undertaken prior to the site preparation phase during spring to confirm that these species do not occur within the Project Site (refer to Section 8.9).

Spread of weeds

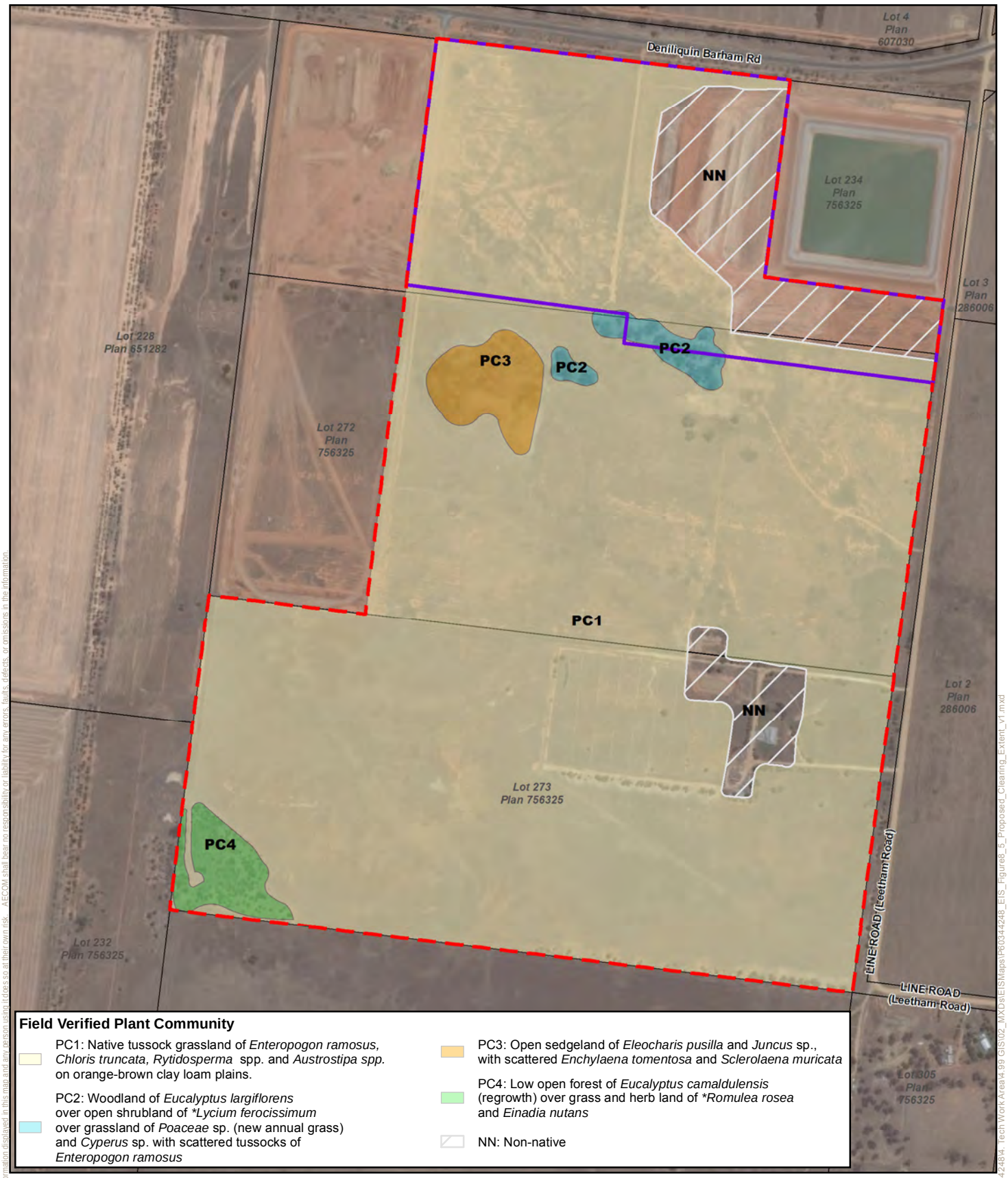
During the construction phase, vehicle and human movement, soil disturbance, soil movement and the transportation of materials are all activities that increase the risk of dispersal or introduction of weeds. Two noxious weed species have been identified within the Project Site (refer to Figure 8.3), these are:

- African boxthorn (*Lycium ferocissimum*)
- Bathurst Burr (*Xanthium spinosum*).

Both are Class 4 weeds under the *Noxious Plant Act*, and the control requirements for Class 4 weeds are that "*the growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread*".

The management of these known noxious weeds will be undertaken through the preparation and implementation of a weed management plan (refer to Section 8.9).

Proposed Clearing Extent



Field Verified Plant Community

- PC1: Native tussock grassland of *Enteropogon ramosus, Chloris truncata, Rytidosperma* spp. and *Austrostipa spp.* on orange-brown clay loam plains.
- PC2: Woodland of *Eucalyptus largiflorens* over open shrubland of **Lycium ferocissimum* over grassland of *Poaceae* sp. (new annual grass) and *Cyperus* sp. with scattered tussocks of *Enteropogon ramosus*
- PC3: Open sedgeland of *Eleocharis pusilla* and *Juncus* sp., with scattered *Enchylaena tomentosa* and *Sclerolaena muricata*
- PC4: Low open forest of *Eucalyptus camaldulensis* (regrowth) over grass and herb land of **Romulea rosea* and *Einadia nutans*
- NN: Non-native

LEGEND

- Cadastral Boundaries
- Project Site
- Project Footprint

Data Sources:
1.Imagery: © 2015 DigitalGlobe © 2015 GeoEye Earthstar Geographics SIO © 2015 Microsoft Corporation
2. Roads, Railway, Drainage, Suburbs, Parks, Localities: @ Street Pro, 2011
3. Key Map Base Layer: ESRI Online
4. Site Boundary: based on CAD Drawingd prepared by DONGMUN I.R.S. Co. Ltd.
5. Environmental Data: AECOM, 2015

AECOM
www.aecom.com

DATUM GDA 1994, PROJECTION MGA ZONE 55

N 0 50 100 150 Metres

FIGURE 8.8

A4

8.7.2 Fauna

Site preparation and construction activities may give rise to impacts to fauna including:

- habitat loss
- habitat fragmentation
- fauna mortality
- fauna disturbance.

Habitat loss

Habitat loss or 'land clearing' is listed as a key threatening process under the EPBC Act. The Project would require the removal of 17.8 ha of fauna habitat, which includes:

- 17.3 ha of grassland (PC1)
- 0.5 ha of black box woodland (PC2).

These habitats are not listed as 'critical habitat' under the TSC Act and mostly host a suite of common species typical of disturbed habitats (refer to Appendix J Flora and Fauna Field Survey Results for further detail). 'Potential koala habitat' has been identified within the Project Site, represented by plant community PC4 (Figure 8.4). Plant community PC4 does not occur within the Project Footprint and as such would not be impacted by the Project.

One threatened fauna species, the plains wanderer, was identified as having a 'Moderate' chance of utilising the Project Site (refer to Section 8.5.5, Appendix I Flora and Fauna Likelihood Assessments) and as an expanded literature review of the plains wanderer was undertaken in association with a 7-part test and an EPBC Act significant impact assessment. This assessment is documented in Appendix K Plains Wanderer Impact Assessment.

The 7-part test concluded that given the sedentary nature of the species and the low abundance estimate of the local population, that the Project could potentially have a significant impact on the local Deniliquin population of plains wanderer, through the removal of secondary habitat, particularly if primary habitat in the region becomes unsuitable. The removal of 17.3 ha of secondary habitat is deemed unlikely to significantly increase fragmentation of habitat within the region. Furthermore, it is considered unlikely that the Project will exacerbate current threats from predation (i.e. foxes) due to the existing establishment of these species and the Projects proximity to existing cropping land uses.

The EPBC Act significant impact assessment concluded that the Project is unlikely to significantly impact the Riverina population of the plains wanderer.

Based on these assessments, further actions are required under the state TSC Act and NSW Biodiversity Offsets Policy for Major Projects and are discussed further in Section 8.9. Under the EPBC Act, no further action is required, including a referral to the Minister for the Environment.

Habitat fragmentation

At a regional scale, the clearing of 17.8 ha of 'Poor' condition habitat within a highly cleared and fragmented agricultural landscape would not result in a significant increase in habitat fragmentation. At the Project Site scale, during preliminary design, the Project Footprint has been reduced in size from 68 ha to approximately 25.6 ha and has been designed to ensure habitat within the Project Site is not fragmented or isolated, with the infrastructure proposed to be situated at the northern extent of the Project Site. Therefore it is not expected that the Project would significantly increase habitat fragmentation at the local or regional scale.

Fauna mortality

Species that are common to disturbed habitats are generally highly mobile and are able to traverse fragmented patches of habitat within agricultural and urban landscapes. These species, with larger home ranges are typically mobile and are less susceptible to injury or loss. Site preparation and construction works may disturb these animals and may result in their movement away from the area of construction. Smaller animals such as reptiles and frogs, or arboreal mammals and birds (who reside in hollows) are more prone to hide during clearing.

A small number of black box trees, located within PC2 will require clearing for the Project Footprint. Clearance of these trees has the potential to impact arboreal vertebrates and nesting birds and mitigation measures would be implemented to reduce the risk of killing or injury to native fauna protected under the NPW Act as discussed in Section 8.9.

Fauna disturbance

Fauna disturbance through increased noise, vibration and light pollution is a temporary impact and would be actively managed through a species management plan (refer to Section 8.9 for further detail). Specifically any potential disturbance to the plains wanderer through the site preparation and construction phase will be addressed through a plains wanderer species management plan (refer to Section 8.8 for further detail).

8.8 Assessment of potential operational impacts

During the operations phase of the Project predominant impacts to flora and fauna may include direct and indirect effects such as:

- fauna mortality
- fauna disturbance
- spread of weeds.

8.8.1 Fauna mortality

The operation would involve the use of light and heavy vehicles within the Project Site. This use has the potential to result in 'road strike' and the injury or death of fauna. Slower moving species such as reptiles and nocturnal species that may be startled by vehicle lights (particularly species that are attracted to the road verge for foraging), may be most prone to such effects. The potential loss of individuals is not expected to be sufficient to have an impact at the local population level.

8.8.2 Fauna disturbance

Fauna disturbance from increased noise, vibration and light pollution would be actively managed through a species management plan (refer to Section 8.8 for further detail).

8.8.3 Spread of weeds

During the day to day running of the Project, human and vehicle movements would occur, increasing the risk of dispersal of weed species. The access roads and carparks within the Project Site would be sealed, with no off-road driving anticipated and weeds would be actively managed through a weed management plan (refer to Section 8.8 for further detail).

8.9 Mitigation measures

Using an impact management hierarchy, potential impacts must be avoided in the first instance, then reduced or minimised using mitigation measures where avoidance is not achievable. Environmental offsets are employed as a measure to address residual impacts. The proposed measures for managing potential impacts to flora and fauna on the Project Site have been classified into avoid, mitigate or offset categories below. Mitigation measures are described in Table 8.3.

Avoid:

- The design of the Project has been modified substantially to reduce the Project Footprint from 68 ha to 25.6 ha. This modification was implemented in an effort to reduce the extent of vegetation clearing to avoid potential impacts to the plains wanderer habitat. The layout of the Project also reduces fragmentation of habitat within the Project Site by collocating structures at the northern end of the Project Site.

Mitigate:

Table 8.3 Biodiversity mitigation measures

Impact	No.	Environmental management measure	Timing
Biodiversity			
Potential impacts to threatened flora	FF1	Pre-clearance surveys would be undertaken in spring for threatened flora species within the Project Site prior to any clearing activities.	Pre-commencement
Potential impacts to plains wanderer habitat. Potential disturbance too, or mortality of plains wanderer individuals or breeding pairs.	FF2	Pre-clearance surveys would be undertaken for plains wanderer and plains wanderer breeding places prior to any clearing activities.	Pre-commencement
Removal of native vegetation	FF3	A vegetation management plan would be prepared and include: - Clear delineation of clearing extent - How clearing is to be undertaken, e.g. timing, staging - How topsoil is to be handled and stored	Pre-commencement
Spread of weeds	FF4	A weed management plan would be prepared including: - Weed control and hygiene measures - Methods to remove African boxthorn and Bathurst burr would be removed from the Project Footprint pre-construction, and disposal protocols. - Weed hygiene procedures to be followed during the construction phase, with particular emphasis on limiting the spread or movement of the noxious weed species African boxthorn and Bathurst Burr. - Continued weed hygiene and monitoring procedures to be followed throughout the life of the Project.	Pre-commencement
Habitat loss Fauna disturbance Fauna mortality	FF5	A fauna management plan would be prepared addressing: - Supervision of the felling of hollow bearing trees and translocating permitted animals to approved sites by an experienced and licensed ecologist. - Staging of native vegetation clearance. - Felling of trees outside the main bird-nesting season i.e. winter months. - Implementation of appropriate speed limits and fencing. - Measures to reduce impacts from noise, light and vibration pollution.	Pre-commencement
Potential impacts to plains wanderer habitat. Potential disturbance too, or mortality of plains wanderer individuals or breeding pairs.	FF6	A plains wanderer species management plan would be prepared. The requirements within the plan would include but not be limited to: - Clearing extents within plains wanderer habitat would be clearly delineated to ensure no over-clearing occurs - Permanent lighting would be directed away from adjacent plains wanderer habitat - Efforts to minimise noise would be undertaken where possible (e.g. mufflers on machinery) - Staff training toolboxes would be delivered to	Pre-commencement

Impact	No.	Environmental management measure	Timing
		all staff associated with the clearing and management of plains wanderer habitat	
Removal of native vegetation. Habitat loss.	FF7	Landscaping would use native species where possible	Construction Phase

Offset:

- As potential exists for the Project to have a significant residual impact on the plains wanderer secondary habitat, offsets would be required and an offset strategy put in place. An offset strategy for the plains wanderer has been prepared and is provided as Appendix K Plains Wanderer Impact Assessment.

8.10 Offsets

The offset strategy prepared for the plains wanderer (refer to Appendix K Plains Wanderer Impact Assessment for further detail) complies with the NSW Biodiversity Offset Policy for Major Projects (OEH 2014) and follows the process set out in the Framework for Biodiversity Assessment (FBA). Under this strategy a range of options exist for the delivery of biodiversity offsets, which are:

- Land based offsets (offsite or onsite): secure additional plains wanderer habitat through a suitable legal instrument, ensuring the land is managed for conservation.
- Retirement of BioBanking credits: purchase an appropriate number of BioBanking threatened species credits under the NSW BioBanking scheme.
- Compensatory measure: investment into plains wanderer scientific research or education programs.

The following approval and offset delivery pathway for the implementation of an offset delivery plan and the delivery of suitable Project offsets is proposed for the Project:

1) Assess biodiversity impacts and determine the biodiversity offset requirements as per the FBA and BioBanking Assessment Methodology. While an indication of the residual impact to plains wanderer habitat has been calculated as part of this EIS, habitat condition and offset requirement reports undertaken in accordance with the BioBanking Assessment Methodology are required prior to the determination of suitable offset sites or calculation of offset credits.
2) Identify an offset site and prepare offset delivery plan – suitable offset areas which meet the offset requirements of the Project would be identified. The preferred offset mechanisms and offset site management measures will be detailed.
3) Delivery of offsets – Offset areas are to be delivered following regulatory approval of the offset delivery plan. Monitoring of the offset site would begin during this stage.

The proponent is committed to maintaining positive biodiversity outcomes through implementing plains wanderer habitat offsets. Proposed offsets will be in accordance with the NSW biobanking offsets methodology and will be guided by current recovery and conservation objectives and expert advice. The implementation of biodiversity offsets will ensure the extent of plains wanderer habitat in the Riverina region is maintained and enhanced.

8.11 Summary and conclusion

The Project would require the clearing of 17.8 ha of ‘Poor’ condition native vegetation, consisting of:

- 17.3 ha of derived native grassland
- 0.5 ha of black box woodland.

These plant communities are not identified as significant community types (i.e. threatened ecological communities) at a State or Commonwealth level.

No threatened flora or fauna species were identified during the field survey. The only species that was identified as having a ‘Moderate’ likelihood of occurring within the Project Site was the plains wanderer (*Pedionomus torquatus*), which is listed as ‘Endangered’ under the TSC Act and ‘Critically Endangered’ under the EPBC Act.

To assess the potential impacts of the Project on the plains wanderer, a 7-part test and an EPBC Act significant impact assessment was undertaken. The 7-part test concluded that given the sedentary nature of the species and

the low abundance estimate of the local population, the Project could potentially have a significant impact on the local Deniliquin population of plains wanderer, through the removal of secondary habitat, particularly if primary habitat in the region becomes unsuitable. However, minimisation of impacts through measures such as a reduced Project Footprint and the co-location of the Project Footprint with existing, adjacent disturbances will ensure other threatening process such as fragmentation, increased predation risk and disruption of dispersal corridors is minimal.

The EPBC Act significant impact assessment concluded that the Project is unlikely to significantly impact the Riverina population of the plains wanderer.

Based on these assessments, further actions are required under the state TSC Act and NSW Biodiversity Offsets Policy for Major Projects. As part of this EIS, a SIS and Offset Strategy have been prepared.

The proponent is committed to maintaining positive biodiversity outcomes through implementing plains wanderer habitat offsets. Proposed offsets will be in accordance with the NSW biobanking offsets methodology and will be guided by current recovery and conservation objectives and expert advice. The implementation of biodiversity offsets will ensure the extent of plains wanderer habitat in the Riverina region is maintained and enhanced.

9.0 Groundwater

This section provides an assessment of the potential impacts of the Project on groundwater. This assessment is supported by the Surface Water and Groundwater Technical Report provided in Appendix L.

9.1 Director General's Requirements

Table 9.1 details the DGRs as they relate to water and wastewater. This chapter focuses only on those DGRs applicable to groundwater and flooding as listed below.

Table 9.1 DGRs for the assessment of groundwater

DGRs –Water
Soils and water
- An assessment of the potential surface and groundwater impacts associated with the development, the wastewater irrigation and the onsite water storage compounds, including the impacts on Groundwater Dependent Ecosystems (GDEs), and potentially affected groundwater users
- Details of impact mitigation, management and monitoring measures.
- A technical assessment of the suitability of the soil use in the construction of the onsite water storage compounds to sustain ongoing wastewater irrigation
Waste water
- An Irrigation Management Plan that details irrigation practices and include a detailed soil nutrient and water balance model

9.2 Methodology

The assessment was based on a desktop assessment of the existing environment and Project.

The following methodology was followed to complete the groundwater assessment:

- Review of details on the construction of the proposed ethanol plant, in particular areas to be excavated/ developed beneath the ground surface.
- Review of data from the Bureau of Meteorology (BoM) groundwater database to identify registered groundwater users.
- Identification of any high priority Groundwater Dependent Ecosystems listed within the Schedule based on the Water Sharing Plans of NOW.
- Identification of any high priority wetlands through a search of the Commonwealth Department of Environment protected matters database.
- Review of relevant water policy and legislation.
- Review of the local geology and hydrogeology.
- Review and assessment of potential impacts to groundwater during the construction and operation phases.
- Development of mitigation and management measures to address potential groundwater impacts during the construction and operation phases.

Referenced information includes:

- information provided by Dongmun Greentec
- publicly available information from relevant agencies
- requests for information lodged with Deniliquin Council
- outcomes from a meeting with the DP&E on 1 May 2015
- outcomes from an AECOM workshop with Dongmun Greentec on 7 May 015
- feedback on a draft water technical report (2 June 2015) in correspondence from the DP&E (30 June 2015), including comments from the EPA and NOW.
- outcomes of a meeting with the DP&E on 8 July.

No fieldwork, surveying or consultation with stakeholders was undertaken.

9.3 Existing environment

9.3.1 Geology

The Project Site is located on the Riverine Plain within the Murray Basin. It is underlain by Quaternary-aged unconsolidated to poorly consolidated clay, silt and silty clay with intercalated lenses of fine to coarse grained sand and gravel of the Shepparton Formation. The thickness of the Shepparton Formation is variable. Bores surrounding Deniliquin have reached and recorded depths in excess of 100 m.

West of the Project Site alluvial sediments associated with the Edward River form a thin veneer over the Shepparton Formation. These unconsolidated silts, sand silty clays and gravel of the Coonambidgal Formation are poorly sorted and are found within the confines of local floodplains associated with the Edward River.

The Shepparton Formation is underlain by the Calivil Formation. The Calivil Formation underlies most of the Riverine Plain and consists of coarse to granular quartz and conglomerate within a white sandy and silty clay matrix. Across parts of the Riverine Plain, the Calivil Formation forms deep leads or palaeo-channels that are concealed by the Shepparton Formation. These buried palaeo-channels are incised 30 to 60 m into the underlying Renmark Formation and tend to follow similar alignments to the modern drainage systems. The Renmark Group is an extensive blanket of sediments that is the basal unit of the Murray Basin. It consists of sand and gravel layers up to 40 m thick inter-bedded with clay layers and lignite. Most clay and silt beds are carbonaceous, with abundant plant remnants, and appear peaty brown in colour.

9.3.2 Hydrogeology

Groundwater is present within the alluvial sediments, Shepparton, Calivil and Renmark Formations and form aquifers. Groundwater within the Shepparton aquifer is typically contained within an upper and lower zone that is separated by discontinuous clay layers that are partially confined. Groundwater flow within the Shepparton Formation aquifer is in a westerly/south westerly direction, however, variations in the thickness of the Shepparton Formation and the absence of the aquifer over bedrock ridges result in local-scale variability to the overall direction of groundwater flow. Groundwater quality is variable and tends to increase in salinity with depth ranging from 900 to 4,000 mg/L TDS. Where extensive irrigation occurs, groundwater mounds can form resulting in water logging and land salinisation. The Shepparton aquifer is recharged locally by rainfall and runoff.

The Calivil is separated from the Shepparton Formation by a basal clay that is not always present. Groundwater within the Calivil aquifer can form a valuable groundwater supply if palaeo-channels are intersected. Historically, groundwater flow within the Calivil aquifer has been interpreted to be in a general south westerly/westerly direction. Variations in the thickness of the Calivil Formation and the absence of Calivil Formation deposits (due to bedrock highs) have localised effects on groundwater flow.

Sand layers in the Renmark Group formation generally constitute important aquifers where low salinity groundwater is available. Some sand layers in this formation show favourable aquifer properties and provide high yields. However, in some areas the poorly sorted nature of sands and gravel reduces the transmissivity of these aquifers (NSW Office of Water, 2011a).

9.3.3 Groundwater flow

The Project Site is located topographically within a relatively flat riverine landscape. Consequently groundwater flow within the Shepparton aquifer is expected to be westward towards the Edward River under low hydraulic gradients.

Groundwater is expected to discharge into the alluvial sediments of the Coonambidgal Formation and ultimately into Edward River. Due to the flat hydraulic gradients base flow may emerge as springs or waterlogged areas as the local water table meets the ground surface.

Irrigation wells intersecting the Renmark Group in the Deniliquin area typically provide bore yields between 1 to 15 ML/day (Jeff Shand, pers. comm.) depending on aquifer properties, borehole diameter and pump selection.

9.3.4 Groundwater quality

The Renmark Group aquifer forms a valuable groundwater resource and the majority of irrigation water in the area is pumped from this aquifer sometimes from depths in excess of 100 m. Groundwater quality is variable in the Deniliquin area but is generally suitable for stock and industrial purposes with salinity concentrations in the order of 1,000 mg/L TDS.

9.3.5 Groundwater dependent ecosystems

Reference to Schedule 4 of the Water Sharing Plan for the Murray Unregulated and Alluvial Water Sources indicates there are no high priority Groundwater Dependent Ecosystems within the vicinity of the Project Site.

A review of the Commonwealth Department of Environment's Protected Matters Search Tool indicates the nearest wetlands are about 6 km to the east within the Murray Valley National and Regional Park associated with the Edward River, Tarangle Creek and Bullatale Creek. These wetlands are classified as nationally important. The closest Ramsar wetland is approximately 8 km from the Project Site which is within the Millewa Forest Group which makes up part of the NSW Murray State Forest Ramsar site.

There are no major springs, wetlands or swamps within the Project Site and there are no extensive alluvium deposits mapped on the Project Site that could support Groundwater Dependent Ecosystems. The nearest wetlands and groundwater dependent ecosystems at Edwards River are more than 6 km to the east and are considered to be at a sufficient distance to not be impacted by the Project.

Further detail on Groundwater Dependent Ecosystems is provided in Chapter 8 Biodiversity.

9.3.6 Regional groundwater use

The Project Site is located in Groundwater Management Area 016, the Lower Murray Alluvium (GWMA 016) which is administered by NOW. GWMA 016 is highly utilised for irrigation, industrial, farming, domestic and recreational supply as well as town water. At the time of the 2010 GWMA 016 Groundwater Status Report, there were 378 production or 'high yield' licensed groundwater wells in GWMA016, all of which are fitted with usage meters. Of licensed groundwater wells in the region, irrigation in GWMA 016 accounts for over 95 percent of all groundwater use (NOW 2011a).

A search of registered groundwater wells within a 1 km radius of the Project Site boundary was undertaken (refer to Appendix L Surface Water and Groundwater Technical Report for further details). Review of the bore data indicates that groundwater is poorly utilised in the vicinity of the Project Site. Only two bores are registered for the purpose of water supply intersecting the Shepparton aquifer (GW504037) and Renmark Group aquifer (GW500926).

The purpose of the three remaining wells is unknown, however there is continual groundwater level monitoring data for these wells since the 1970s (GW501494 and GW501662) and 1990s (GW501661) suggesting these are monitoring wells. The water table within the Shepparton Formation is relatively deep ranging from 10 to 14 m below the ground surface, fluctuating in response to seasonal and climatic changes.

9.4 Assessment of potential impacts

9.4.1 Reduced groundwater recharge impacts

The planned construction activities pose a low potential to cause changes to groundwater flow patterns that could impact groundwater levels and recharge characteristics.

During the construction phase the development of access roads, buildings, water storages, plant and areas for stockpiling could give rise to groundwater recharge. This is considered extremely unlikely and would be minimal and temporary in the event any impact did result.

The Project will result in an increase of impermeable surface, approximately 20.2 ha, which will consist of roof, pavement and hardstand areas accounting for some 20 percent of the overall 120 ha Project Site. This increase in hardstand area could potentially impact groundwater levels as a result of changes to groundwater flow patterns, recharge and discharge characteristics of the Project. Runoff from most roofs would be collected into rainwater tanks for drinking water, whilst runoff from a large area of hardstand will be collected in a shallow concrete-lined underground holding tank for reuse. Most of the 20.2 ha of hardstand is proposed to drain into an onsite bioretention and flood detention basin. The net reduction in available recharge area is not considered significant given the Project Site is in a rural area.

9.4.2 Construction drawdown impacts

Groundwater drawdown due to construction and operation is very unlikely as the highest water table measured within the local aquifer is 10 m below the ground surface. Excavations to enable construction of foundations are unlikely to extend to depths beyond 5 m deep and consequently the requirement to dewater is extremely unlikely. It is considered there would be no impacts related to construction dewatering.

9.4.3 Water quality impacts

There is a potential for construction and operational activities to adversely impact groundwater quality from fuel and chemical spills; petrol, diesel, hydraulic fluids and lubricants contaminating groundwater; or if a leak or spill occurs. Additionally stockpiling of construction materials may also introduce pollutants to the Project Site. Currently there is no site specific groundwater quality or groundwater level data, however, through the application of adequate mitigation and management measures it is considered unlikely that the Project would result in the contamination of groundwater.

9.5 Mitigation measures

The Project would implement a number of management and mitigation measure to further reduce the likelihood of any potential groundwater impacts as a result of its activities. Table 9.2 summaries these commitments.

No mitigation or management measures are proposed for reduced recharge as these impacts are expected to be minimal.

No mitigation or management measures are proposed for induced groundwater drawdown during construction since groundwater is at least 10 m below ground surface and the building infrastructure is unlikely to extend to these depths. Consequently dewatering would not be required.

Preparation of a site specific CEMP by the contractor prior to construction would detail control measures for fuel spills and sedimentation. Additionally the Project will operate under and IMS including an EMS system for the site as well as specific water management plans.

Additionally, mitigation measures would be employed during the construction of to construct the water storages with concrete, and if required a cut off trench, to reduce any leakage. The water storages would also be constructed with outer bunds to capture any leakages caused by a wall breach.

During construction and operation there is a potential for fuel and chemical spills petrol, diesel, hydraulic fluids and lubricants contaminating groundwater. Mitigation measures would be employed and include the provision of bunding and spill kits around fuel depots and stockpile areas. Emergency response and management plans would be developed to address fuel leaks and spills at machinery compounds or during refuelling including a spill emergency procedure.

Table 9.2 Groundwater mitigation measures

Impact	No.	Environmental management measure	Timing
Fuel spills and sedimentation	GW1	Preparation of a site specific CEMP by the contractor prior to construction would detail control measures for fuel spills and sedimentation.	Pre-construction phase
Water management	GW2	Implementation of a site wide IMS including an EMS system as well as specific water management plans.	Operation phase
Water storage	GW3	Constructing the water storages with concrete, and if required a cut-off trench, to reduce any leakage.	Construction phase
	GW4	Constructing the water storages with outer bunds to capture any leakages caused by a wall breach.	Construction phase
Water management	GW5	Implementation of a site wide IMS including an EMS system as well as specific water management plans.	Operation phase
Fuel leaks and spills	GW6	Providing bunding and spill kits around fuel depots and stockpile areas. Response plans would be developed to address fuel leaks and spills at machinery compounds or during refuelling including a spill emergency procedure.	Operation phase
	GW7	Emergency response and management plans would be developed to address fuel leaks and spills at machinery compounds or during refuelling including a spill emergency procedure.	Operation phase

9.6 Summary and conclusion

This chapter identifies the potential groundwater related issues arising from the Project, and where required, outlines mitigation strategies to be implemented to minimise identified issues. The structure of this document was developed to meet the issued DGRs.

The Project is not expected to have significant impacts on the surrounding environment or communities from a groundwater perspective. Where appropriate, specific mitigation strategies have been identified to minimise any remaining potential risks resulting from the Project's construction and operation.

In summary, the Project's potential impacts on groundwater are considered to be unlikely and insignificant.

10.0 Surface water

This chapter provides an assessment of the potential impacts of the Project upon surface water. The assessment includes a description of the existing environment, water supply, the operations water balance, the wastewater treatment process, proposed stormwater management and the associated potential impacts of the Project on surface water along with proposed mitigation measures.

This assessment is supported by the Surface Water and Groundwater Technical Report which is provided in Appendix L.

10.1 Director General's Requirements

The key objectives of the surface water assessment were to:

- Identify potential impacts on surface water, sensitive environments and water quality associated with the Project
- Describe the proposed wastewater treatment system
- Identify environmental management measures that would be required to manage the identified impacts
- Inform the future detailed design of the Project with respect to surface water flows and quality.

Table 10.1 sets out the DGRs as they relate to surface water.

Table 10.1 DGRs for the assessment of soils and water and waste water

DGRs –Water
Soils and water
- Description of the water demands and a breakdown of water supplies
- Description of the measures to minimise water use
- A detailed water balance
- Description of the construction erosion and sediment management controls
- A description of the surface stormwater management system including on site detention, and measures to treat of reuse water
- Details of impact mitigation, management and monitoring measures.
- A technical assessment of the suitability of the soil use in the construction of the onsite water storage compounds to sustain ongoing wastewater irrigation
- An assessment of any potential existing soil contamination
Waste water
- A clear and detailed description of the wastewater treatment process for the development including details of the volume of wastewater generated, treated, reused/recycled, or stored on site
- Details of the key pollutant concentrations of the wastewater before and after treatment with reference to relevant water quality guidelines
- A full evaluation of options to manage any brine stream resulting from wastewater treatment and detailed assessment of the environmental impacts of each option
- An Irrigation Management Plan that details irrigation practices and include a detailed soil nutrient and water balance model

10.2 Methodology

The assessment was based on a desktop assessment of the existing environment and Project. Referenced information includes:

- information provided by Dongmun Greentec
- DGRs dated 23 December 2013
- publicly available information from relevant agencies
- requests for information lodged with Deniliquin Council
- outcomes from a meeting with DP&E on 1 May 2015

- outcomes from an AECOM workshop with Dongmun Greentec on 7 May 2015
- feedback on a draft water technical report (2 June 2015) in correspondence from the DP&E (30 June 2015), including comments from the EPA and the Department of Primary Industries Office of Water
- outcomes of a meeting with the DP&E on 8 July.

No fieldwork, surveying or consultation with stakeholders was undertaken to prepare this technical report.

Alternative water supply options were considered during the assessment.

10.2.1 Water balance model

The following methodology was used to develop the water balance model:

- Review of available information on water usage, water storage, production and operation schedule, water sources and required licenses
- Assessment of adequacy and security of water source to provide the required water during construction and operation
- Development of a detailed water balance model including water requirements for construction, ethanol plant operation and general usage considering variation for the life cycle of the Project
- Review of on-site wastewater treatment system including the process, capacity and input/output water quality
- Review of water management plan including water sources and contingency plan, potential impact on water resources, recycling on-site, water usage efficiency and minimising water requirements
- Review of wastewater disposal strategy
- Development of mitigation and management measures to address potential surface water impacts during the construction and operation phases.

10.2.2 Surface Water

The following methodology was followed to complete the surface water assessment:

- Review of details on the construction of the proposed ethanol plant, particularly in relation to flood risk and stormwater management
- Review of information from Deniliquin Council regarding historic flood risk and drainage, topographical data, Deniliquin Effluent Reuse Scheme and existing services
- Review of relevant water policy and legislation
- Review of publicly available relevant and applicable information
- Description of the local hydrology
- Preparation of a stormwater assessment and development of a conceptual Stormwater Management Plan, based on the Project layout and local hydrology
- Preparation of an Erosion and Sediment Control Plan for the Project
- Review and assess the potential impacts to surface water during the construction and operation phases
- Development of mitigation and management measures to address potential surface water impacts during construction and operation phases.
- Development of a MUSIC model to assess the effectiveness of the proposed treatment devices to meet pollutant reduction targets.

10.2.3 Referenced Information

Referenced information includes:

- Information provided by Dongmun Greentec
- Publically available information from relevant agencies
- Requests for information lodged with Deniliquin Council
- Outcomes from a meeting with the DP&E on 1 May 2015

- Outcomes from an AECOM workshop with Dongmun Greentec on 7 May 2015
- Feedback on a draft water technical report (2 June 2015) in correspondence from the DP&E (30 June 2015), including comments from the EPA and the DP&I and NOW
- Outcomes of a meeting with the DP&E on 8 July.

10.3 Existing environment

10.3.1 Climate

The Project Site is located within the Riverina Bioregion. The dominant climate of this region is dry, semi-arid, characterised by hot summers and cool winters. The mean annual temperature is between 15 and 18°C.

There are two meteorological stations close to the Project Site. The one with the longest record (1858 to 2014) was selected and long term rainfall data was extracted from the BoM Climate Database. The mean annual rainfall for this station over a 156 year record is approximately 404 millimetres (mm). Table 10.2 and Figure 10.1 show the long term average monthly rainfall for this station.

Table 10.2 Long term mean monthly rainfall at rainfall gauge Deniliquin (Wilkinson St)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean rainfall (mm)	28	28.2	32.1	30.3	38	39.9	34.8	36.4	37.7	39.1	30	29.6

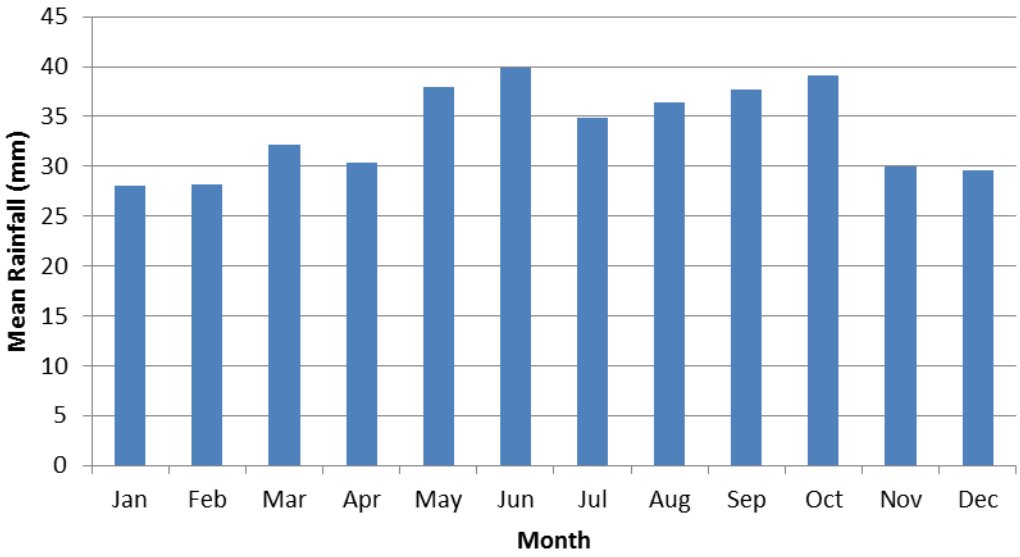


Figure 10.1 Long term mean monthly rainfall at Deniliquin (Wilkinson St)

10.3.2 Topography

LiDAR (Light Detection and Ranging) data for the Project Site and surrounding area was obtained from Deniliquin Council, and presented in Figure 10.2. The Project Site is relatively flat and falls generally from south to north, from a high of ~96.5 m AHD in the south western corner to a low of approximately 94.0 m AHD in the north eastern corner.

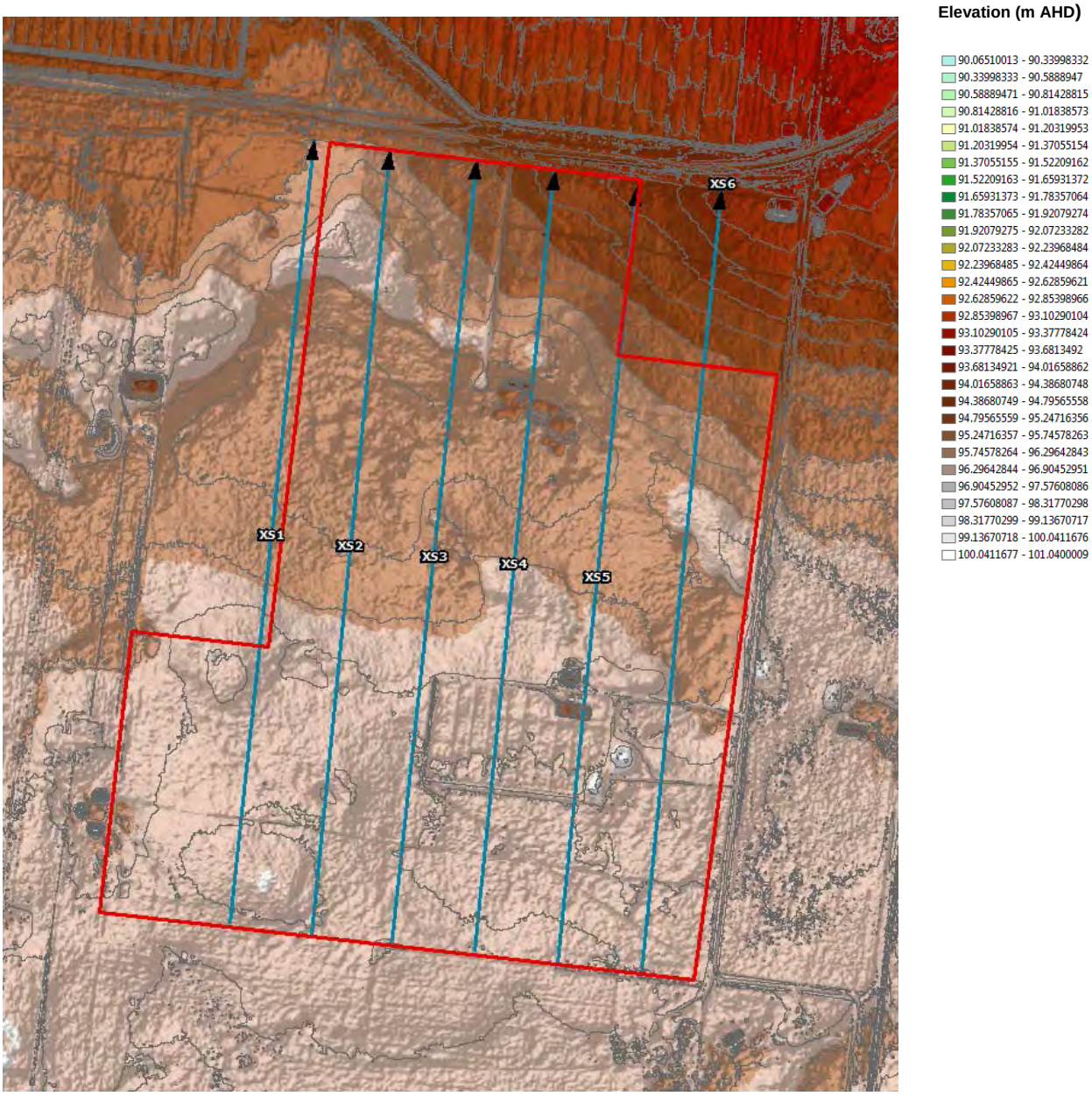


Figure 10.2 Local topography based on LiDAR data

Cross sections were developed to illustrate the Project Site topography (refer to Plate 1 to Plate 6 of the Appendix L Surface and Groundwater Technical Report. These cross sections demonstrate the following:

- A low ridge (approximately 0.3 - 0.5 m high), runs in a south east to north west direction in the northern half of the Project Site, creating a localised watershed. Most of the Project Footprint area is located on the northern side of this ridgeline.
- The ridgeline creates a local depression to the south, which will capture and hold surface water runoff.

10.3.3 Soil

Saline heavy grey and brown clays form the main soil types in the Project Site. Other soil types in the area are red-brown and grey clays and calcareous sand (Ken & Jenni Bates Pty Ltd, 2009). The native soils of the Shepparton Formation are silty and sandy and unsuitable for water storage. As such all water storages on site will be concrete-lined.

10.3.4 The Murray Darling basin

The Project is located in the Murray Darling basin, one of the largest and most important catchments in Australia. The River Murray rises near Mount Kosciuszko and flows 2,530 km to the Southern Ocean; its mouth is near Goolwa in South Australia. The central section of the River Murray (between Yarrawonga in the east to the confluence of the Darling River and the River Murray at Wentworth), includes the Edward River as one of its tributaries. The Edward River flows through Deniliquin, and is located approximately 6 km north of the Project Site.

The central River Murray supports a diverse range of natural environments (wetlands, rivers, floodplains, river red gum forests, black box and grey box woodlands) that are refuges and breeding sites for many endangered species. Ramsar listed sites along this section of the River Murray include Kerang Wetlands and Gunbower Forest in Victoria, and the New South Wales Central Murray state forests: Millewa, Werai and Koondrook (Murray-Darling Basin Authority Website, accessed 26 May 2015).

10.3.5 Regional flood risk

No significant waterways or waterbodies are located within the Project Site. The nearest major waterway, the Edward River, lies approximately 6 km north of the Project Site. There is no historic or anecdotal evidence suggesting that the Project Site is at flood risk, as confirmed with Deniliquin Council (Julie Rogers, Deniliquin Council, pers. comm.). A detailed flood study of the Edward River was carried out for Deniliquin Council during 2014 (WMA Water, 2014), which concluded that the Project Site is located outside the 0.5 percent AEP (or 1 in 500 year ARI) Edward River flood line.

10.3.6 Local hydrology

As demonstrated in Figure 10.2 any surface runoff north of the low ridge on the Project Footprint currently drains to the north eastern corner of the Project Site, and into the shared table drain located within the road reserve on Deniliquin Barham Road. A small percentage of runoff from less than five percent of the Project Footprint area currently drains towards the north western corner of the Project Site, and into the same Deniliquin Barham Road table drain.

Runoff generated from the catchment area south of the low ridge will accumulate and pond within the existing localised depression storage. In extreme rainfall events, the depression storage might overtop the low ridge and continue as overland flow in a northerly direction, towards the Deniliquin Barham Road table drain.

There are no major springs, wetlands or swamps within the Project Site. Wetlands within a 10 km radius of the Project Site are described in further detail in Chapter 8 Biodiversity.

According to Deniliquin Council there are no existing drainage issues on the Project Site; however, '*a significant rain event can result in localised flooding at the intersection of Barham Road and Leetham Road*' (Julie Rogers, Deniliquin Council, pers. comm.). It is also understood that there is an existing 450 mm culvert across Deniliquin Barham Road, located on the Deniliquin side of the intersection of Deniliquin Barham Road and Line Road (Mark Dalzell, Deniliquin Council, pers. comm.).

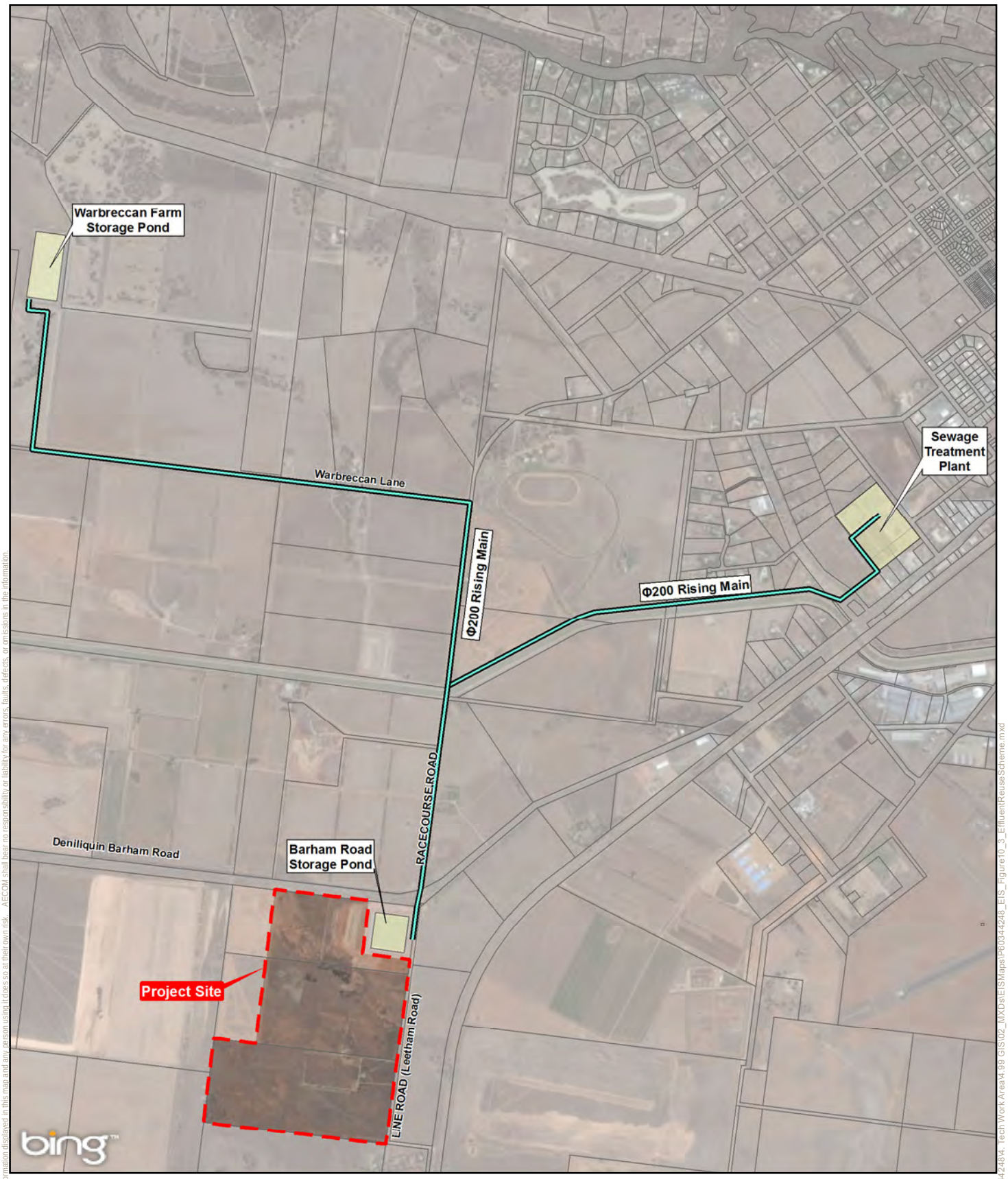
10.3.7 Existing water bodies

An ERS Pond, approximately 175 ML in size, is located adjacent to the Project Site, to the north east, which is maintained by Deniliquin Council. This pond, locally known as 'Barham ERS Pond' is part of Deniliquin Council's Effluent Reuse Scheme, which in turn is a part of Deniliquin Council's STP.

Barham ERS Pond acts as overflow storage during times of wet weather with the main storage being located on Warbreccan Farm. Figure 10.3 shows the extent of the Effluent Reuse Scheme. Deniliquin Council has a contractual agreement with the owners of Warbreccan Farm regarding the ownership and use of the effluent. Under this agreement, Deniliquin Council is obliged to sell all the effluent produced by the STP to the owners for the next 30 years.

A small stormwater detention basin is located between Barham ERS Pond and Deniliquin Barham Road, which currently collects runoff from the western area of the Project Site (Mark Dalzell, Deniliquin Council, pers. comm.). This basin is a Deniliquin Council asset.

Deniliquin Council Effluent Reuse Scheme Extent



LEGEND

- Railway
- Pipeline
- Cadastral Boundaries
- Project Site
- Reuse Scheme Facility

Data Sources:
1.Imagery: © 2015 DigitalGlobe © 2015 GeoEye Earthstar Geographics SIO © 2015 Microsoft Corporation
2. Roads, Railway, Drainage, Suburbs, Parks, Localities: @ Street Pro, 2011
3. Key Map Base Layer: ESRI Online
4. Site Layout: based on CAD Drawingd prepared by DONGMUN I.R.S. Co. Ltd.
5. Utilities @ Deniliquin Council, pers. comm., 13-May-2015

Disclaimer:
Site Layout is indicative only. To be used for information only. For detailed design reffer to CAD Drawings

AECOM
www.aecom.com

DATUM GDA 1994, PROJECTION MGA ZONE 55

N 0 150 300 450
Metres

FIGURE 10.3

A4

10.4 Assessment of potential impacts

10.4.1 Water requirements, water resources and wastewater

Water is required for construction and operation of the Project. Ethanol plants need a significant volume of good quality water for operation. The following sections provide a review of available water sources and water requirements for the Project.

10.4.2 Available water resources

A number of potentially available water sources for the Project were considered as discussed in Section 9.2. Recycled process water and town water (i.e. potable water) were selected as the Project water sources, in consultation with Deniliquin Council.

Dongmun Greentec has agreed with Deniliquin Council that up to 1.3 ML/day of town water could be provided for the Project via an extension of the main trunk along Deniliquin Barham Road as part of the industrial development scheme for the area. Currently there is no capacity in the reticulation system to provide this demand to the Project Site. Deniliquin Council is planning to construct a 4 ML reservoir in an industrial area in 2016. On completion, the reservoir could be used to transfer water to the proposed ethanol plant via a pump station and trunk main. Further detail is provided in Appendix L Surface Water and Groundwater Technical Report.

Deniliquin Council allocates approximately 5,500 ML/y of its own water for use by the town. However, current usage is around the 3,000 ML/y. The peak day use in summer has been up to 17 ML/day while Deniliquin Council has the capacity to provide 25 ML/day (Mark Dalzell, Deniliquin Council, pers. Comm). Deniliquin Council therefore has sufficient capacity for future growth in town, as well as growth in industrial usage. Deniliquin Council's ability to provide water to service the abattoir, when operating at full capacity, had been discussed as part of Deniliquin Council's Integrated Water Catchment Management Plan, which considered a range of climate conditions and growth strategies.

This plan doesn't include the Project, and a review of the Integrated Water Catchment Management Plan and Drought Management Plan is therefore required to incorporate the Project's water demand (Mark Dalzell, Deniliquin Council, pers. Comm).

In addition to the potable water, supplied by Deniliquin Council, recycled water from the wastewater treatment system would be another source of supply for the Project. These water sources would be highly reliable and adequate for Project water requirements. The water quality of these sources is acceptable for ethanol production. Further details of treated wastewater quality are presented in Section 10.4.5.

There is a very small likelihood for the onsite wastewater treatment system to fail. This would cause a water deficit for ethanol production, and in such an unlikely event, the ethanol plant would be shut down.

10.4.3 Water requirements

Construction water requirements

Water requirements during construction, including potable drinking water for the predicted workforce, are estimated at approximately 34 ML/y. This will be supplied by Deniliquin Council via an extension of the main trunk along Deniliquin Barham Road.

Deniliquin operational water requirements

Water is a primary input to the ethanol production process, and is therefore crucial for operation of the Project. The dominant use of water is in the ethanol production process, which requires approximately 2,640 kL/day. A small supply of water would also be used for landscaping and workplace supply (toilets, drinking water, etc.). This water would be supplied from rainwater (refer to Section 10.4.4).

Potential impacts of the operational water requirements and supply are as follows:

- Subject to obtaining formal approval, Deniliquin Council potable water would be a reliable water supply. By using a Deniliquin Council water supply, there is no potential impact on surface water quality.
- There is a low probability that Deniliquin Council might be unable to meet the required potable water demand during significant dry periods. Based on information provided by Deniliquin Council, the Project would become part of the overall Deniliquin Council water supply network, to be managed in line with Deniliquin Council's existing Drought Management Strategy.

10.4.4 Water balance model

Identified water sources for the Project are:

- Deniliquin Council potable water supply with the capacity to provide up to 1,272 kL/day.
- On-site wastewater treatment system with the capacity to provide 1,368 kL/day of treated water (discussed further in Section 10.4.5).

A consolidated water balance model bringing together all sources was developed for this assessment. To develop an integrated water budget plan for the Project, the following water related issues were identified and assessed:

- Water demand for operation of various process operations.
- Losses from different parts of the plant.
- Water runoff and all outputs from the plant.
- Total input needed to meet the above requirements.
- Available water sources.
- The amount of water that can be supplied with high security from each of the identified water sources.

Lot 273 of the Project is zoned RU1 Primary Production and under Deniliquin Council's current Water and Sewer Limits Policy, Deniliquin Council does not service properties in this zone. Properties in the RU1 zone must source potable water from a separate source to the town supply system, which for Deniliquin is predominantly a rainwater tank.

Rainwater tanks would be used as the water source for general usage. This would meet the requirements of the RU1 zone and minimises the use of the town water supply by the development. Captured roof runoff would be used as drinking water. Runoff from some hardstand areas would be captured in a shallow concrete-lined underground holding tank. Water would be treated through a proprietary treatment device prior to storage to remove trace particulates and contaminating materials. This water would be used for minor on-site landscape watering.

In the unlikely event of rainwater not being sufficient to meet drinking water requirements, the deficit can be supplied via Deniliquin Council's town water supply.

The Project operates in a relatively closed system. Therefore, seasonal and annual climate variations do not affect the water requirements. The only variation would be the month that the plant is closed for general maintenance in December. Water required for general usage during maintenance would be of limited quality and can be provided via Deniliquin Council potable water supply or rainwater tanks.

The plant would operate at full capacity from day one of operation. Water requirements during start-up are expected to be 148 ML. This significant volume of water is needed to fill all the tanks, pipes and the cooling tower and cannot be provided from the proposed Project water supplies without accumulating the water on the Project Site over some months. A commissioning period of three months is proposed prior to the plant commencing operation.

Based on the developed water balance, there is no water deficit for the Project during the operations phase. Potential impacts related to the different water supplies including security, adequacy, quality and their potential impacts are discussed in the following sections.

Figure 10.4 shows the operational water balance including; water inputs, required water for different processes, losses, reused water and outputs.

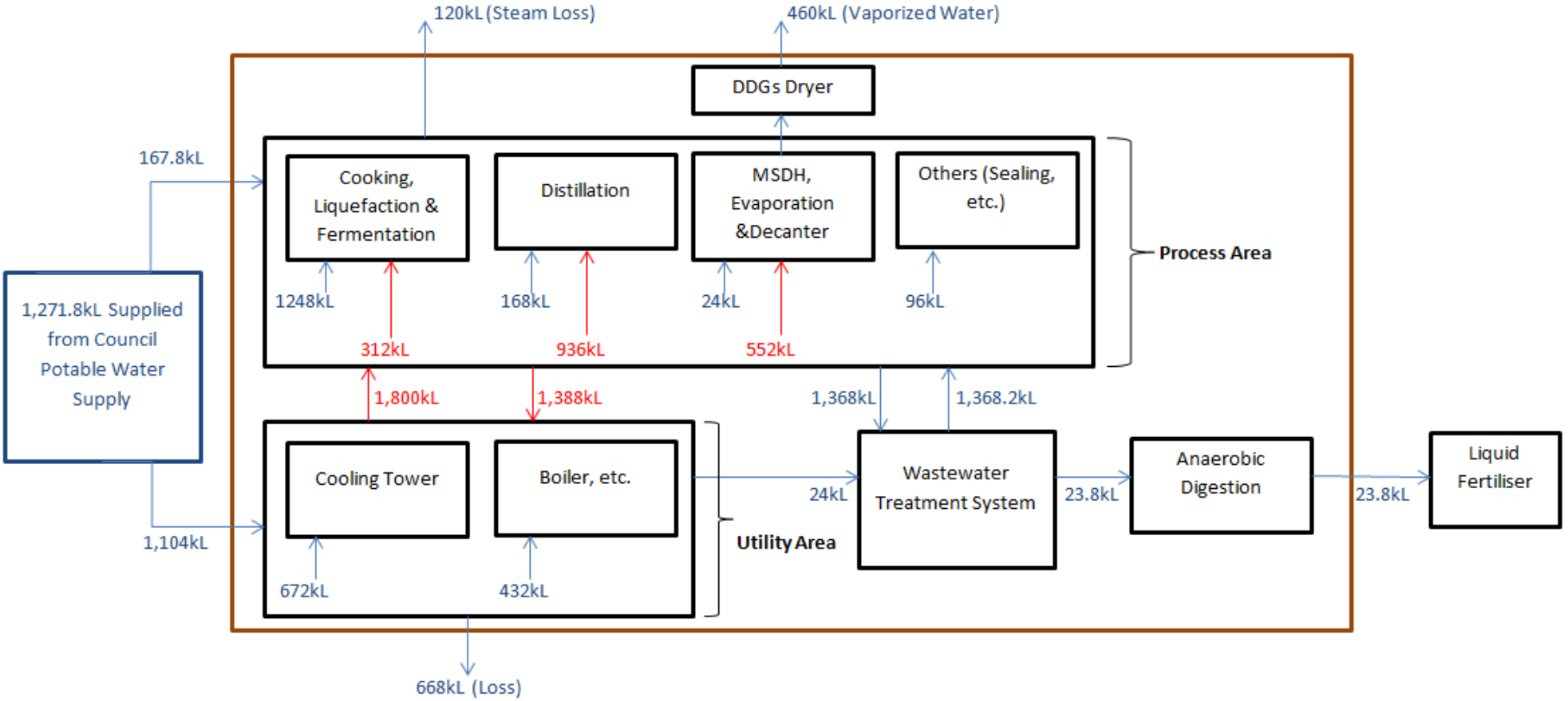


Figure 10.4 Daily operational water balance

Note: Red numbers are the volumes of water supplied in the form of steam

Table 10.3 shows the overall water balance in the ethanol plant disregarding how the water is consumed in different sections.

Table 10.3 Operational water balance (daily and annual)

Input	Annual quantity (ML/y)	Daily quantity (kL/day)	Destination
Deniliquin Council potable water supply	419.7	1,271.8	To the process and utility area
Recycled water from onsite wastewater treatment system	451.5	1,368.2	To the process area
Total	**871.2**	**2,640.0**	
Output	**Annual quantity (ML/y)**	**Daily quantity (kL/day)**	**Destination**
Steam loss from process area	39.6	120.0	
Vaporized water loss in DDGS dryer	151.8	460.0	
Steam loss in cooling tower	220.4	668.0	
Liquid fertiliser	7.9	23.8	Sold as fertiliser
Recycled water from wastewater treatment	451.5	1,368.2	Use as input in the system (to be reused in process)
Total	**871.2**	**2,640.0**	

10.4.5 Wastewater

Ethanol production plants typically produce wastewater with high levels of BOD, Chemical Oxygen Demand (COD), and Suspended Solid (SS), Total Dissolved Solids (TDS) as well as colour impurities and odour. The key pollutant of ethanol production would be organic waste.

Wastewater generation

Wastewater generated from two sources would be discharged to the onsite wastewater treatment system. These sources are described below:

- Approximately 1,345 kL/day of wastewater generated within the process area and DDGS would be condensed in the condenser (with design of 1,400 kL/day capacity) and would be pumped to the wastewater treatment system.
- Approximately 47 kL/day of wastewater generated within the cooling tower and general cleaning of process and utility areas would be discharged to the wastewater treatment system.

The proposed wastewater treatment system is expected to generate a low volume of effluent as the majority (98 percent or 1,368 kL) of wastewater generated will be recycled as process water (refer to Table 10.4).

The remaining 2 percent (23.8 kL) is in the form of organic waste (sludge) that ends up as a liquid fertiliser.

Wastewater treatment process

The wastewater treatment process comprises a sealed anaerobic digester that breaks down the organic compounds into methane which is returned as fuel for the boilers with excess methane flared. The next step is an anoxic basin where further anaerobic treatment such as denitrification occurs. The next treatment step is aerobic digesters where the sludge form the anaerobic treatment steps will be digested. This process step is then followed by a membrane bioreactor which is the combination of a membrane process like microfiltration or ultrafiltration with a suspended growth bioreactor.

Membrane bioreactor processes are widely used for municipal and industrial wastewater treatment applications and can produce effluent of high quality. The membrane bioreactor process produces two separate streams, treated effluent and sludge. The treated effluent will be directed to an intermediate basin where it will be filtered (via activated carbon) for reuse as process water.

Figure 3.7 in Chapter 3 Project description illustrates the inputs and outputs of the wastewater treatment system and shows how the water is treated in the system. Flow rate and water quality at the labelled points in Figure 3.7 are presented in Table 10.4.

Table 10.4 Wastewater treatment inputs and outputs

Point	Flow rate (kL/day)	pH	BOD (mg/l)	COD (mg/l)	SS (mg/L)	N (mg/L)	P (mg/L)	TDS (mg/L)
Input								
A	47.00	6~8	1,500	2,500	100	10	4	
B	1,345.00	4~5	2,500	3,500	200	40	10	
Total	**1,392.00**	**4~5**	**2,500**	**3,500**	**313**	**39**	**8**	**1,990**
Water flow in the system								
C	1,392.00	6-8	2,250		275			
D	1,392.00	6-8	560	875	240	29	6	
E	1,372.00	6-8	15	20	3	7	3	
F	1,368.21	6-8	10	15	2	6	2	
H	3.79	6-8	10	15	3	6	2	760
J (Sludge)	3.79	6-8	25,000	35,000	16,000	10,000	600	2,400
K	20.00	6-8	15	20	3	7	3	
L (Sludge)	20.00	6-8	25,000	35,000	16,000	10,000	600	2,400
Output								
G (Treated recycled water)	1,368.21	6-8	10	15	2	6	2	
M Liquid fertiliser)	23.79		21,026	29,460	14,410	8,414	506	2,200
Total	**1,392.00**							

Refer to figure 3.7 for location of inputs

Further information regarding the on-site wastewater treatment plant, specifically in relation to the process and the individual treatment stages, is provided in Appendix D of Appendix L Surface Water and Groundwater Technical Report.

Wastewater treatment performance

Wastewater generated from ethanol production would be discharged to the on-site wastewater treatment system. The proposed wastewater treatment system maximises recycling and provides good quality water for use in ethanol production.

The wastewater treatment system is critical for the Project and its failure would have a significant impact on ethanol production. As such a double system will be installed for some key treatment components and the volume supplied by each system would exceed the required volume to ensure a reliable supply of recycled water to the ethanol production process.

All water generated in the wastewater treatment system would be beneficial and safe for reusing in ethanol production. Potential impacts related to the on-site wastewater treatment system would be as follows:

- Spillage and leakage from water and wastewater storage and treatment. The potential for leakage from tanks that store treated water is considered negligible owing to mitigation measures to be employed. The main risk would be related to the collection tank that stores wastewater generated in the process area and DDGS and storage of liquid fertiliser. Mitigation measures in this regard are discussed in Section 9.5.
- There would be a small likelihood that the wastewater treatment system operates inefficiently. This would result in production of poor quality water that may not meet the requirements for reuse in the system. The risk is minor and could be minimised by monitoring the quality of treated water.
- There is a risk of leakage and spillage of the stored co-products that are produced in the wastewater treatment process. Mitigation measures are discussed in Section 9.5.

Sewage generated from the site workforce has the potential to contaminate surface water and groundwater. To mitigate this risk, Dongmun Greentec is seeking approval to dispose of the effluent via Deniliquin Council's sewerage system extension. Should Deniliquin Council be unable to provide a connection to Deniliquin Council's sewerage system, Dongmun Greentec would use an off-line septic system. In such an event an 'Application for Local Activity' under Section 68 of the *Local Government Act 1993* will be lodged with Deniliquin Council to seek approval to install a septic tank.

10.4.6 Surface water

Potential impacts to surface water as a result of construction and operation would be associated with flooding, stormwater quality and possible changes to the drainage regime. Potential surface water impacts are discussed below and mitigation measures to eliminate or manage potential impacts are discussed in Section 9.5.

Flooding impacts

The Project Site is not located within a classified flood risk area, and as such the development is highly unlikely to exacerbate flood risk elsewhere. Deniliquin Council has confirmed that '*the land has not been identified within the flood planning area in the Edward River at Deniliquin Flood Study*' (Julie Rogers, Deniliquin Council, pers. comm.).

As demonstrated in Figure 10.2, there is little to no risk of overland flow emanating from areas off-site to affect the Project Site during extreme rainfall events. Runoff generated on the area to the south of the Project Footprint is captured within the localised depression storage.

Stormwater quantity impacts during construction

Construction of the ethanol plant is unlikely to have any measurable impact on the stormwater drainage regime external to the Project Site. As part of the construction management, the contractor would be required to protect existing drainage infrastructure from damage, and prepare and implement a Stormwater Management Plan. This will form part of the CEMP.

Stormwater quality impacts during construction

Initial construction activities, including topsoil stripping and earthworks, would disturb soils at the Project Site and increase potential erosion and sediment risks. As part of the construction management, the contractor would be required to protect existing drainage infrastructure from damage and establish a detailed Erosion and Sediment Control Plan to ensure runoff from the Project Site, does not mobilise and transport sediment, or cause scour. This will form part of the CEMP.

The Project Site has a very shallow grade, and flow velocities are expected to be low, which significantly reduces the erosion potential for the Project. Oil, lubricants and other liquids used during construction could be released to stormwater runoff; although this would be addressed through the development and implementation of a Materials Storage and Handling Plan for the construction phase. As a result, construction of the works is unlikely to have any measurable impact on water quality in the Murray-Darling basin.

Stormwater quantity impacts during operation

The impervious areas within the Project Footprint would be increased significantly as a result of the Project. The majority of proposed impervious areas would consist of internal roads, car parks and roof areas. Any increase in impervious areas is likely to increase runoff as areas available for infiltration would be reduced. Left unmitigated an increase in runoff could lead to a larger peak flow being discharged from the Project Site along with a change in the timing of the peak, which could potentially cause drainage issues elsewhere.

A conceptual Stormwater Management Plan has been prepared for the Project Site (refer to Appendix F of Appendix L Surface and Groundwater Technical Report). The objective of the Stormwater Management Plan is to mitigate the potential quantity and quality impacts elsewhere as a result of stormwater discharge from the Project Site, and to mimic the existing drainage regime. The entire Project Site would be engineered in such a way that a variety of containment techniques would capture run-off, and direct it to the appropriate water storages and/or discharge points. Final discharge points will replicate existing and no surface water will be diverted across local watersheds.

The conceptual Stormwater Management Plan demonstrates three catchment areas on the Project Site, of which two cover the Project Footprint:

- Catchment A which includes rainwater harvesting measures. This catchment would discharge via a vegetated swale into a bioretention and flood detention basin. Runoff generated from hardstand areas would be collected by a pit-and-pipe system, and directed into the vegetated swale. Runoff generated from the roofs of the workshops and office building is to be captured in rainwater harvesting tanks.

- Catchment B which includes rainwater harvesting measures. This catchment would discharge via a vegetated swale into a bioretention and flood detention basin. Runoff generated from hardstand areas would be collected by a pit-and-pipe system, and directed into the vegetated swale. Runoff generated from the hardstand area that supports the ethanol storage tanks will be collected in a shallow concrete-lined underground holding tank, for the primary use of minor on-site landscape watering. Water would be treated through a proprietary treatment device prior to storage to remove trace particulates and contaminating materials.
- Catchment C which falls away from the Project Site in a south eastern direction and ponds in the existing localised depression storage. This catchment will be left undisturbed, and so requires no mitigation

Appendix F of the Surface Water and Groundwater Technical Report shows the proposed locations of the rainwater tanks and underground holding tank, the number and size of which will be further detailed during subsequent design phases. All rainwater harvesting collection infrastructure and storages will be designed to include appropriate and safe overflow management provisions during extreme rainfall events.

Stormwater quality impacts during operation

Erosion and sedimentation is not expected to occur during operation of the Project, as the active operational areas would be paved, effectively stabilising the surface. Areas surrounding the plant would be landscaped or turfed to prevent erosion of the topsoil. Consequently, the potential impacts of erosion and sedimentation from the Project are negligible.

The increase in impervious surfaces associated with the Project has the potential to impact on surface water quality. Surface runoff washes off pollutants that build up on hard surfaces such as road pavements. Runoff would typically contain pollutants such as nutrients, chemicals and heavy metals as a result of spills of materials on the roads or hardstand areas, or from atmospheric deposition, vehicle leaks, operational wear and road wear. These pollutants could be discharged to the receiving environment with the stormwater runoff, and could contribute to impaired ecosystem health or biodiversity impacts in the Edward River.

Should stormwater runoff come into contact with some of the process materials, such as grain, dry distiller's grain or other stored materials, the stormwater may be contaminated with organic matter or other pollutants (e.g. oil residue). To address this, it is proposed to store all feed material and co-products in covered areas to prevent stormwater contact. The conceptual Stormwater Management Plan (refer to Appendix F of Appendix L Surface and Groundwater Technical Report) outlines the proposed stormwater quality treatment design. This includes a proprietary treatment device before stormwater enters the underground holding, vegetated swales and a bioretention and flood detention basin. Based on the proposed design and standard operating measures, the runoff from the Project Site is highly unlikely to have a measurable impact on water quality in the Murray-Darling Basin.

Pollutant reduction targets and MUSIC modelling

Stormwater pollution control targets set out in the draft document Managing Urban Stormwater: Environmental Targets (DECC, Consultation Draft, 2007) are applicable to the operation phase of the Project. The NSW Office of Environment and Heritage recommends the following targets as the minimum requirements for developments to minimise impacts on the environmental values of water. These targets require pollutant reductions for Total Suspended Solids of 85%, Total Phosphorus of 65%, and Total Nitrogen of 45%.

The Model for Urban Stormwater Improvement Conceptualisation (MUSIC), version 6.1 was used to size stormwater treatment devices proposed in the Conceptual Stormwater Management Plan to demonstrate compliance with pollutant reduction targets. This software was developed by the Cooperative Research Centre for Catchment Hydrology (now eWater CRC) as a decision support system for the design of stormwater treatment devices, and is now considered the standard method for determining compliance with water quality targets within the stormwater industry.

Modelling was based on the contributing catchment areas and change in size of the proposed treatment devices to get the required pollutant reduction. In the absence of specific MUSIC modelling guideline for Deniliquin, the model was setup in accordance with the Draft NSW MUSIC Modelling Guidelines prepared for CMA (2010). MUSIC Modelling Guidelines prepared by Water by Design (WD) (2010), WSUD Engineering Procedures prepared by Melbourne Water (MW) (2005) and Australian Runoff Quality –A guide to WSUD design prepared by Engineers Australia (EA) (2006) were also used where additional information was required.

The water quality targets appropriate for the project are the application of the DECC, Consultation Draft (2007) treatment targets to the increase in pollutant loads that would result as a result of the project. Based on the MUSIC model results, the proposed treatment devices and estimated size will be sufficient treatment for

compliance with these treatment targets. For more details on MUSIC model development, please refer to Appendix L-Surface Water and Groundwater Technical Report.

10.5 Mitigation measures

Proposed bioretention and flood detention basin

The bioretention and flood detention basin will be designed in accordance with Water Sensitive Urban Design (WSUD) principles. It will be a 'dry' basin with the bioretention treatment facility included within a wider flood detention facility, as shown on the Concept Stormwater Management Plan (Appendix F of the Surface Water and Groundwater Technical Report). The flood detention facility will be sized to ensure that peak discharges from the site are not increased beyond that of the pre-developed environment for nominally the critical 1, 10 and 100 year ARI storm events. Preliminary calculations suggest that flood storage of around 6,000 m^3 will be required.

Targets

Stormwater pollution control targets set out in the draft document Managing Urban Stormwater: Environmental Targets (DECC, Consultation Draft, 2007) are applicable to the operation phase of the Project. The NSW Office of Environment and Heritage recommends the following targets as the minimum requirements for developments to minimise impacts on the environmental values of water. These targets require pollutant reductions for TSS of 85 percent, Total Phosphorus of 65 percent, and Total Nitrogen of 45 percent.

Size

Final bioretention and flood detention basin will be designed in accordance with Water Sensitive Urban Design (WSUD) principles during the detailed design stage. It will be a 'dry' basin with the bioretention treatment facility included within a wider flood detention facility. The Concept Stormwater Management Plan (Appendix F of the Surface Water and Groundwater Technical report) illustrates the proposed and indicative location and size of the bioretention system. The proposed conceptual treatment devices were modelled and conceptually sized using MUSIC software. The results demonstrate that the proposed stormwater quality improvement devices will improve the overall water quality indicators during the post-development phase, compared to the developed site without treatment, with the reductions meeting or exceeding the required percentage reductions. Based on the model results, the project is considered to have negligible impact on stormwater quantity and quality during operation.

Design considerations

Runoff that is discharged to bioretention systems must be pre-treated to remove coarse sediments, prior to the runoff reaching the bioretention filter media surface. Swales are proposed along the perimeter of the site for the purposes of collecting runoff from the drainage system, and conveying this to the flood detention and bioretention systems. Swales are an efficient device for coarse sediment removal and would provide suitable pre-treatment.

Onsite landscape maintenance

Watering of landscaped areas using harvested stormwater is proposed for the on-site landscape. A water efficient irrigation system will be designed and implemented to minimise water use. In addition, native and drought-tolerant plants will be used in the landscaping design to reduce the need for watering. Given the focus on drought tolerant vegetation with little water demand and that the depth of the groundwater table is in excess of 10 m; water logging is considered highly unlikely, and consequently no mitigation or management measures are proposed.

Other mitigation measures related to surface water issues have been summarised in Table 10.5

Table 10.5 Surface water mitigation measures

Impact	No.	Environmental management measure	Timing
Water usage efficiency	SW1	Water usage efficiency will be increased by minimising the water loss in the system. One of the major losses is in the cooling tower. The Project would collect blow-down water for reuse on-site which improves the efficiency of the system. Mitigation measures may include: - to install all valves properly to make sure that there is no leakage and to monitor water consumption - to replace the current open loop cooling tower system with a closed loop system. This would significantly reduce water loss in the cooling	Pre-construction phase

Impact	No.	Environmental management measure	Timing
		tower - to monitor the quality of the feed water and blow-down water conductivity to maintain higher average conductivity, thus reducing total bow-down.	
	SW2	Rainwater tanks will be used for potable water supply	Operation phase
Water requirements	SW3	A double waste water treatment system will be installed and the volume supplied by each system will be larger than the required volume.	Construction phase Operation phase
Storage	SW4	No organic waste would be pumped or released. Water, waste water and co-products will be stored on-site within sealed or concrete lined areas.	Operation phase
	SW5	Waste water and co-product storage should be constructed in accordance with Australian codes (such as Fertiliser Australia – Fertiliser Handling Code of Practice (December 2014) and Australian Fertiliser Services Association Code of Practice (August 2008)), standards and legislative requirements and follow the storage and handling procedures outlined in the CEMP. The construction management plan would document the nature of these dangerous goods in detail.	Construction phase
	SW6	All storage and containers will be labelled clearly and correctly so the contents are easily identifiable.	Operation phase
Accidental spills	SW7	Spill management equipment will be available in all areas where materials or goods are stored. All materials and goods will be stored in appropriate containers in designated areas, with bunding provided to contain any accidental spills and designed in accordance with the Australian Standards (such as AS1940 - 1993 for the Storage of Flammable and combustible liquids and AS 4452 - 1997 for the Storage and Handling of Toxic Substances).	Operation phase
	SW8	Spill kits will be provided on site and staff will be trained on the handling of chemicals and materials particularly spillage management	Operation phase
Sewerage	SW9	Sewage generated by on site facilities (i.e. toilets and kitchen) would be disposed to Deniliquin Council's sewerage system via an extension provided by Deniliquin Council. Should a sewer connection not be available, An off-line septic system if required will be designed to comply with AS/NZA 1546.1:2008 On-site Domestic Wastewater Treatment Units – Septic Tanks standard.	Detailed design phase Operation phase
Anaerobic and aerobic digesters	SW10	Real-time monitoring will be carried out of various parameters in the anaerobic and aerobic digesters such as methane, oxygen and temperature	Operation phase
Effluents	SW11	Online monitoring will be carried out of various effluent parameters, including (but not limited to) DO, TSS, ORP, ammonia, nitrate/nitrite analysers. Real time monitoring of these parameters at key process units (i.e. in the intermediate basin) will	Operation phase

Impact	No.	Environmental management measure	Timing
		ensure that all effluent directed towards the aerated lagoon will be of sufficient quality. In the event of an exceedance of any parameter, the effluent can be recycled back in the wastewater treatment system for additional treatment.	
Potential fouling	SW12	Regular cleaning of the Membrane bioreactor membranes to prevent fouling. This may include membrane backwashing or chemical cleaning. The frequency of these backwashing events will be determined during operation.	Operation phase
Hazardous materials and accidental incidents	SW13	A Materials Storage and Handling Plan will be implemented during construction for the on-site storage of potential pollutants, such as oil, to avoid accidental spillage into the receiving environment.	Operation phase
Stormwater impacts due to vegetation stripping and/or earthworks and site development	SW14	Temporary stormwater management measures will be installed during construction, to avoid stormwater impacts to the Project Site, or receiving environment as a result of vegetation stripping and/or earthworks. The contractor would be required to prepare and implement a detailed construction Stormwater Management Plan, as part of the CEMP. Civil works would be staged to minimise disruption to the local drainage regime. At the detailed design stage, an updated MUSIC model would be developed to demonstrate water quality compliance with required targets. In addition to currently proposed water treatment features (e.g. vegetated swales and bioretention and flood detention basin) structural treatment devices, such as oil separators, may also be required. These will be confirmed during detailed design stage.	Pre-construction phase Construction phase
Drainage	SW15	If stormwater drainage system not maintained properly, there is a residual flood risk associated with blocked or damaged stormwater infrastructure such as culverts and drains. A routine drainage inspection and maintenance program will be established as part of the overall site asset management plan	Construction phase
Erosion and sediment	SW16	The permanent vegetated swales will be established first, which will also fulfil a sediment and erosion control function during construction.	Construction phase
	SW17	Any exposed areas of the Project Site will be covered as soon as possible, to prevent erosion and sediment mobilisation. An Erosion and Sediment Control Plan will be developed and implemented by the Contractor as part of the CEMP.	Pre-construction phase Construction phase
Flooding	SW18	The Project Site is not located within a flood risk area. No mitigation or management measures are proposed for flooding. Minor surface runoff currently being conveyed from a small catchment area to the west of the Project Site to the on-site localised depression, will be captured in the bioretention and flood detention basin.	Detailed design phase

10.6 Summary and conclusions

This chapter identified the potential surface water issues arising from the Project and where required, specific mitigation strategies were implemented during planning, construction and operation phases to minimise the identified issues.

In summary, the Project is not expected to have significant impacts on the surrounding environment or communities from a surface water perspective, beyond those issues that can be adequately mitigated. The implemented mitigation measures and strategies will minimise any remaining potential risk resulting from the Project's construction and operation.

11.0 Co-products and waste management

This chapter presents an assessment of anticipated waste types and quantities likely to be generated during the construction and operation of the Project.

The chapter describes the existing waste management facilities in the area, likely waste generation from construction and operation of the ethanol plant, proposed management of the waste streams and co-products, and proposed mitigation measures to address residual risks associated with waste generation at the site.

11.1 Director General's Requirements

The scope of this assessment is to address the following issues in accordance with the DGRs and EPA requirements. A summary of the applicable DGRs is provided in Table 11.1.

Table 11.1 DGRs for the assessment of waste

DGRs - Waste
- The quantity and type of all liquid and solid waste to be generated on site and how this waste would be handled, processed and, if necessary, disposed
- Investigation of appropriate options for sludge disposal
- Details of the measure to dispose/remove distillers grain, and details of contingency arrangements should these disposal measures become unavailable
- The EIS must provide details of the proposed management of the DDG co-products including estimated quantities and proposed treatment, storage and handling methods
- The EIS needs to demonstrate that sufficient demand exists in the local market and outline contingencies should other disposal methods be required.

Note: Since the issuing of the DGRs the Project scope has changes. As a result a number of DGRs are no longer applicable to the Project.

11.2 Methodology

11.2.1 Identifying Project waste and co-product streams

The waste management assessment involved an analysis of the proposed construction and operation activities to identify potential or likely waste streams and quantities arising from the Project. Waste and co-product generation quantities were estimated based on the proposed process to produce ethanol, DDGS and the wastewater treatment (refer to Chapter 3 Project Description).

11.2.2 Identifying waste impacts

The location and acceptance criteria of the existing Deniliquin Council landfill (Deniliquin Waste Depot), and other licensed landfills within 150 km of the Project Site, was investigated to assess the appropriateness of landfills in the vicinity of the Project for receipt of various categories of waste. Existing waste management facilities were identified based on a desktop review of available information.

11.3 Existing environment

11.3.1 Waste management contractors and facilities

The nearest waste management facility to the Project is the Deniliquin Waste Disposal Depot, approximately 4 km north of Deniliquin and 13.5 km from the Project Site. The waste depot is owned and operated by Deniliquin Council and accepts general waste from kerbside collection, self-hauled general waste and a variety of recyclable materials (such as scrap metal and whitegoods). Under EPL 6188 the Deniliquin Waste Depot must not exceed the following annual thresholds for disposal of waste:

- 20,000 tonnes of General Solid Waste (putrescible)
- 20,000 tonnes of General Solid Waste (non-putrescible)

Where alternative offsite disposal of waste is required due to the nature or quantity of the waste, the most appropriate local disposal location would be identified in agreement with the licensed waste collection contractor. In accordance with the Waste Regulation 2014 principle residual waste must be disposed of at a landfill within 150

km of the source of generation, unless being transported for reuse or recovery (as defined in the Regulations). There are several waste disposal facilities located in the Murray Shire Council approximately 75 km from Deniliquin. These include:

- Closter's Liquid Waste, Hillside Road, Moama, NSW, 2731 (Waste oil/hydrocarbon mixtures/emulsions in water)
- Moama Solid Waste Depot operated by Murray Shire Council, Centre Road, Moama, NSW, 2731 (licensed to receive 40,000 tonnes of General Solid Waste (putrescible) and 40,000 tonnes of General Solid Waste (non-putrescible) per annum)

In accordance with Waste Regulation 2014, waste management contractors would be required to provide documentation identifying the waste streams removed, the volumes disposed and the disposal locations.

11.4 Assessment of potential impacts

Waste has the potential to impact ecological function and services, biodiversity, water quality, social value and human health. However, if suitable resource recovery options are available and utilised, waste can be considered a valuable resource.

The core principle applied to waste management is that waste materials are to be managed to minimise environmental impacts. Various chapters of this EIS contain further descriptions of environmental values which may be affected by the Project's waste generation, as shown in Table 11.2.

Table 11.2 Environmental values application to waste management

Environmental value	Potential impact	EIS reference
Visual Amenity	The control of waste disposal and soil stockpiling during the construction stage is required to minimise the potential impacts upon visual amenity. Soil stockpiling may result in a temporary change of land form. An increase in traffic flow may occur due to waste collection and disposal. Both elements may affect the Project Site's visual amenity.	Chapter 15 Landscape Character and Visual Amenity Chapter 12 Traffic and Transport
Air Quality	Potential impacts on the quality of air in the vicinity of the Project, from waste such as dust, odour and air-borne contaminants, have been assessed as part of the study carried out for Chapter 16 Air Quality, Odour and Emissions. The potential impacts identified would be managed, minimised or avoided with appropriate controls and mitigation measures.	Chapter 16 Air Quality, Odour and Emissions
Flora and Fauna	Terrestrial flora and fauna within and adjacent to the Project area may be affected by windblown wastes or contaminated land/ contaminated water following a spill event.	Chapter 8 Biodiversity and Chapter 10 Surface Water
Public health and safety impacts	The health and safety of persons on the Project Site and in the community can be potentially impacted through uncontrolled waste placement and management. Inappropriate storage can result in increased populations of vermin and the spread of disease. Strategies to mitigate this are included in Chapter 20 Health and Safety.	Chapter 20 Health and Safety

Management strategies developed for each waste stream have been designed to be consistent with the waste management hierarchy, meet relevant legislation and policy, and to achieve the environmental objectives of the Project.

11.4.1 Waste generation

A variety of waste types would be generated during the construction and operation phases of the Project. Principle wastes generated during construction would be associated with the clearing of vegetation and earthwork. During operation of the Project waste would be generated from the ethanol production process, the use of machinery and worker domestic activities. Waste expected from the Project can be categorised into the following general streams:

- Solid waste (e.g. vegetation, building waste, general waste).
- Liquid waste (e.g. sewage effluent, waste water).
- Hazardous waste (e.g. hydrocarbon wastes, solvents, batteries).
- Air emissions (e.g. dust, CO_2).

The expected waste types from each activity, classification and estimated volumes are described in Table 11.3.

Table 11.3 Estimated waste generated

Activity	Waste type	Classification*	Approximate quantity
Construction			
Vegetation and soil clearing	'Poor' condition derived native grassland (PC1)	General solid waste (non-putrescible) – green waste	Quantities of waste that will be generated during land clearing are unknown at this stage but not expected to be significant.
	'Poor' condition black box woodland (PC2)	General solid waste (non-putrescible) – green waste	
	Soil	General solid waste (non-putrescible)	
General construction	Hard waste (concrete, bitumen, wood pallets/ timber, other packaging materials	General solid waste (non-putrescible)	Minor
	Scrap metal	General solid waste (non-putrescible)	Minor
Construction staff/ contractors and crib hut facilities	General municipal waste - Food waste / residual	General solid waste (putrescible)	83 t/y*
	General municipal waste - Paper, cardboard, glass and plastic	General solid waste (non-putrescible)	
Machinery and fugitive emissions from the removal of cover vegetation	Air emissions (dust, CO_2)	Air emissions	See Chapter 16 Air Quality, Odours and Emissions
Sewerage	Sewage effluent	Liquid waste	30 ML/y
Operation			
Site office and staff/ contractors	General municipal waste - Food waste / residual	General solid waste (putrescible)	11.96 t/y
	General municipal waste - Paper, cardboard, glass and plastic	General solid waste (non-putrescible)	
Cleaning of incoming wheat	Screenings (stones, chaff, small pieces of metals, twine)	General solid waste (non-putrescible)	Dependent on the type of wheat and harvesting method
Ethanol Production (grain intake, processing and DDG drying process)	Filter bags	General solid waste (non-putrescible)	15 t/y**
Sewerage	Sewage effluent	Liquid waste	4.4 ML/y
Ethanol production – process area and DDGS from a condenser	Wastewater	Liquid waste	1,345 kL/day
Cooling tower and cleaning	Wastewater	Liquid waste	47 kL/day
Workshop activities	Oils (hydrocarbon)	Hazardous waste	Minor

Activity	Waste type	Classification*	Approximate quantity
General operations	Waste contaminated with hydrocarbons	Hazardous waste	Minor
Cleaning and maintenance activities	Spent and unused paints, solvents and other chemicals	Hazardous waste	<50 L/y
Vehicles, comms. equipment, flashlights, emergency lighting	Batteries	Hazardous waste	Minor
Fermentation and distillation	Air emissions (CO_2 and inert gases)	Air emissions	91,000 t/y***
Wastewater treatment process	Liquid fertiliser	Liquid waste	7.9 ML/y
Wastewater treatment process	Recycled water	-	451.5 ML/y

Notes:

* t/y – tonnes per year

** Waste Classification would be confirmed prior to disposal in accordance with the Waste Classification Guidelines (EPA, 2014)

*** Based on processing 300,000 tonnes of wheat per year

11.4.2 Liquid fertiliser

As discussed in Chapter 10 Surface Water, ethanol production plants typically produce wastewater with high levels of BOD, COD, and SS, Total TDS as well as colour impurities and odour. The key pollutant of ethanol production would be organic waste.

Wastewater generated from two sources is discharged to the onsite wastewater treatment system. These sources are described below:

- Approximately 1,345 kL/day of wastewater generated within the process area and DDGS, would be condensed in the condenser (with a design capacity of 1,400 kL/day capacity) and would be pumped to the wastewater treatment system.
- Approximately 47 kL/day of wastewater generated within the cooling tower and general cleaning process and utility areas would be discharged to the wastewater treatment system.

The proposed wastewater treatment system is expected to generate a low volume of effluent as the majority (98 per cent or 1,368 kL/day) of wastewater generated would be recycled as process water (refer to Table 11.3). The remaining 2 per cent (23.8 kL/day) is in the form of organic waste (sludge) that ends up as a liquid fertiliser.

Liquid fertiliser from the Project would be suitable for use in agricultural as a soil amendment (fertiliser), applied to the land. It is proposed that sale and application to land of liquid fertiliser would be covered under a specific Resource Recovery Order and Exemption, issued by the EPA in accordance with the Protection of the Environment Operations (Waste) Regulation 2014 (2014 Waste Regulation). The liquid fertiliser would be accessed in accordance with the *Guidelines on Resource Recovery Exemptions (Land Application of Waste Materials as Fertiliser or Soil Amendment) (DECCW, 2011)* prior to lodging an application with the EPA. The liquid fertiliser would be stored in a tank with a capacity of 100 kL (equal to four days storage) located in a bunded area before being pumped into heavy vehicles to be transported for sale. Details on the storage of liquid fertiliser and associated spill prevention and management measures is discussed in the Surface Water and Groundwater Technical Report provided in Appendix L.

The liquid fertiliser would have a high organic content, with a predicted BOD of 8,000 mg/L, suspended solids concentration of 14,000 mg/L (1.4 percent) and nitrogen content of 21,000 mg/L. The carbon and nitrogen in the liquid compost encourage beneficial microbial activity and improves soil fertility and structure when applied to soil by irrigation or cultivation. Appropriate dilution rates for soil application would be developed by the liquid compost retailer.

In the event that a market for liquid fertiliser is not able to purchase the volumes of liquid fertiliser produced per annum, and sufficient storage capacity is not available, Dongmun Greentec would dewater the liquid fertiliser, for example using a belt filter press, to approximately 15 per cent solids, a similar consistency to biosolids. In the event that this option is considered, Dongmun Greentec would apply for a specific Resource Recovery Order and the consumer accepting the material would apply for a Resource Recovery Exemption for approval to apply the dewatered organic sludge as a soil amendment (compost material). The residual liquid produced during the dewatering process would be recirculated into the wastewater treatment plant.

11.4.3 Co-products

The Project would process approximately 300,000 tonnes of wheat per annum in order to produce fuel grade ethanol. In addition to ethanol, two additional products, referred to as co-products, are produced from the ethanol production process. The co-products that would be produced consist of:

- DDGS produced from the solids separated out during the distillation process
- Distiller's syrup produced from the evaporation of the thin stillage process

The commercialisation of these co-products as a result of the ethanol distillation process means that these products are not considered a waste but a commercial product.

A description of the co-products is provided below. In additional a detailed description of the ethanol process and the types of co-product produced is provided in Chapter 3 Project Description. Figure 11.1 provides an illustration of the wastes and co-products produced during the ethanol production process.

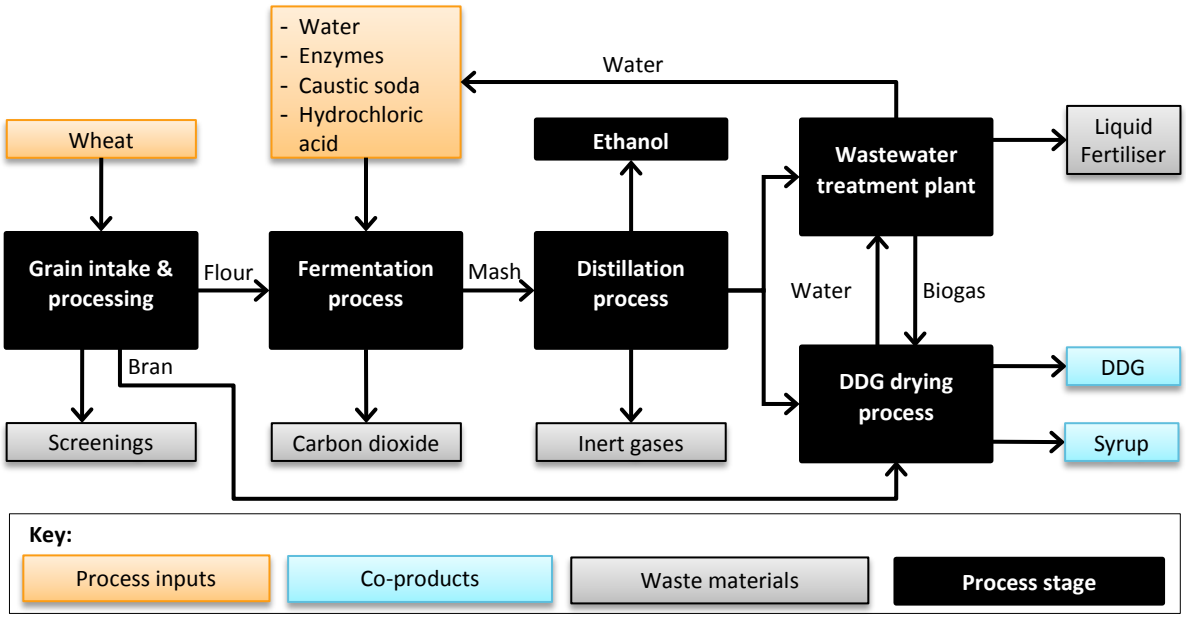


Figure 11.1 Summary process diagram showing co-products and waste streams

Dried Distiller's Grain with Solubles

DDGS are produced during the distillation process. DDGS is used in the feedlot and dairy industries for livestock feed, as it is high in protein and also contains minerals, beneficial fats and acids.

DDGS produced by the Project would be sold in the Riverina, Goulburn Valley and other local agriculture markets. In addition, there may be an opportunity to export the DDGS to New Zealand and South Korea. Further detail regarding the DDGS market is provided in Chapter 4 Project Need and Alternatives.

DDGS would be stored in silos of adequate capacity before being transported by heavy vehicle from the site for sale. Containment measure will be employed to prevent spillage. DDGS has a long shelf life and can be transported and stored on farms if required. Approximately 100,000 t/y of DDGS is expected to be produced by the plant, based on processing 300,000 t/y of wheat.

In the unlikely event that no market is identified given current domestic and international demand for the product, the DDGS would need to be disposed of to landfill. Deniliquin and Moama Landfill have been identified as potential options as a contingency measure for any DDGS that have not been sold to market. Dongmun Greentec considers this to be a very unlikely scenario. Further information of market demand is provided in Section 3.2.4 of Chapter 4 Project Need and Alternatives.

Distiller's Syrup

Distiller's syrup would be produced during the DDGS drying process. The syrup is a high protein substitute for molasses, which is widely used in feedlots for livestock nutrition. Syrup also forms a basis for the production of highly effective liquid biological fertilisers that improve soil and plant health, reducing reliance on imported synthetic fertilisers. Some of the syrup produced by the plant would be mixed with the DDG to improve its sale value, nutritional quality, reducing energy use in drying and to help prevent dust. The remaining syrup would be sold on the agricultural market as a stockfeed.

The syrup would be stored in vats of adequate capacity at the Project Site before being transport by truck for sale. Approximately 250,000 t/y of syrup is expected to be produced by the Project, based on processing 300,000 t/y of wheat.

In the unlikely event that no market is identified for the syrup the syrup would need to be disposed of to an appropriately licensed liquid waste treatment facility. Dongmun Greentec considers this to be a very unlikely scenario.

11.4.4 Environmental protection licence requirements

As a result of the Project's waste generating activities an EPL would be sought as part of its approval. The following triggers require the attainment of EPL for the Project:

- Chemical production (capacity to produce more than 20,000 tonnes of plant fertilisers per year)
- Chemical production (involves having on site at any time more than 5 tonnes of prescribed waste, not including excluded material (where 1,000 litres of liquid is taken to weigh 1 tonne)).
- Composting (involves having on site more than 2,000 tonnes of organics received from site and receiving more than 5,000 tonnes per year of non-putrescible organics or more than 200 tonnes per year of putrescible organics).

Details regarding the EPL applicable to the Project are discussed in further detail in Chapter 5 Statutory Controls and Approvals.

11.5 Mitigation measures

11.5.1 Waste management objectives

The environmental objectives for the management of waste generated from the Project are to:

- minimise the waste generated throughout the construction works and maximise the reuse and recycling of waste materials produced; and
- store, handle, transport, and dispose of waste in an environmentally responsible manner that does not cause harm or contamination to soil, air or water.

11.5.2 Waste management strategy

As noted in Section 11.4, the waste management hierarchy is a framework for prioritising waste management practices to achieve the best environmental outcome.

The preferred order of adoption is as follows:

- **Avoid** by identifying appropriate construction materials and procuring
- **Reduce** waste by optimising construction, and operation methods
- **Reuse** waste by identifying sources that can utilise the waste
- **Recycle** waste by identifying facilities that are able to recycle waste
- **Recovery** of waste materials, including energy from waste
- **Disposal** of waste at an appropriate facility

To deliver effective waste management across the Project Site, in accordance with the waste management hierarchy, a number of strategies would be adopted. These are discussed below.

11.5.3 Waste minimisation

Through cleaner production processes, and commercialisation of co-products, the Project would focus on reducing and reusing waste generated by the Project. By treating and recirculating processed wastewater and biogas from the wastewater treatment plant, the Project has reduced its reliance on imported process water and gas for heating. Additionally, commercialising the DDGS, distiller's syrup and liquid fertiliser for an agricultural market decreases the waste generated from the Project.

Disposal to landfill is limited to items that cannot be reused or recycled, such as filter bags and screenings.

11.5.4 Waste storage, handling and disposal

Table 11.4 outlines the proposed management strategy for each of the waste streams expected to be generated from the construction and operation phases of the Project.

Table 11.4 Waste management strategy

Waste type	Management measure
Construction	
Cleared vegetation	Cleared and stockpiled onsite. Vegetation would be chipped and reused for on-site rehabilitation following construction.
Soil (topsoil including grass)	Soil would be reused through direct placement in the first instance. Alternatively soil would be stockpiled and used for onsite rehabilitation following construction. Stockpiles would be located away from water sources and in clear areas. Grass would be incorporated into the topsoil to retain the biological activity and provide propagules for grass regrowth to stabilise stockpiles during temporary storage.
Hard waste (concrete, bitumen, wood pallets/ timber, other packaging materials)	Appropriate purchasing of construction materials would reduce hard waste produced during construction. Hard waste generated would be separated and returned to the supplier, where appropriate, or collected in industrial skips for disposal to the Deniliquin Waste Disposal Depot or a licensed offsite recycling facility.
Scrap metal	Scrap metal would be stored on-site in a designated location. Scrap metal would be taken to the Deniliquin Waste Depot or an off-site licenced metal recycler for recycling.
General municipal waste - Food waste	Collected on-site in designated waste collection bins. Transported to a licensed off-site waste facility, such as Deniliquin Waste Depot or Moama Waste Depot.
Recyclable paper, cardboard, glass and plastic	Collected on-site in designated recycling collection bins. Transported to a licensed recycling facility, where practical.
Operations	
General municipal waste – Food waste / residual	Collected on-site in designated waste collection bins. Transported to a licensed off-site waste facility, such as Deniliquin Waste Depot or Moama Waste Depot.
General municipal waste Recyclable paper, cardboard, glass and plastic	Collected on-site in designated recycling collection bins. Transported to a licensed recycling facility, where practical.
Screenings (stones, chaff, small pieces of metals, twine)	The volume of screenings is expected to be small, with the material collected in onsite industrial bins for disposal off site at the Deniliquin Waste Disposal Depot at regular intervals.
Filter bags	Filter bags would be regularly changed and stored in a designated collection bin. Spent filters and bags would be disposed of at the Deniliquin Waste Disposal Depot.
Sewerage effluent	Sewage generated by on site facilities (i.e. toilets and kitchen) would be disposed to Deniliquin Council's sewerage system via an extension provided by Deniliquin Council. Should a sewer connection not be available, an offline septic system would be developed. This would be designed to comply with AS/NZA 1546.1:2008 On-site Domestic Wastewater Treatment Units – Septic Tanks standard.
Process wastewater	Treated wastewater will be re-used on-site.
Oils (hydrocarbon)	Stored in a designated area and disposed of at a licensed offsite waste processing facility for recycling or disposal.
Waste contaminated with hydrocarbons	Taken to a licensed offsite waste processing facility for recycling or disposal.
Spent and unused paints, solvents and other chemicals	Stored in a contained area until product can be collected by a licensed waste management contractor.
Batteries	Stored in a designated area on-site, within waterproof battery storage containers. Batteries would be managed by a licensed waste contractor to be taken to an appropriately licensed waste processing facility for recycling or disposal.
Air emissions (CO_2 and inert gases)	Gases would be released to air. Should a viable market be established for carbon dioxide in the beverage, industrial cleaning or grain storage industries in the future, the plant would be upgraded to capture CO_2 for sale (subject to further approvals).
Liquid fertiliser	Liquid fertiliser would be stored in covered, bunded areas before being pumped into tanker trucks to be transported for sale.

11.5.5 Waste reuse

Waste re-use would be achieved by the following key re-use opportunities:

- soil and vegetation used onsite for site landscaping
- treating and recirculating processed wastewater from the wastewater treatment plant
- organic rich effluent from the wastewater treatment plant would be marketed as liquid fertiliser under a specific Resource Recovery Order and Exemption, following approval from the EPA.

Throughout the construction phase, to maximise re-use opportunities, waste would be segregated. Where feasible, Dongmun Greentec would work with suppliers and investigate the opportunities for the re-use of packaging materials and surplus materials, such as timber pallets and scrap metal.

Throughout the operations phase, investigations would continue looking into re-use opportunities, both on-site and with local businesses/industries. Additionally, the marketability of wastes would be regularly reviewed to ensure potential new and emerging opportunities for waste re-use are identified and maximised.

11.5.6 Waste recycling

Where practical and considering potential health and hygiene issues, wastes would be collected and segregated on-site and stored in suitable containers before being transported to licensed offsite recycling facilities.

11.5.7 Waste disposal

The disposal of waste materials would be considered as a last resort and where all other avenues have been investigated. Where no other option is available, all waste would be handled and disposed of in a manner that causes the least environmental harm.

General waste would be transported to a local licensed landfill for disposal in line with regulatory requirements. Trackable wastes (required to be tracked in accordance the 2014 Waste Regulations) would be handled by a licensed waste contractor and transported to an appropriately licensed offsite waste disposal facility.

11.5.8 Waste monitoring and auditing

On-site waste monitoring and auditing procedures would be developed for the construction and operation phases of the Project for types of waste streams, quantities produced, and waste management practices.

These procedures would include:

- an assessment of the actual wastes compared to predicted waste streams, quantities and classification;
- review the waste transportation records and disposal routes;
- monitoring the implementation of the principles of waste management hierarchy
- monitoring and auditing would enable positive actions to be taken in the event of incidents or accidents occurring on-site and allow the development of actions to improve waste management practices..

Inspections of the waste management areas would be conducted on a weekly basis to ensure that all waste materials are appropriately separated, stored and labelled.

New waste streams would be addressed as they arise and assessed to determine the most suitable management measures to use when handling, storing, transporting and disposing of the waste.

11.5.9 Waste reporting

A database inventory would be used to record and report all waste streams, volumes and management measures for all waste streams arising through the construction and operation phases of the Project. This database would be used to inform internal and external stakeholders, and government agencies on the types and volumes of waste being generated, re-use and recycling rates, and the types and quality of substances emitted to land, water and air.

Dongmun Greentec would report on the waste emissions for the construction and operation of the Project in accordance with EPL requirements and, where relevant thresholds are triggered, the National Pollutant Inventory (NPI) reporting requirements.

11.5.10 Construction and operation mitigation measures

A Construction Waste Management Plan (CWMP) and Waste Management Plan (WMP) would be developed to ensure appropriate waste separation, storage and disposal occurs during the construction and operation phases. Specific items to be incorporated into the CWMP are detailed in Table 11.5.

Table 11.5 Waste mitigation measures

Impact	No.	Environmental management measure	Timing
Waste management	CW1	A waste management plan would be incorporated into the CEMP and operational EMP for the Project.	Construction phase and operations phase
	CW2	Waste generated during construction would be managed and disposed of in accordance with Table 11.4	Construction phase
	CW3	Waste generated during operations would be managed and disposed of in accordance with Table 11.4	Operations phase
	CW4	A database inventory would be used to record and report all waste streams, quantities and management measures for all waste streams arising through the construction and operations phase of the Project.	Construction phase and operations phase
	CW5	A designated, secure waste storage area would be provided to enable waste separation into general waste and recycling	Construction phase and operations phase
	CW6	Bins and skips would be covered to prevent rubbish from blowing away or rainwater entering the waste receptacles	Construction phase and operations phase
	CW7	Temporarily stored construction waste would be located in a suitably stabilised area, e.g. construction compound or designated stockpile areas	Construction phase and operations phase
	CW8	Suitable containment would be provided for the temporary storage of wastes, which would be collected frequently	Construction phase and operations phase
	CW9	Temporarily stored putrescible waste, or other wastes that may attract vermin, would be stored in secure containers and be disposed of regularly	Construction phase and operations phase
	CW10	Waste and other potential polluting materials would be removed from the site and the site left in a clean and tidy state	Construction phase and operations phase
	CW11	Waste would be disposed of in accordance with statutory and local authority requirements by an appropriately licensed contractor	Construction phase and operations phase
	CW12	Waste would be disposed of in accordance with statutory and local authority requirements by an appropriately licensed contractor	Construction phase and operations phase
	CW13	The Project Site would be kept in a neat and tidy condition through good house-keeping practices, including regularly removing waste bins (including recycling bins) to prevent bins overfilling, promptly cleaning up after spills, and regularly tidying up the site.	Construction phase and operations phase
	CW14	Inspections of the waste management areas would be conducted on a weekly basis to ensure that correct waste management procedures are being followed	Construction phase and operations phase

11.6 Summary and conclusions

The construction and operation of the Project would produce a relatively small amount of waste which can be categorised as solid waste, liquid waste, hazardous waste and air emissions. Waste that is generated by the

Project would need to be disposed of to landfill, with the remainder of the waste recycled or re-used onsite or re-used by the local agriculture industry (liquid fertiliser/compost). In addition co-products from the process would be sold to the local agricultural market (DDGS and syrup). Overall, the waste that would be generated through the Project would be minimised and the recycling and reuse of waste materials produced would be maximised through the implementation of the identified mitigation measures. Further, the development and employment of waste management programs would help to manage the storage, handling, transport and disposal of waste in an environmentally responsible manner that does not harm or contaminate the soil, air or water.

12.0 Traffic and transport

This chapter provides an assessment of the potential impacts of the Project upon the existing transport infrastructure surrounding the Project Site. The impact assessment anticipates the likely traffic generated throughout the phases of the Project and considers potential mitigation measures to appropriately reduce or manage the level of impact and maintain the operational efficiency of the existing transport networks.

This assessment is supported by a Traffic and Transport Technical Report which is provided in Appendix M.

12.1 Director-General's Requirements

Traffic and Transport specific requirements within the DGRs are presented in Table 12.1.

Table 12.1 DGRs for the assessment of traffic and transport

DGRs - Traffic and Transport
- details of all traffic and transport demands likely to be generated during construction and operation, including a description of haul routes
- details on access to the site from the road network including intersection location, design and sight distance
- an assessment of predicted impacts on road safety and the capacity of the road network to accommodate the project
- plans of any road upgrades, rail and other infrastructure works or new roads required for the development
- an assessment of where far-field road works are required as a result of traffic impacts from the development
- details of any proposed rail siding and associated rail traffic and assessment of the predicted impact of this on the rail network
- detailed plans of the proposed layout of the internal road network and parking on site in accordance with the relevant Australian standards.

12.2 Methodology

The following methods were adopted for the traffic and transport assessment of the Project's construction and operations phases:

- Identification of the existing transport infrastructure in the region (i.e. regional roads and rail infrastructure) through a review of available mapping from online sources and provided by relevant departments.
- Consultation with relevant stakeholders and departments including Deniliquin Council, RMS, Public Transport Victoria and V/Line and QUBE Logistics to ascertain:
  - Road specific data including route status, speed limits and safety data.
  - Timetable information for train routes
  - Plans of any road upgrades, rail and other infrastructure works or new roads required for the development.
  - Current and future capacity of the existing routes.
- A review of relevant standards, policies and guidelines to inform the design and assessment including:
  - Guide to Traffic Generating Development (RTA, 2002)
  - Austroads Guide to Road Design (including Part 4A: Unsignalised and Signalised intersections and Part 3: Geometric Design) (Austroads, various)
  - Road Design Guide (RTA, Various)
  - Australian Standards AS2890: Parking Facilities (AS2980)
- A quantitative assessment of the additional traffic generated as a result of Project activities during construction and operations phases, including the movement of Project related materials, plant, equipment and workforce along the Project's identified transport corridors.

- Development of plans of the proposed layout of the internal road network and parking on site in accordance with the relevant Australian standards.
- An assessment of the potential impacts from the Project on:
    - the existing road infrastructure and network, including road safety, road traffic generation, and the capacity of the road network to accommodate the likely increase, and cumulative impacts
    - the existing rail network, including potential rail traffic generation and the capacity of the rail network to accommodate the likely increase, and cumulative impacts
    - any other transportation mode that may be impacted (e.g. air, shipping)
- Identification of potential mitigation and management strategies which may be implemented during the Project's phases.
- Identification and assessment of the residual impacts (if any) resulting from the Project following the implementation of mitigation measures.

The assessment outputs are summarised within this chapter and are detailed in full in the Traffic and Transport Technical Report (Appendix M).

12.3 Existing environment

The existing road and rail networks, as well as planned network and infrastructure upgrades, are described in this section.

12.3.1 Road network

The extent of the existing transport infrastructure surrounding the Project Site is presented in Figure 12.1.

The key State and local roads used to access the Project Site and the rail network are:

- Riverina Highway (B58)
- Cobb Highway (B75)
- Deniliquin Barham Road
- Line Road (Leetham Road)
- Ricemill Road

State Roads

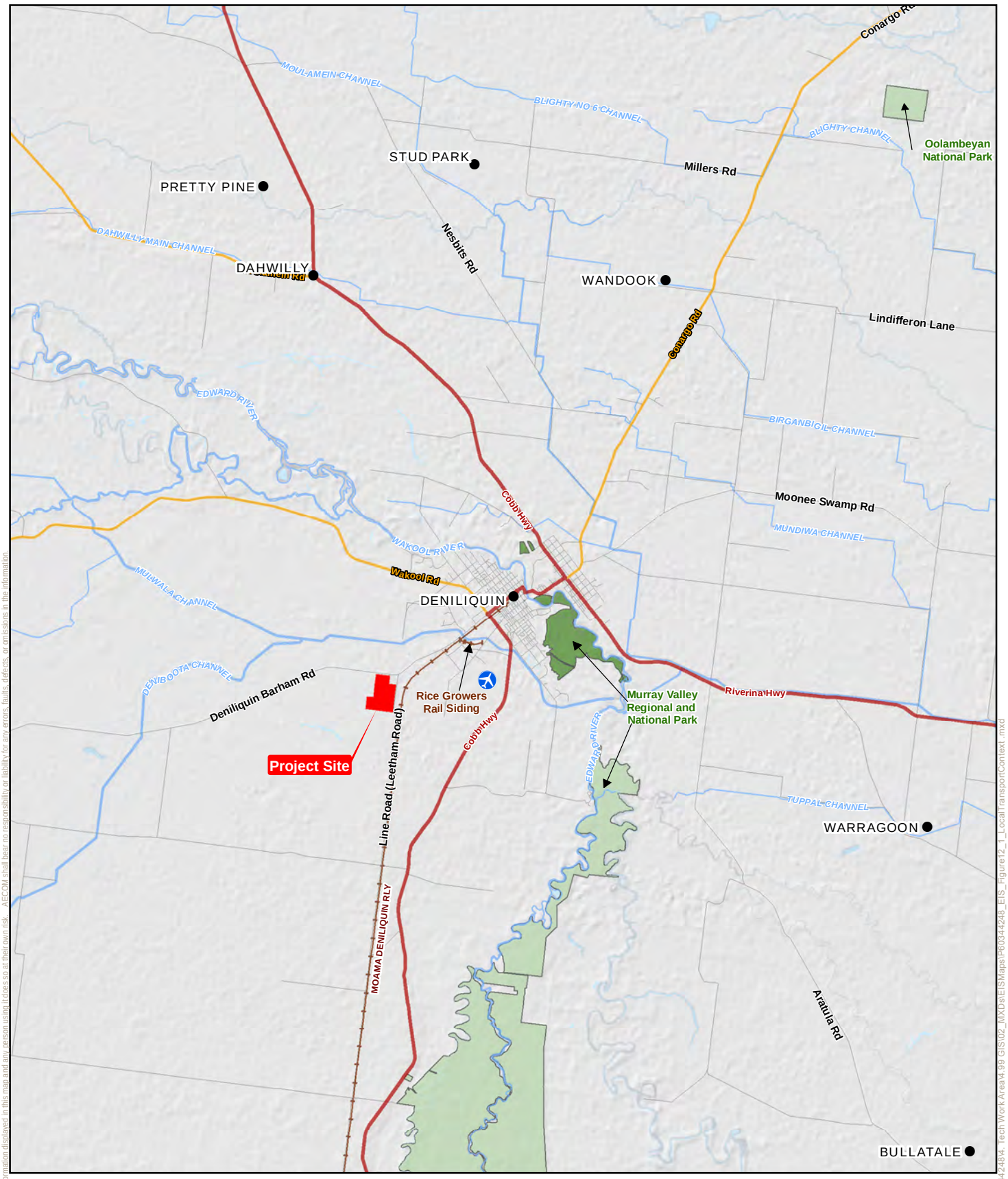
Riverina Highway (B58)

The Riverina Highway runs parallel to the Murray River in NSW for 230 km through the Riverina region from Finley to Deniliquin. It begins in the east at Bethanga Bridge over the Murray River, near Albury, heading west through Albury and Howlong to near Corowa. From here the highway runs north for nearly 20 km before resuming its westerly course to Deniliquin via Berrigan and Finley connecting to the Cobb Highway (B58). On entry to Deniliquin, the Riverina Highway is a two-lane, single carriageway formation with a posted speed limit of 60 km/hr (urban areas) and travelling east from Deniliquin, the speed limit is 100 km/hr (outside urban areas). The Riverina Highway is an approved AB-Triple route.

Cobb Highway (B75)

The Cobb Highway (B75) extends from the bridge over the Murray River at Moama, via Deniliquin, through Hay and Ivanhoe to meet with the Barrier Highway (A32) near Wilcannia. In the vicinity of Deniliquin, the Cobb Highway is a two-lane, single carriageway formation with a posted speed limit of 100 km/hr (outside urban areas). It is a RMS approved route for road trains and 4.6 m high vehicles. The Cobb Highway is an approved AB-Triple route north of Deniliquin and approved Road Train Route south of Deniliquin.

Local Transport Context



LEGEND

- Locality
- Airport
- Freeway; Highway
- Main Road
- Other Roads
- Railway
- Major River / Watercourse
- Minor Watercourse
- Project Site

NSW Protected Areas

- Regional Park
- National Park
- Nature Reserve

Data Sources:
1. Roads, Railway, Parks, Drainage, Suburbs: © Street Pro, 2011
2. Base Map Layer: Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community
3. Parks and Reserves: An area of land, the boundaries of which have been determined by the Governor by proclamation in the Government Gazette, which has been reserved for various protection purposes defined in instruments administered by Department of Environment and Climate Change (Parks & Wildlife Division).

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FIGURE 12.1

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Deniliquin Council roads

Deniliquin Barham Road

The Deniliquin Barham Road starts at the Cobb Highway at Deniliquin, running through to Barham – Moama Road at Thule. The Deniliquin Barham Road is an unclassified regional road which is a sealed, single carriageway with a posted speed limit of 100 km/hr in the rural areas. It is also an approved 19 m B-Double route. Deniliquin Barham Road provides the key connection to the State road network (connecting to the Riverina Highway and the Cobb Highway at Deniliquin).

Line Road

Line Road (also known as Leetham Road) is a local road which is a sealed, single carriageway with a posted speed limit of 100 km/hr in the rural areas. Line Road connects Mathoura to Deniliquin Barham Road.

Ricemill Road

Ricemill Road is a local road which is a sealed, single carriageway with a posted speed limit of 60 km/hr in the rural areas. Ricemill road connects with Wirraway Drive and the Deniliquin Rice Growers rail siding is accessed off this road.

12.3.2 Existing intersections

The following intersections would be utilised by Project generated traffic on the preferred transport routes:

- Deniliquin Barham Road and Line Road: This is a priority intersection with basic right turn treatment on a two-lane rural road.
- Deniliquin Barham Road and Rice Grower's Lane: This is a priority intersection with auxiliary right turn treatment for the traffic turning right into Ricshuemill Road (Type AUR).
- Deniliquin Barham Road and Cobb Highway: This is a large single lane roundabout connecting Deniliquin Barham Road with Cobb Highway which forms part of the B-Double Routes and A-Double Road Train Routes.
- Cobb highway and Riverina Highway: This is a large single lane roundabout connecting Cobb Highway with Riverina Highway which forms part of the B-Double Routes and A-Double Road Train Routes.

12.3.3 Road traffic volumes

The key road transport corridors to be used by the Project during the construction and operations phases would be the Riverina Highway, Cobb Highway and Deniliquin Barham Road.

The daytime traffic volumes (observed between 8.00 am – 5.00 pm) on these key roads which would service the Project Site are presented in Table 12.2.

Table 12.2 Annual average daily traffic volumes (Deniliquin Council, 2015)

Road Name	Traffic volumes (9 hrs)	Percentage of heavy vehicles
Riverina Highway	696	14 percent
Cobb Highway	2,179	7 percent
Deniliquin Barham Road (at Caldwell)	405	32.6 percent
Deniliquin Barham Road (west of Calimo Street)	1,696	10.6 percent

12.3.4 Road safety and crash data

Accident data based on information sourced from Transport for NSW shows that there were two recorded accidents in the Project vicinity between 2009 and 2015 involving trucks (heavy vehicles). Both accidents occurred on the Cobb Highway, to the north and east of Deniliquin.

Along Deniliquin Barham Road, between January 2009 and June 2014, Deniliquin Council recorded two minor accidents in 2012 in the vicinity of the Project Site and one recorded in 2013 west of Caldwell.

Deniliquin Council Area Crash Statistics for 2012 shows that crash numbers in the Deniliquin LGA have been reducing over a five year period with the last fatal crash in Deniliquin occurred in 2010.

12.3.5 Public transport

There are currently five bus and coach services (local bus routes and long distance coaches) as well as eight school bus routes servicing Deniliquin and surrounds.

12.3.6 Rail network

The Deniliquin Line (also known as the Echuca Line) connects Bendigo to Echuca and Deniliquin (Figure 12.1). V/Line operates a passenger service on this line from Melbourne to Echuca. It does not provide services to Deniliquin.

The Moama Deniliquin Line is the nearest freight rail infrastructure (broad gauge) connecting Deniliquin to Bendigo (via Echuca). Freight trains are operated by QUBE Logistics transporting mainly rice, grain and containers. Red-gum sleepers are also loaded at Mathoura and Deniliquin. In general, the line operates with maximum speed of 80 km/hr between Bendigo and North Bendigo Junction, 65 km/hr between North Bendigo Junction and Echuca and 40 km/hr between Echuca and Deniliquin (Vicsig, 2015).

There are rail sidings operating in the proximity of the Project Site namely:

- Deniliquin Rice Growers Siding – accessed via Ricemill Road off Deniliquin Barham Road.
- Deniliquin Freighters Siding – accessed via Harfleur Street off Cobb Highway.

The rail crossings in the vicinity of these sidings are open type.

Rail traffic volumes

VLine operates two to three passenger train services per day from Southern Cross station in Melbourne to Echuca only.

Freight trains (operated by QUBE Logistics) run every Monday to Friday between Melbourne and Deniliquin's Rice Growers Siding (shown in Figure 12.1 and Figure 12.2). Trains depart Westgate Port Siding, Melbourne around 5.00 am and arrive at Deniliquin Rice Growers Siding around 12.30 pm. Trains depart Deniliquin around 5.00 pm and arrive back at Westgate Port Siding around 12.40 am.

12.3.7 Other transportation modes

Deniliquin Airport is situated between Cobb Highway and Wirraway Drive, approximately 5 km south west of the Deniliquin town centre and 3.5 km east of the Project Site. There are no plans to use the airport for the Project.

The Port of Melbourne (approximately 250 km to the south of the Project) is likely to be used by the Project during the operations phase for the export of products. The Port would be accessed by existing road and rail routes.

12.3.8 Planned infrastructure upgrades

Deniliquin Council has received funding for a $1.1 million upgrade to Deniliquin Barham Road. A 2 km section of the road from the Ochtertyre Street roundabout to the intersection of Abattoir Road is being widened, strengthened and resurfaced for the use of road trains. The total project cost is $1.148 million, of which $574,000 would be funded through the Federal Government's Heavy Vehicle Safety and Productivity Program.

The remainder of the project cost would be funded by Deniliquin Council. Deniliquin Council is upgrading to assist in maintaining a safer road network for Deniliquin.

There are no known proposed rail infrastructure upgrades and the Project does not require any far-field road or rail upgrades.

12.4 Assessment of potential impacts during construction

During the construction phase, equipment would be transported to the Project Site at the direction of the contractors responsible for elements of the Project's construction. Where possible, the majority of the equipment required for construction would be sourced from local businesses around Deniliquin; however some specialist equipment may be required throughout the construction period which would be sought from specialist providers.

The preferred road transport route to access the Project Site (during both construction and operations phases) would be along regional and state roads including the Cobb and Riverina Highways and Deniliquin Barham Road.

It is noted that the Riverina Highway is an approved AB-Triple route. The Cobb Highway is an approved AB-Triple route north of Deniliquin and approved Road Train Route south of Deniliquin. Deniliquin Barham Road is an approved 19 m B-Double route. It is anticipated that the transportation of raw material and outputs from the plant would use heavy vehicles up to the B-Double category.

The rail network would not be used during the site preparation and construction phase.

12.4.1 Road network

A road traffic impact assessment has been undertaken to determine the level of impact the traffic generated during the construction phase would have on the surrounding network. The following assumptions have been made as part of the assessment:

- The construction period is between 14 to 16 months.
- It is estimated that the average number of construction workers on-site would be up to around 350 per day during periods of peak construction activity.
- The construction workforce would mostly reside in Deniliquin.
- For weekdays, the construction activities would be carried out between 7:00 am to 6:00 pm. For Saturdays, the allowable hours for construction activities would be limited to between 8:00 am to 1:00 pm. No construction activities would be carried out on Sundays and Public Holidays.
- The plant would be constructed on-site with no large pre-prefabricated equipment to be transported to site. There is not expected to be over-size and over-mass (OSOM) vehicles required to transport large equipment to the site.
- Apart from personal light vehicles and shuttle buses, no other transport option has been included in terms of road based transport for workforce.
- Shuttle bus service (assumed 40 seater shuttle bus / coach) could be provided to transport the workforce living in Deniliquin to minimise the shorter distance trips between Deniliquin and the proposed Project Site. Each bus trip would be equivalent to removing 40 workers' vehicles from the road network.
- It is anticipated that a temporary concrete batching plant would be built on-site so the overall vehicle movements would include the delivery of cement, aggregate and sand from local quarry suppliers. Steel and other metal components would likely be delivered from Melbourne or Sydney.

12.4.2 Site access arrangements

The primary vehicular access points during construction for the Project Site are:

- entry via Deniliquin Barham Road approximately 550 m west of the intersection between Deniliquin Barham Road and Line Road (Leetham Road). Separate site accesses are provided for light vehicles accessing the proposed main office area and for heavy vehicles delivering construction materials.
- exit via Line Road (Leetham Road) which connects to Deniliquin Barham Road.

Figure 12.2 shows the proposed external access points for the Project. Figure 12.3 shows internal vehicle routes and parking.

All access and exit driveways are located along straight sections of road with good sight distances of over 250 m in both directions of the carriageway (both on Deniliquin Barham Road and on Line Road). The available sight distances would more than satisfy the requirement of 222 m for a 100 km/hr road (based on an 8 second gap).

12.4.3 Construction vehicle movements

The number of daily and hourly construction-related light and vehicles heavy vehicle movements and the total peak volume (during shift changes) were calculated to assess the potential impact to the road network. The calculation is detailed within Appendix M Traffic and Transport Technical Report.

The estimated number of overall daily vehicular trips is around 300 vehicles per day during periods of peak construction activities (i.e. 150 vehicles per day per direction based on 50 percent inbound and 50 percent outbound).

On average, the estimated breakdown of the daily total vehicles is approximately 80 percent workforce vehicles and around 20 percent construction related vehicles. This equates to approximately 244 light vehicle and shuttle bus trips (122 two-way trips per shift change with 110 car trips and 12 bus trips per shift change) and 56 heavy vehicle trips (28 heavy vehicles per direction per day).

12.4.4 Traffic volume assessment

The existing traffic volume along Deniliquin Barham Road is around 405 vehicles per day (with 32.6 percent heavy vehicles) (Table 12.2). The estimated construction related traffic during peak construction activities is 300 vehicles per day, which is around 74 percent of the current daily traffic volumes. However, if the traffic volume of 1,696 vehicles per day (with 10.6 percent heavy vehicles) along Deniliquin Barham Road (west of Calimo Street)

is to be adopted as the background traffic volume, the development generated traffic would be reduced to around 18 percent of the current background traffic.

12.4.5 Road capacity

There would be approximately one heavy vehicle every ten minutes during periods of peak construction activities. This is considered to be relatively low in comparison to the existing traffic volumes (Table 12.1) on the key road connections (namely Cobb and Riverina Highways accessed by the construction vehicles) and this is unlikely to have a significant impact on the operational efficiency of these key road links.

RTA's *Guide to Traffic Generating Developments* recommends for a two-lane rural road on level terrain with a design speed of 100 km/hr and with heavy vehicles exceeding 15 percent; the estimated capacity would be around 2,290 vehicles per hour (based on peak hour flow for Level of Service E) (LoS E) (RTA, 2002). For the weekday peak hour, the recommended performance standard for a two-lane rural road would be Level of Service C (LoS C), which equates to around 870 vehicles per hour (refer to Appendix M Traffic and Transport Technical Report for discussion on LOS).

Assuming the peak hour traffic volumes for a rural road are around 15 percent of the daily traffic volume, the estimated existing peak hour traffic volume would be around 61 vehicles per hour (based on 405 vehicles per day). The additional traffic volume generated by the construction activities of the Project during the peak hour would be around 128 vehicles per hour. Therefore the peak hour traffic volume along Deniliquin Barham Road would be approximately 189 vehicles per hour. This frequency is relatively low compared to the peak hour volume of 870 vehicles per hour for a two-lane rural road with LoS C.

Deniliquin Barham Road (west of Calimo Street) has a higher estimated existing traffic volume of 1,696 vehicles per day at the eastern end of Deniliquin Barham Road which equates to approximately 255 vehicles per hour (at 15 percent of the daily traffic volume). With the additional 128 vehicles per hour for the construction activities, this would still be below 870 vehicles per hour for LoS C (total around 383 vehicles per hour). This assessment demonstrates that the peak hour traffic generated during the construction phase is unlikely to have an adverse impact on the capacity performance of the surrounding road network.

12.4.6 Road infrastructure

As mentioned above, Deniliquin Council is upgrading a 2 km section of Deniliquin Barham Road from the Ochtertyre Street roundabout with Cobb Highway approximately 2.6 km to the east of the Project Site. The road is being widened, strengthened and resurfaced for the use of road trains and the upgrade would assist in maintaining a safer road network for Deniliquin.

Of the 56 heavy vehicles per direction per day accessing the Project Site during the period of peak construction activities, 28 heavy vehicles per direction per day would be accessing to and from the west and 28 vehicles per direction per day would be accessing to and from the east. The number of heavy vehicles accessing the Cobb and Riverina Highways is likely to be around four heavy vehicles per direction per hour and hence unlikely to cause adverse impacts on these highways.

The magnitude of heavy vehicles generated by the Project during the construction phase at 56 vehicles per day is between 31 to 42 percent of the heavy vehicle volumes for the existing background traffic along Deniliquin Barham Road. The section of Deniliquin Barham Road, between the Project Site and the end of Deniliquin Council's upgrade work, is likely to experience some pavement impact by the Project during the construction phase (14 to 16 months). The potential impacts would be mitigated following discussions with Deniliquin Council to confirm an appropriate approach.

12.4.7 Road safety

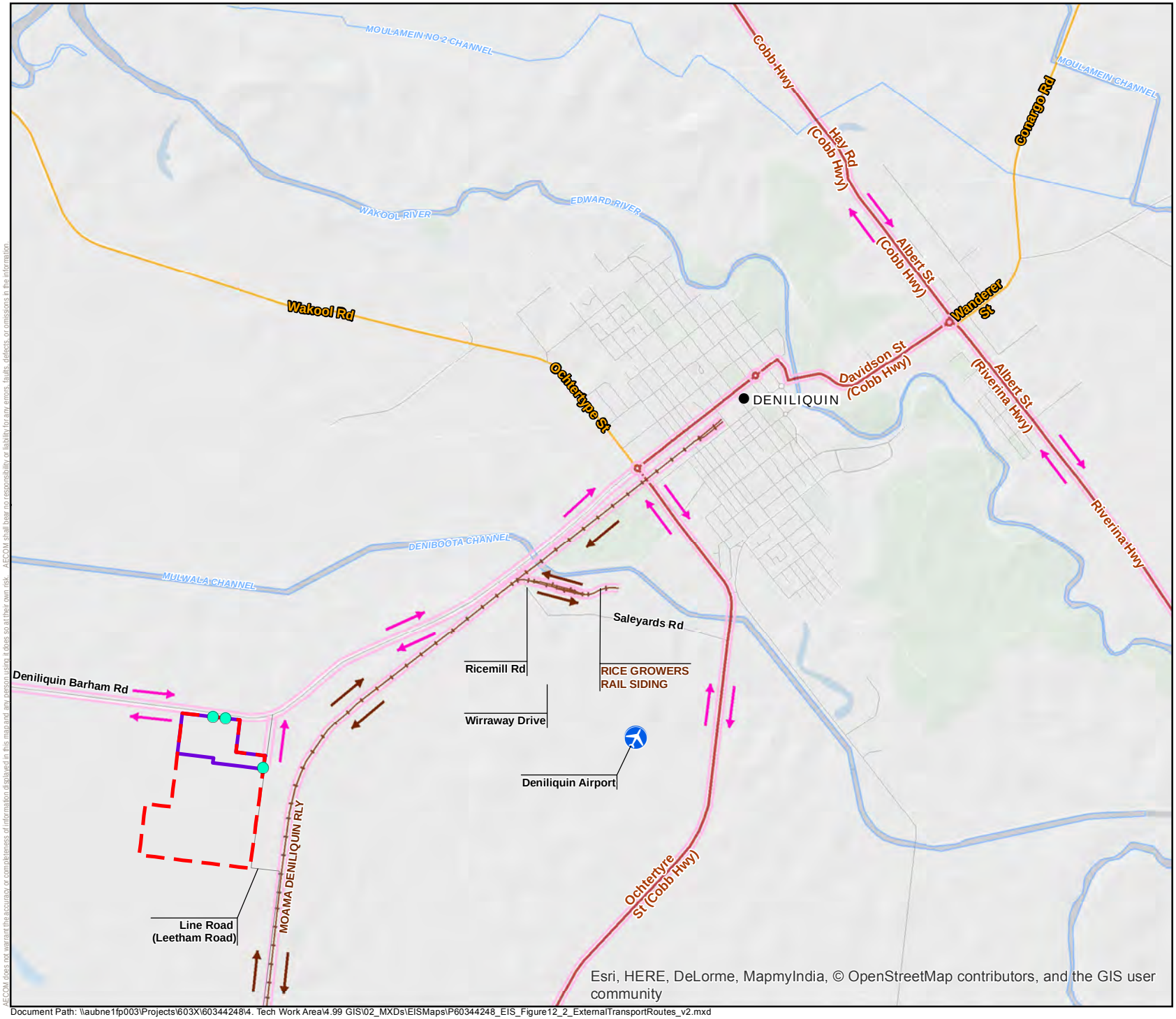
The impact of the additional vehicles on State roads is not likely to have an impact on road safety. The increase of heavy vehicles on local roads may have safety impacts due to large construction vehicles turning across the Deniliquin Barham Road at the construction site entrance and exits. Traffic management measures would be required to ensure vehicles could access and leave the site safely without disrupting road users and pedestrians.

12.4.8 Public transport

The Project Site does not occur or interfere with any existing bus stops or mapped pick up locations. The majority of these are within Deniliquin town. The Project construction traffic is likely to use some of the roads utilised by the Deniliquin Town Service bus, long distance coaches and school buses including Deniliquin Barham Road, Cobb Highway and Riverine Highway. The number of additional vehicle movements (light vehicles and heavy vehicles) on the local network during the construction phase is unlikely to impact on the journey time of the existing public transport routes due to the low volumes and the existing capacity of the roads.

12.4.9 Rail network

The rail network would not be used to transport equipment and personnel during the construction phase. There would be no impact to the existing rail network during this phase.



Deniliquin Ethanol Plant
Environmental Impact Statement

FIGURE 12.2
External Transport Routes

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LEGEND

- Site Access and Exit Points
- Locality
- Airport
- Major River / Watercourse
- Minor Watercourse
- Direction of Travel - rail
- Direction of Travel - vehicles
- External Transport Routes
- Freeway; Highway
- Main Road
- Other Roads
- Railway
- Project Site
- Project Footprint

Data Sources:
1. Roads, Railway, Parks, Drainage, Suburbs: @ Street Pro, 2011
2. Base Map Layer: Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community
3. Parks and Reserves: An area of land, the boundaries of which have been determined by the Governor by proclamation in the Government Gazette, which has been reserved for various protection purposes defined in instruments administered by Department of Environment and Climate Change (Parks & Wildlife Division).

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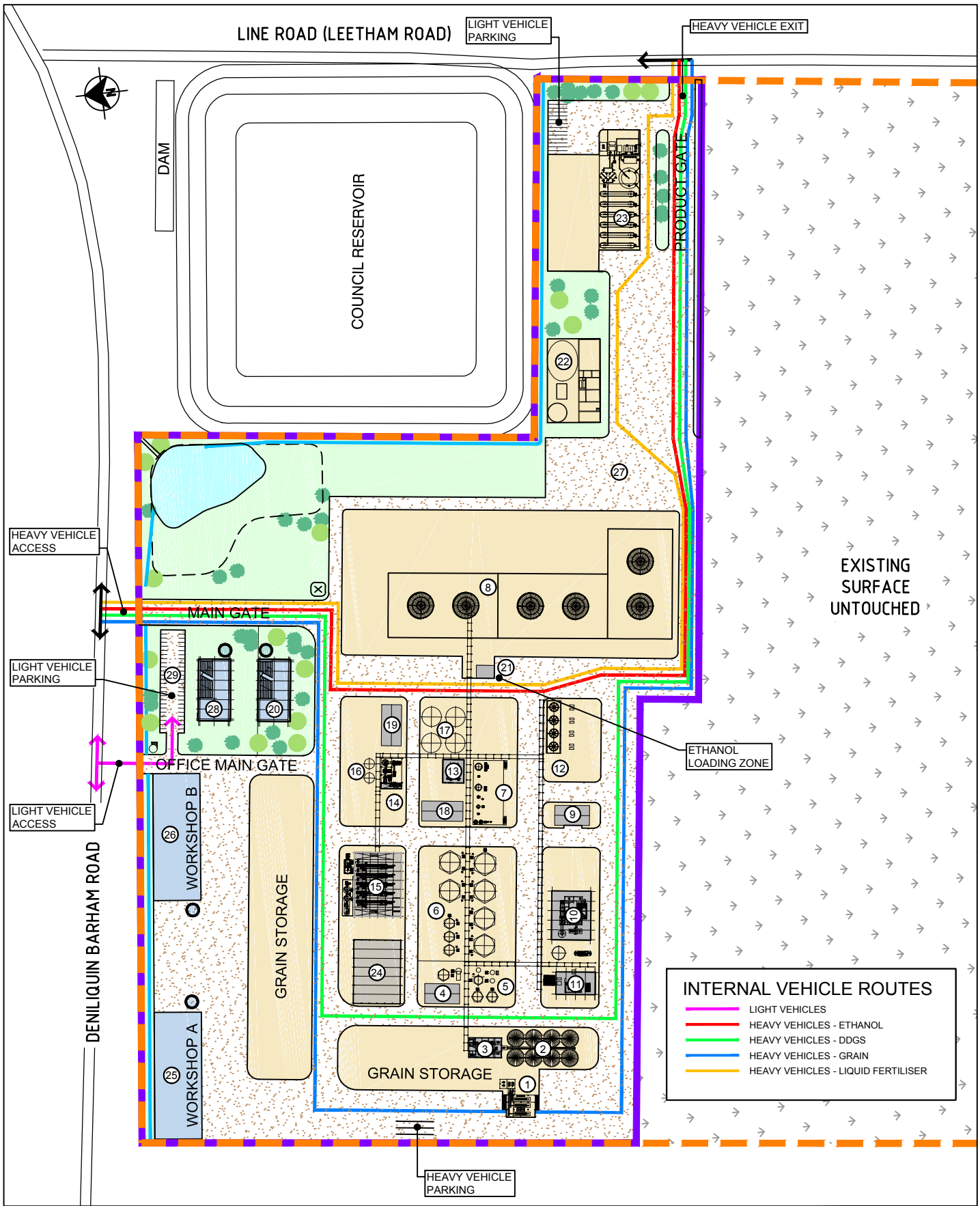
Internal Vehicle Routes and Parking



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LEGEND

- ROADWAY
- SITE BOUNDARY
- PROJECT BOUNDARY
- LANDSCAPING
- RAIN HARVESTING TANK
- PAVEMENT AREA
- HARDSTAND AREA
- ROOFWATER CATCHMENT
- BIO-RETENTION & FLOOD DETENTION BASIN
- VEGETATED SWALE
- STORMWATER HOLDING TANK
- PARKING

1. Grain Intake
2. Grain Storage
3. Grain Preparation & Milling
4. Enzyme Storage
5. Gelatinization & Liquefaction
6. Fermentation
7. Distillation (Mash Tower, Rectifier Tower, Sieve Column & Dehydration)
8. Product Storage
9. Substation
10. Boiler & Air compressor
11. Water Treatment
12. Cooling Tower
13. Decanter
14. Evaporator
15. Dryer
16. Syrup Tank
17. Stillage Storage Tank
18. Control Room
19. Maintenance Room
20. Office
21. Ethanol Loading
22. Waste Water Treatment
23. Anaerobic Digestion
24. DDGS Storage & Loading Area
25. Workshop A
26. Workshop B
27. Impermeable Pavement
28. Training & Development Centre
29. Staff & Visitor Car Park

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FIGURE 12.3

12.5 Assessment of impacts during operations

During the operations phase the key transport movements would be the movement of staff (mainly light vehicles) and the transportation of raw materials required for the processing, and the output products from the ethanol production process (mainly heavy vehicles and rail).

The routes to access the Project Site during the operations phase are similar to the construction phase (as shown on Figure 12.2). The Deniliquin Rail Line and the Rice Growers Rail Siding are the preferred rail networks that would be utilised by the Project during operation.

The Project proposes to transport 70 percent of the raw materials, ethanol and co-products using the existing rail network via the Rice Growers Rail Siding. The raw materials and output products would be transported to the Rice Growers Rail Siding by heavy vehicles. The remaining 30 percent of raw materials and output products would be transported by road.

The plant would be operating 24 hours per day, seven days a week over 330 days per annum allowing for annual plant maintenance when the plant would be shut down.

For the purpose of identifying the likely traffic generation and likely impact on the surrounding road network, it has been assumed, that the number of hours for movement of input/out materials by heavy vehicles would be during a period of 10 hours per day (generally between 8.00 am and 6.00 pm). This would also take into account the likely impact from the overall operation on the local commuter peak periods.

It is anticipated that the workforce would comprise up to 50 full-time staff (including staff-rotation). The daily on-site workforce includes approximately eight administration staff that would be present only during standard working hours (i.e. 8.00 am to 5.00 pm). There would typically be three shifts per day for the technical staff with each shift employing around eight staff members. There would also be four Research and Development (R&D) staff per shift. Shifts would nominally be 7.00 am to 3.00 pm, 3.00 pm to 11.00 pm and 11.00 pm to 7.00 am.

12.5.1 Road network

Site and internal access

Figure 12.3 shows the site access and exit points, the internal access roads, directional flows, and on site parking areas.

All access and exit driveways are located along straight sections of road with good sight distances of over 250 m in both directions of the carriageway (both on Deniliquin Barham Road and on Line Road). The available sight distances would more than satisfy the requirement of 222 m for a 100 km/hr road (based on an 8 second gap).

All heavy vehicle movements whilst on the Project Site would be in a forward direction and include exiting the site on Line Road which connects directly to Deniliquin Barham Road. Staff parking would be provided on site and be designed in accordance with the relevant Australian Standards including AS2980.

The site layout and the internal road network would be further refined during detailed design and before the site configuration is finalised for construction.

Detailed intersection analysis would be undertaken in consultation with Deniliquin Council as part of the future detailed design. For operational safety, the heavy vehicle access intersection along Deniliquin Barham Road would include the following turn treatments:

1) A westbound left turn deceleration lane from Deniliquin Barham Road.
2) An eastbound right turn lane or a slip lane from Deniliquin Barham Road.
3) A westbound left turn acceleration lane merging with Deniliquin Barham Road.

The site access intersections would likely be channelized right-turn and rural auxiliary left-turn treatments which would be confirmed as part of the detailed design.

12.5.2 Operation light vehicle movements

For the workforce-related traffic generation, it is assumed that the inbound and outbound trips would be from and to Deniliquin respectively and would consist of light vehicles.

During the operations phase of the Project, the number of daily light vehicle movements would mainly consist of up to eight office staff (standard working hours), eight technical staff and four R&D staff per shift (three 8-hour shifts per day).

Allowing for shift changes, the worst case scenario in terms of identifying the number of vehicle trips per hour would be to assume two shifts coming in and out within the same hour (i.e. 12 light vehicles inbound and 12 light

vehicles outbound within the same hour). For the office staff, the worst case would be all eight staff arriving or departing within the same hour in the morning and in the afternoon peak periods.

Taking into account the shift changes for the technical and R&D staff, the number of light vehicles accessing the plant in the morning peak would be 20 inbound and 12 outbound vehicles. For the afternoon peak, the number would be 12 inbound and 20 outbound vehicles. The remaining trips would be during the remaining shift change for the technical staff (i.e. around 11.00 pm at night).

The number of light vehicle movements during the operations phase per day totals at 88 (44 per direction per day), with 32 vehicles per hour (two-way) for the am and pm peak periods (which equates to one vehicle every three minutes in the peak direction and one vehicle every five minutes in the non-peak direction during the morning and afternoon peaks). The remaining 24 light vehicles would be from the shift change around 11.00 pm.

12.5.3 Operation heavy vehicle movements

As the supplier and market arrangements for the raw materials and distribution of the output products has yet to be finalised, it has been assumed for this assessment that the heavy vehicle movements are split evenly along Deniliquin Barham Road, the Cobb Highway and the Riverina Highway. More detailed assessments including the movement of ethanol products would be carried out in detailed design, once the volume of heavy vehicles and destinations have been confirmed.

A calculation of the estimated quantity of required input materials and volumes of output products from the process was undertaken to anticipate the number of heavy vehicles required to transport the products, and to provide a magnitude of overall traffic generation. This calculation is detailed in Appendix M Traffic and Transport Technical Report.

Based on the transportation requirements for the raw materials required for the ethanol production, the ethanol produced and the co-products, the number of heavy vehicle movements per day are summarised in Table 12.3.

Table 12.3 Operations phase daily heavy vehicle movements

	Vehicles per day per direction	Total trips (inbound and outbound)
Inputs		
Grain	30	60
Total	***30***	***60***
Outputs		
Ethanol	9	18
DDGS	11	22
Liquid Fertilizer	1	2
Syrup	14	28
Total	***35***	***70***
Overall Total	**65**	**130**

Assuming the movement of materials by heavy vehicles occurs over a 10-hour period per day, the overall hourly movement is around 13 vehicles per hour with six to seven vehicles per hour per direction. In terms of distribution, on average, five vehicles per hour (two to three inbound and two to three outbound) would be accessing the Project Site to/from the west along Deniliquin Barham Road and eight vehicles (four inbound and four outbound) would be accessing the Project Site to/from the east along Deniliquin Barham Road (linking to the Cobb Highway and Riverina Highway at Deniliquin).

12.5.4 Road capacity

The current traffic volume along Deniliquin Barham Road is around 405 vehicles per day (June 2015). Due to its low background traffic volume, the estimated daily operation Project related traffic (218 vehicles per day) is around 54 percent of the current daily traffic volumes. However, if the traffic volume of 1,696 vehicles per day along Deniliquin Barham Road west of Calimo Street is to be adopted as the background traffic volume, the development generated traffic would be reduced to around 13 percent of the current background traffic.

Assuming the peak hour traffic volume for a rural road is around 15 percent of the daily traffic volume; the estimated peak hour background traffic volume would be around 61 vehicles per hour. The additional peak hour traffic volume generated by the operations phase would be around 45 vehicles per hour (with approximately 32

light vehicle workforce trips and 13 heavy vehicle trips). The peak hour traffic volume along Deniliquin Barham Road would then be around 103 vehicles per hour, which is relatively low compared to the peak hour volume of 870 vehicles per hour for a two-lane rural road with LoS C.

If the traffic volume of 1,696 vehicles per day at the eastern end of Deniliquin Barham Road is to be adopted (or around 255 vehicles per hour at 15 percent of the daily traffic volume), the additional peak hour volume would still be below 870 vehicles per hour for Los C (overall around 300 vehicles per hour). This demonstrates that the peak hour traffic generated during the operations phase is unlikely to have an adverse impact on the performance of the surrounding road network.

The average number of heavy vehicles generated during the operations phase is estimated to be one heavy vehicle every four to five minutes. This impact on the surrounding road network is considered to be relatively low and unlikely to have a significant impact on the operational efficiency of other key road connections (namely Cobb and Riverina Highways).

12.5.5 Road infrastructure

The magnitude of heavy vehicles generated by the Project during the operations phase at 130 vehicles per day is of similar magnitude to the heavy vehicle volumes of the existing background traffic along Deniliquin Barham Road (132 – 180). The section of Deniliquin Barham Road, between the Project Site and the end of Deniliquin Council's upgrade work, is likely to be impacted by the Project and would be mitigated following discussions with Deniliquin Council to confirm an appropriate approach.

Of the 65 heavy vehicles per direction accessing the site per day, 22 heavy vehicles per direction per day would be accessing to and from the west and 43 heavy vehicles per direction per day would be accessing to and from the east. The majority of the heavy vehicles would be travelling between the site and Deniliquin Rice Growers Siding east of the site (approximately around 29 heavy vehicles per direction per day transporting grains and ethanol); and as such the number of heavy vehicles accessing the Cobb and Riverina Highways is likely to be relatively small and unlikely to cause any adverse impacts on these highways.

12.5.6 Road safety

The increased heavy vehicle traffic on State roads is not likely to pose an impact to road safety. Intersections to enter and exit the site will be provided including acceleration and deceleration lanes where required. These will be designed in accordance with the Road Design Guide (RTA) and Austroads Guide to Road Design and will mitigated the potential safety impacts of heavy vehicles turning across the Deniliquin Barham Road.

The upgrading of the Deniliquin Barham Road by Deniliquin Council (being widened, strengthened and resurfaced for the use of road trains) would assist in maintaining the structural integrity of the road. The measures required to ensure safety and structural integrity of the section of Deniliquin Barham Road between the development site and the end of Deniliquin Council's upgrade work would be the subject of further discussions with Deniliquin Council.

Public transport

The Project Site does not impact any existing bus stops or mapped pick up locations. The majority of these are within Deniliquin town. The Project operation traffic is likely to use some of the roads utilised by the public buses, long distance coaches and school buses including Deniliquin Barham Road, Cobb Highway and Riverine Highway. The impact of the number of additional vehicles on the local road network during the operations phase will be considered as part of the final selection and implementation of the Project Transport Management Plan (i.e. road transport routes) and discussed with Deniliquin Council during the detailed design phase.

12.5.7 Rail network

The proposal is to transport 70 percent of the raw materials and output products from the ethanol production using the rail network. The current assumption is that the raw materials and products would be trucked to/from the Rice Grower's siding approximately 3 km to the north east. In the longer term, the plan is to provide a rail siding on the western boundary of the site which connects to the Moama Deniliquin Railway line immediately to the east of the site subject to further approval. It is estimated that the average number of train wagons required per day (based on 330 days per year) would be around 12 wagons per day inbound and 10 wagons per day outbound from Deniliquin.

QUBE Logistics, the sole operator of the rail line into Deniliquin has been consulted and confirmed that there is available capacity on this line for all the proposal's rail freight needs. Details around the specific requirements for transporting the ethanol product would be defined at the next stage of Project development.

12.5.8 Other transportation modes

All raw materials would be obtained domestically and transportation would be via road and rail only.

Output products would be distributed domestically (by road and rail) and exported internationally via shipping from the Port of Melbourne. The existing port facilities and infrastructure would be used to export product along existing shipping routes. The detailed logistics of freight movement would be worked out at a later stage as it is dependent on the location of the purchaser or buying agent).

12.6 Mitigation measures

The following environmental management measures would be implemented during the detailed design, construction and operations phases.

Table 12.4 Traffic and transport mitigation measures

Impact	Ref #	Environmental management measure	Timing
General	TT1	For any works on road corridors during construction, a detailed Road Use Management Plan (RMP) (to include details on the number, type and duration of the vehicle movements, traffic management and controls, fatigue management, and consideration of public transport) would be prepared by the construction contractor for the Project further to discussions with RMS and Deniliquin Council including any detailed traffic control plans.	Detailed design
	TT2	A Transport Management Plan (TMP) for the operations phase would be provided to RMS and Deniliquin Council for review prior to project works or project related works occurring. Where appropriate, the TMP would also provide details on the number, type and duration of the vehicle movements, description of intended access locations, consideration of public transport, fatigue management, and transportation of hazardous materials.	Detailed design
Road safety during construction	TT3	For safety reasons, the Deniliquin Barham Road entry and exit should have traffic management in place during the construction phase. Adequate signage should be displayed to inform motorists of the approach to the intersection for construction traffic turning. This should form part of the RMP (and governed by Australian Standard AS 1742.3 – 2009) for the construction phase of works.	Construction phase
	TT4	Once more detail is known around the exact construction vehicles and routing, then more detailed vehicle swept path analysis should be undertaken along the heavy vehicle route (if required). The outcomes would be included within the RMP. Large oversize materials (if required) should be transported outside of peak traffic times to reduce impacts on road network (subject to RMS approval) and the police should be contacted for any of these movements.	Detailed design
Impacts on existing road surfaces and junctions (including safety)	TT5	The condition of the public roads to be used for the delivery of raw and fabricated materials should be established prior to commencement of works and then regularly monitored during the period of the works. The road and intersection conditions should be established by the use of field surveys and regular site inspections. When required, rehabilitation of the pavement and/or edges of seal, shoulders and verges would be carried out. At the completion of the construction works, the access roads should be in the same or be of superior condition than at the commencement of the works. The measures required to ensure safety and structural integrity	Detailed design

Impact	Ref #	Environmental management measure	Timing
		of the section of Deniliquin Barham Road between the development site and the end of Deliniquin Council's upgrade (during construction and operations phases) would be the subject of further discussions with Deniliquin Council.	
	TT6	Intersections to enter and exit the site during operations phase be designed during the detailed design phase to meet the Road Design Guide (RTA) and Austroads Guide to Road Design, including provision of acceleration and deceleration lanes where required. To be discussed with Deniliquin Council.	Detailed design
Transporting hazardous materials	TT7	Transportation of hazardous materials would be carried out in consultation with the consent authorities and in accordance with NSW Government's *Hazardous Industry Planning Advisory Paper No 11 on Route Selection, January 2011*. The TMP would include the following: - Hours of operation. - Routes to be used through the affected local government area(s). - The quantity of hazardous goods (i.e. ethanol product) to be transported. - Safety controls including fatigue management	Operations phase

12.7 Summary and conclusion

A traffic impact assessment was undertaken that concluded that the impact of the Project from increased traffic volumes on the local and wider road network is likely to be minimal, for both the construction and operations phases. The number of heavy vehicle volumes (56 vehicles per direction per day during peak construction activities and 65 heavy vehicles per direction per day during daily operations) and light vehicle volumes (122 vehicles per direction per day during construction activities and 44 vehicles per direction per day during daily operations), can be accommodated on the existing transport network without the requirement for local or far-field road works.

Impacts to the road pavement of Deniliquin Barham Road between the Project Site and the end of Deniliquin Council's upgrade work (Deniliquin Barham Road from the Ochtertyre Street roundabout with Cobb Highway) are possible due to the increase in heavy vehicle movements. These potential impacts would be mitigated following discussions with Deniliquin Council to confirm an appropriate approach.

There is the potential for safety impacts during construction due to large heavy vehicles turning across the Deniliquin Barham Road at the site entrance and exit locations. Traffic management measures would be in force to ensure vehicles could access and depart the site safely.

It is estimated that the average number of train wagons required per day (based on 330 days per year) would be around 12 wagons per day inbound and 10 wagons per day outbound from Deniliquin. The availability of line and train capacities to support the Project have been confirmed with the rail freight operator QUBE Logistics.

13.0 Hazard and risk

The objective of this Chapter is to identify hazards and risks associated with The Project and to assess the risks in accordance with *Hazardous Industry Advisory Planning Advisory Paper No. 6 – Guideline for Hazard Analysis* and *Multi-Level Risk Assessment*. The Chapter provides a summary of the identified hazards, their potential impacts and the mitigation measures that would be adopted to minimise these impacts through appropriate safeguards.

13.1 Director General's Requirements

The assessment addressed the DGRs as detailed in Table 13.1.

Table 13.1 DGRs for the assessment of hazard and risk

DGRs – Hazard and risk
- A Preliminary Hazard Analysis (PHA) in accordance with *Hazardous Industry Planning Advisory Paper No. 6 - Guideline for Hazard Analysis* and *Multi-Level Risk Assessment*
- Details of fire/ emergency measures and procedures
- Detail contingency plans for any potential incident or equipment
- The assessment of the key issues listed above must take into account relevant guidelines, policies and plans as identified. While not exhaustive, Attachment 1 contains a list of some of the guidelines, policies and plans that may be relevant to the environmental assessment of this development

13.2 Methodology

13.2.1 Potentially hazardous or offensive industries (Applying SEPP 33)

A risk screening assessment has been carried out as per the *Applying SEPP 33 Guidelines* (NSW DP&I, 2011) to determine if the Project is potentially hazardous or offensive and whether or not SEPP 33 applies.

The following information was used in the risk screening process:

- Details of all dangerous goods and otherwise hazardous chemicals involved in the Project including raw materials, intermediates, and products.
- Dangerous goods classifications (including all subsidiary classes) for all dangerous goods held on site.
- Quantities of dangerous goods and otherwise hazardous chemicals involved in the Project.
- Distance from the boundary for each hazardous chemical.
- Weekly and annual number of deliveries (and the quantities) of dangerous goods and otherwise hazardous chemicals to and from the Project Site.
- The Project Site layout plan.
- Locality plan showing immediate neighbours including residential properties and their land use.

In order to identify hazards outside of the scope of the risk screening method, the following additional information was considered:

- Incompatible materials (hazardous and non-hazardous chemicals).
- Wastes that could be hazardous.
- The possible existence of combustible dusts within confined areas.
- Types of activities the dangerous goods and otherwise hazardous chemicals are associated with (storage, processing, reaction, etc.).
- Incompatible, reactive or unstable chemicals and process conditions that could lead to uncontrolled reaction or decomposition.
- Storage or processing operations involving high (or extremely low) temperatures and/or pressures.

Other information required specifically to identify a potentially offensive industry included:

- Details of materials and processes that could pose a potential for pollution through air, noise, water or other emissions

- Details around known requirements for pollution control licences, permits or agreements.

13.2.2 Methodology hazardous industries

To determine if the Project is potentially hazardous, a preliminary hazard and risk screening was carried out in accordance with *Applying SEPP 33* (NSW DP&I, 2011). Both the storage and handling of hazardous chemicals at the Project Site as well as transport considerations were applied.

Hazardous scenarios that were identified to have potential offsite effects, further followed a multilevel risk assessment approach as outlined in the *Multi-Level Risk Assessment Guideline* (NSW DP&I, 2011). The assessment also included *Hazardous Industry Planning Advisory Papers No. 6, "Hazard Analysis"* (NSW DP&I, 2011), and *Hazardous Industry Planning Advisory Paper (HIPAP) No. 4, "Risk Criteria for Land Use Safety Planning"* (NSW DP&I, 2011).

The Multi-Level Risk Assessment approach is summarised into three levels of assessment, depending on the outcome of preliminary screening. These are:

- Level 1 – Qualitative Analysis, primarily based on the hazard identification techniques and qualitative risk assessment of consequences, frequency and risk.
- Level 2 – Partially Quantitative Analysis, using hazard identification and the focused quantification of key potential offsite risks.
- Level 3 – Quantitative Risk Analysis (QRA), based on the full detailed quantification of risks, consistent with Hazardous Industry Planning Advisory Paper (HIPAP) No.6 – Guidelines for Hazard Analysis.

Generally, qualitative assessments (Level 1) are sufficient in the following circumstances:

- Where materials are relatively non-hazardous (for example corrosive substances and hazardous materials (non-dangerous goods)).
- Where the quantity of materials used are relatively small.
- Where the technical and management safeguards are self-evident and readily implemented.
- Where the surrounding land uses are relatively non-sensitive.

In these cases, it may be appropriate for a Preliminary Hazard Analysis (PHA) to be relatively simple. Such a PHA should:

- identify the types and quantities of all dangerous goods to be stored and used
- describe the storage/processing activities that would involve these materials
- identify accident scenarios and hazardous incidents that could occur
- consider surrounding land uses (identify any nearby uses of particular sensitivity)
- identify safeguards that can be adopted (including technical, operational and organisational), and assess their adequacy (having regards to the above matters).

A partial quantitative assessment (Level 2) should address the elements as described in a Level 1 assessment as well as provide sufficient quantification of risk contributors to demonstrate the following:

- consequences of events using appropriate modelling tools
- an estimate of the likelihood for each event confirmed to have significant off-site effects
- an indicative estimate of the off-site risk
- demonstration in principle that no individual event would have a fatality or injury frequency greater than that appropriate for the exposed land use
- demonstration in principle that no combination of events would cumulatively cause individual risk criteria to be exceeded.

A full quantitative risk assessment (Level 3) is required where the societal risk from a proposed development is plotted in the intolerable zone or where a Level 2 assessment is unable to demonstrate that the significant offsite risk criteria can be met.

13.2.3 Methodology offensive industries

To determine if the Project is potentially offensive, a preliminary industry type screening was carried out in accordance with the requirements of the *Applying SEPP 33 Guideline* (NSW DP&I, 2011). The guideline provides

a list of categories of industries with the potential for off site offensive impacts. These impacts may include air emissions, water quality, noise or other environmental impacts.

For the assessment of potentially offensive industries, the quantity, nature and significance of the offences likely to be caused by the development should be provided as well as the need for any licences. It should be demonstrated that there are adequate safeguards in place to ensure that emissions from a facility can be controlled to a level such that they are not considered significant.

13.3 Existing environment

13.3.1 Project description

The Project would produce up to 115 ML of ethanol annually and would include several grain storage silos, the ethanol production plant and a wastewater treatment facility. The proposed site layout for the Project is provided in Figure 3.1.

13.3.2 Meteorological and topographical considerations

The Project Site is situated in an area which is predominantly flat farm land and grass land.

The predominated predicted wind conditions on an annual basis are in the western and southern quadrants. The wind roses which detail the direction and speed of the local wind conditions were taken from the Deniliquin Airport situated approximately 3 km from the Project Site.

Using the wind and weather information presented in Bureau of Meteorology website (BOM), the following two broad dominant weather categories relate to the Project Site;

- F1.5 (stable and low wind speed 1.5 m/s, typical night time) and
- D6 (unstable and low to moderate high wind speed, typical day time).

These represent both low and high wind speed conditions as well as day and night conditions at the Project Site. Detailed meteorological data can be found in Appendix P Air Quality Technical Report.

13.3.3 Sensitive receptors

The Project Site is surrounded by rural farmland with the Deniliquin Council reservoir on the eastern boundary. Further afield there is the saleyards, a proposed abattoir and the rice mill to the north east, as well as Deniliquin Airport and cemetery to the east. The closest residential zone is located approximately 4.2 km to the north east. In closer proximity are scattered rural residences to the north and south of the Project Site.

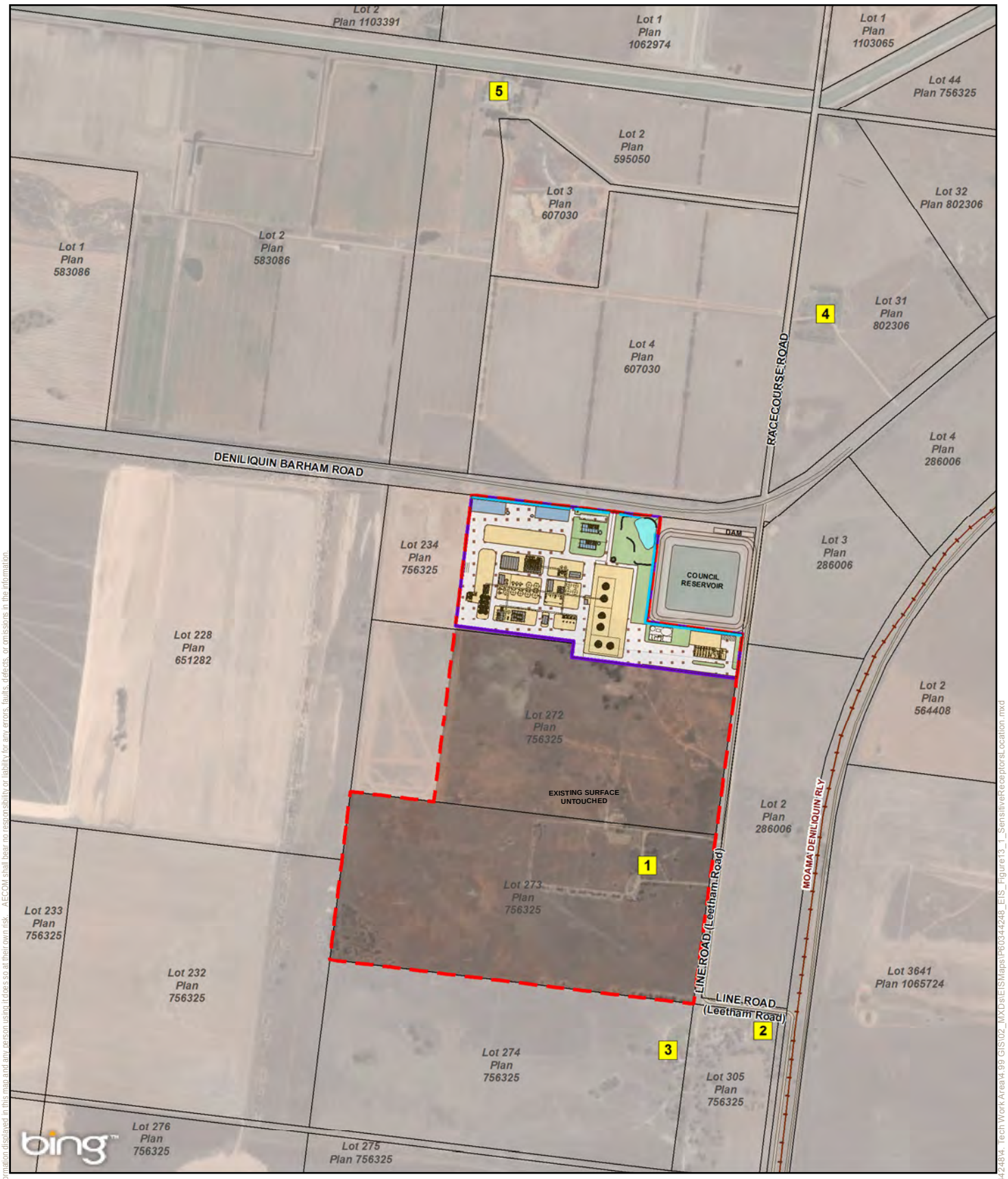
Five receptors representative of the surrounding land uses were included in the study based on a desktop review of the Project (Figure 13.1). Receptors 1 to 5 represent the nearest residential properties as shown in Table 13.2.

Table 13.2 List of surrounding sensitive receptors

Receptor ID	Easting	Northing	Type	Approximate Distance from Project Site (m) / Direction (degree true)
R1	310235	6062318	Rural Residential	500 m S [1]
R2	310569	6061841	Rural Residential	850 m SE
R3	310295	6061784	Rural Residential	880 m S
R4	310749	6063912	Rural Residential	550 m N
R5	309806	6064557	Rural Residential	1100 m N

Notes: Measured from Project Footprint to property boundary of the sensitive receptor

Sensitive Receptor Locations



LEGEND

- Sensitive Receptors
- Railway
- Site Layout
- Vegetated Swale
- Cadastral Boundaries
- Project Site
- Project Footprint
- Pavement Area
- Bio-Retention Basin
- Hardstand Area
- Landscaping
- Roofwater Catchment

Data Sources:
1.Imagery: © 2015 DigitalGlobe © 2015 GeoEye Earthstar Geographics SIO © 2015 Microsoft Corporation
2. Roads, Railway, Drainage, Suburbs, Parks, Localities: @ Street Pro, 2011
3. Key Map Base Layer: ESRI Online
4. Site Layout: based on CAD Drawingd prepared by DONGMUN I.R.S. Co. Ltd.

Disclaimer:
Site Layout is indicative only. To be used for information only. For detailed design reffer to CAD Drawings

AECOM
www.aecom.com

DATUM GDA 1994, PROJECTION MGA ZONE 55

N 0 75 150 225 Metres

FIGURE 13.1

A4

13.4 Assessment of potential impacts

13.4.1 Process description

The production of ethanol involves the milling of wheat to flour followed by a cooking, fermentation and distillation process. This process converts starch, which comprises up to 75 per cent of the wheat to ethanol. An overview of the proposed ethanol plant processes is further detailed in Chapter 3 Project Description.

13.4.2 Types and quantities of dangerous goods

The dangerous goods which are likely to be stored, handled and produced at the Project Site are outlined in Table 13.3 and Table 13.4 below.

Any construction or industrial site requires minor quantities of hazardous chemicals such as paints and solvents. The correct storage and separation of such goods is governed by Australian Standards and the appropriate safety management systems of the Project. The minor storage of dangerous goods is not considered to be significant contributor to the overall risk profile of the Project from a land use safety planning perspective; therefore such hazardous chemicals have been excluded from the tables below.

Table 13.3 Project hazardous materials

Hazardous materials	Maximum quantity stored on site	Dangerous goods class including subsidiary class(es)	Packing Group	UN No.	Chemical abstract Number (CAS No.)	Physical and Chemical Properties	Type of storage	On-site Location	Average number of road movements
Fuel Grade Ethanol 99.5% v/v	18,000m^3 (14,500 tonne equivalent to 50 days storage)	Class 3 Flammable Liquid	PG II	1170	64-17-5	Extremely flammable liquid.	Bulk storage tanks	Designated ethanol storage area located in the east of The Project Footprint	30% transport by road 70% transport by rail 9 x 32 tonne capacity heavy vehicles road tankers per day used to transport product to customers and rail
CNG	N/A	Class 2.1 Flammable Gas	N/A	1972	74-82-8	Odourless colourless Flammable Gas.	Pipeline	Pipeline to steam Boiler, DDGS dryer and Waste Heat Boiler	N/A
Biogas (70% CH_4 and 30% CO_2)	Co-product of the anaerobic digester process, collected in gas holder (600m^3)	Class 2.1 Flammable Gas	N/A	1954	98615-67-9	Flammable Gas	Gas holder	The gas holder is located within the anaerobic digester process	N/A
Carbon Dioxide	By product of ethanol process (95,100 tonne/a)	Class 2.2 — non-flammable, non-toxic gases	N/A	1013	124-38-9	Asphixiant	N/A	N/A	N/A
Caustic Soda	8 tonne	Class 8 - Corrosive	PG II	1824	1310-73-2	May cause severe skin burns, eye damage and respiratory irritation.	Bags (pillets) Chemical is	Storage: Designated chemical storage	1 x 8 tonne capacity heavy vehicle per month used to deliver caustic

Hazardous materials	Maximum quantity stored on site	Dangerous goods class including subsidiary class(es)	Packing Group	UN No.	Chemical abstract Number (CAS No.)	Physical and Chemical Properties	Type of storage	On-site Location	Average number of road movements
							dissolved to 20% v/v in 1m^3 tanks prior to use.	area. Use: Grain liquefaction and wastewater treatment plant areas	soda to the site
Hydrochloric Acid (HCl) Solution	17.5 tonne	Class 8 - Corrosive	PG II	1789	7647-01-0	May cause severe skin burns, eye damage and respiratory irritation	Bulk Storage Tanks	Fermentation	1 x 10 m^3 delivery per month
Sodium Hypochlorite (NaOCl)	13 tonne	Class 8 - Corrosive	PG III	1791	7681-52-9	May cause severe skin burns, eye damage and respiratory irritation	Bulk Storage Tanks	Waste Water Treatment	1 x 10 m^3 delivery per month

Chemical substances which are not subject to SEPP 33 requirements are also likely to be stored and handled at the Deniliquin Ethanol Plant are presented in Table 13.4 below.

Table 13.4 Other Chemical Substances Not Subject to SEPP 33 Requirements

Chemicals Substances	Maximum storage quantity on-site	Dangerous goods class	Type of storage	On-site location	Average number of road movements
Organic Liquid Fertiliser	1,500 tonne	Not considered a dangerous good: No UN Number allocated	In-ground concrete tank (Organic Liquid fertiliser is a product of the anaerobic digestion process)	Stored: Anaerobic digestion section	1 x 20 tonne tank lorry per day used to distribute organic liquid fertiliser to local growers
Liquefaction Enzyme (Alpha Amylase, ENL)	0.210 tonne	Not considered a dangerous good	50L jars Chemical is dissolved in 1 m^3 capacity tank prior to use.	Stored: Enzyme storage area Used: Grain liquefaction and saccharification section	N/A
Saccharification Enzyme (Alpha	0.210 tonne	Not considered a dangerous good	50L jars Chemical is dissolved in 1 m^3	Stored: Enzyme storage area Used: Grain liquefaction and	N/A

Chemicals Substances	Maximum storage quantity on-site	Dangerous goods class	Type of storage	On-site location	Average number of road movements
Gluco-amylase, ENS)			capacity tank prior to use.	saccharification section	
Antifoam Liquid	8 tonne	Not considered a dangerous good	200L plastic drums Chemical is dissolved in 1 m^3 capacity tank prior to use.	Stored: Chemical storage area Used: Fermentation section	1 x 8 tonne capacity heavy vehicle per month used to deliver to the site
Ammonium Phosphate	15 tonne	Not considered a dangerous good	50kg bags (powder) Chemical is dissolved in 1 m^3 capacity tank prior to use.	Stored: Chemical storage area Used: Fermentation section	1 x 15 tonne capacity heavy vehicle per month used to deliver to the site
Urea Pills or pellets with total nitrogen not less than 46% w/w	15 tonne	Not considered a dangerous good	50kg bags (solid) Chemical is dissolved to in 1m^3 capacity tank prior to use.	Stored: Chemical storage area Used: Fermentation section	1 x 15 tonne capacity heavy vehicle per month used to deliver to the site
Water Treatment Polymer	1 m^3	Not considered a dangerous good	200L plastic Drums Chemical is dissolved in 1 m^3 capacity tank prior to use	Stored: Chemical storage area Used: Waste Water Treatment	Delivered with Anti-foam
Syrup	3000 tonne	Not considered a dangerous good	Storage vats	Stored: Syrup storage area	14 heavy vehicles per day to deliver product
Grain and DDGS	-	Not considered a dangerous good	Storage silos and packages	Stored: Grain storage and DDGS storage area	30 heavy vehicles per day of grain delivered and 11 heavy vehicles of DDGS to distribute

13.4.3 Potentially hazardous industry screening assessment

This screening assessment in *Applying SEPP 33 Guideline* (NSW DP&I, 2011), focuses on key issues and considerations for land use safety planning, rather than providing a high level of detail. The detailed screening assessment in Preliminary Hazard Analysis Technical Report (refer Appendix N) has been summarised in Table 13.5 for the list of dangerous goods outlined in Section 13.4.2.

Table 13.5 Applying SEPP 33 potentially hazardous screening assessment

Dangerous good	Dangerous good class	Approximate quantity	Approximate separation distance	Potential for offsite impacts
Ethanol 99.5% v/v	*Class 3 PGII Flammable Liquid*	14,000 tonnes	Boundary: 105 m from storage bund Sensitive Receptor: >550 m	**Below the threshold:** The storage of class 3 PGII flammable liquids in quantities 14,500 tonnes at distances less than 80m to the site boundary or 115 m to sensitive receptors, has the potential to result in off-site risk. Given the quantity, site layout and distance from the site boundary, the ethanol 99.5% storage is unlikely to result in a significant off-site risk to the current land uses. **Further Criteria:** Further to the screening assessment, ethanol is stored in relatively large quantities, is produced at high temperatures and pressures and is a flammable liquid. As a result, risk scenarios associated with the storage of ethanol have been carried forward as a special case for further analysis and risk prioritisation based on the risks associated with the ethanol properties and possible changes to future land use
CNG	*Class 2.1 Flammable Gas*	60 kg	Boundary: 0 to 300 m Sensitive Receptor: >550 m	**Below the threshold:** CNG would not be stored on site, but supplied by a gas pipeline. The quantity of methane is limited to the size and length of the gas pipeline. **Further Criteria**: Even though the screening limit suggests that The Project is unlikely to be potentially hazardous in terms of the CNG on site, the risks associated with a high pressure flammable gas have been considered and evaluated as a special case that does not fall within the screening assessment
Biogas (60% CH_4 and 40% CO_2)	*Class 2.1 Flammable Gas*	295 kg	Boundary: 50 m Sensitive Receptor: >600 m	**Below the threshold:** The storage of class 2.1 flammable gases in quantities up to 1 tonne which is at least 35 m from the nearest site boundary, is assumed to be unlikely to result in significant off-site risk. The biogas has not been grouped with the CNG as the gas is at atmospheric pressure and stored in a separate area away from the Ethanol Production facility. The biogas present on site is a co-product of the anaerobic digestion process which is collected in a

Dangerous good	Dangerous good class	Approximate quantity	Approximate separation distance	Potential for offsite impacts
				gas holder and used within the anaerobic digestion process. Due to the quantity, process conditions and location relative to the site boundary for the biogas handled on site, it is unlikely to result in a significant off-site risk.
Carbon Dioxide	Class 2.2 — non-flammable, non-toxic gases	N/A	Boundary: >100m Sensitive Receptor: >600 m	**No screening limit** is applicable to Class 2.2 gases. Carbon Dioxide is not stored on site. It is vented as a gas so does not pose significant off-site risk.
Caustic Soda	Class 8 - Corrosive PG II	8 tonne	N/A	**Above the threshold:** The threshold for class 8 PGII corrosive substances is 25 tonne. The Caustic Soda and HCl are not likely to be used in the same area of the facility so can be assessed individually. However, for the assessment they have been grouped to ensure a conservative approach has been considered. Therefore, the quantity of Class 8 PG II on site is 25.5 tonne which exceeds the threshold quantity and it can be assumed that there is the potential for off-site risk. Risks associated with the storage of Class 8 PGII have been carried forward for further analysis.
Hydrochloric Acid (HCl) Solution	Class 8 - Corrosive PG II	17.5 tonne	N/A	
Sodium Hypochlorite (NaOCl)	Class 8 - Corrosive	15 tonne	N/A	**Below the threshold:** The threshold for class 8 PGIII corrosive substances is 50 tonne. The quantity of Class 8 PG III on site is less than 15 tonne which does not exceed the threshold quantity. It can be assumed that sodium hypochlorite does not pose significant off-site risk

The Project was found to be potentially hazardous with respect to transportation of ethanol and a route evaluation study would be required to be completed in accordance with *HIPAP No. 11: Route Selection* (NSW DP&I, 2011).

13.4.4 Potentially hazardous industry risk prioritisation

Based on the initially screening review of *Applying SEPP33*, the Project could be considered to be a potentially hazardous development. A preliminary hazard analysis (PHA) has been conducted to assess the hazards associated with the storage and handling of materials, the proposed safeguards and their effectiveness in managing the hazards and risks as detailed in Appendix N Preliminary Hazard Analysis Technical Report. The report includes a detailed hazard identification table for the dangerous goods to be stored, handled and produced at the Project. This table identified a number of hazards, hazard causes, hazard consequences and safeguards which would be implemented for the Project Site.

Applying SEPP 33 Guideline (NSW DP&I, 2011), was used to assist in the selection of the appropriate level (Level 1, 2 or 3) of hazard analysis and risk assessment for the materials identified to have the potential for significant injury, fatality, property damage or harm to the environment in the absence of controls.

The risk prioritisation into Level 1, 2 or 3 is not a measure of acceptability of an activity in terms of risk, but only a pointer to one of the types of risk analysis that is required in accordance with *HIPAP No. 6 — Hazard Analysis* (NSW DP&I, 2011).

Generally, qualitative assessments (Level 1) are sufficient where materials are relatively non-hazardous (for example corrosive substances and non-dangerous goods) and where the quantity of materials used is relatively small.

Grain combustible dusts are not classified dangerous goods. Grain dust can cause explosions if there is a combination of a dust concentration within the explosive range and the presence of an ignition source. Static electricity is the most common source of ignition due to the dry conditions typically prevailing within a dusty atmosphere. Appendix N Preliminary Hazard Analysis Technical Report used a Level 1 qualitative assessment as appropriate for grain dust to conclude that the Project's grain dust risks can be are appropriately managed.

Caustic soda and hydrochloric acid solution are corrosive substances and the quantity of material on site is relatively small. Appendix N Preliminary Hazard Analysis Technical Report used a Level 1 qualitative assessment as appropriate for Class 8 PG II substances and concluded that the Project's corrosive chemical risks can be appropriately managed.

Ethanol is flammable and is stored in relatively large quantities; however, it is stored some distance from the boundary on site. CNG is flammable, but is not stored on site. Both materials fall outside the Level 1 assessment criteria due to the materials being classified having a medium potential for harm due to the hazardous nature of the materials. A Level 2 or semi-quantitative analysis is deemed appropriate in accordance with the *Multi-Level Approach to Risk Assessment* (NSW DP&I, 2011), provided the following conditions can be demonstrated:

- Detailed qualification of consequences with appropriate modelling tools
- Demonstration that the more likely events consequences are contained within the site
- Societal risks are negligible
- The necessary technical and management safeguards are well understood and readily implemented
- There are no sensitive surrounding land uses impacted by the Project.

13.4.5 Level 2 risk assessment hazardous scenarios

The Project is at the preliminary design phase. A desk top review of the potential hazardous scenarios has therefore assumed worse case spill sizes to identify possible hazardous scenarios with potential off site impacts. The worst case scenarios for The Project were evaluated based on a desktop review of the potential scenarios for ethanol and CNG, to include the following

- Ethanol Event 1 (E1): Catastrophic failure of ethanol storage tank. Liquid release of ethanol into the storage bund, ignition and resulting pool fire. This event is the largest pool fire event associated with any leak at the storage area or within The Project Footprint.
- Ethanol Event 2 (E2): Failure of the filling hose (most likely worst case scenario during filling operation) with the loading pump operating. Liquid release of ethanol into the loading bund, ignition and resulting pool fire.
- Ethanol Event 3/4 (E3/4): Failure of equipment or piping at the distillation plant. High temperature (greater than boiling point), liquid/vapour release, ignition and resulting jet fire or late explosion.
- CNG Gas Event 1 (G1): Failure of CNG pipeline. High pressure, gas release, ignition and resulting jet fire or late explosion.
- CNG Gas Event 2 (G2): Failure of CNG pipeline at appliance. Low pressure, gas release, ignition and resulting jet fire or late explosion. Gas is piped to three appliances namely the steam boiler, waste heater boiler and the DDGS dryer. The steam boiler appliance location was chosen as a representative location.

Qualification of consequences with appropriate modelling tools

To assess the consequence of each hazard event scenario DNV's Phast Risk Modelling Program, version 6.7 was used. The program requires a number of inputs to model the consequence effects associated with different hazards. The assumptions for the consequence modelling are detailed in Appendix N Preliminary Hazard Analysis Technical Report.

Demonstration of events consequences

The results of the event consequence modelling are tabulated in Appendix N Preliminary Hazard Analysis Technical Report. All consequence effects of the events for all weather conditions are contained within the site boundary except for the worst case weather condition for the catastrophic failure of a single storage tank, resulting in a pool fire (Event 1, Weather D6). During this event and worst case weather condition, the injury radiation contour extends a few metres over the boundary to the east onto the Deniliquin Council reservoir, but the fatality radiation contour is within the Project Footprint boundary.

Facilities that are considered to be potentially hazardous are classified as such due to the fact that the worst case consequence scenarios associated with the facility would impact beyond the site boundary. The risk associated with these events occurring is related to the consequence as well as the likelihood of the event.

Catastrophic tank ruptures are not likely events and the likelihood of this occurring at the same time as worst weather conditions, is even lower.

For all events the heat radiation levels of 12.6 kW/m^2 and the explosion over pressures of 7 kPa are all contained within the site boundary. It was also confirmed that a vapour release gas cloud was limited to within the site footprint.

Even if all combination of events would cumulatively occur, the consequences are contained within The Project Footprint such that in principle no combination of events would result in individual risk criteria to be exceeded.

Through this quantitative consequence assessment it has been concluded that the consequences associated with the more likely events are all contained within the Project Footprint.

Societal risks

The impact of societal risk is based on the consequence and likelihood of all events associated with a facility in relation to the number of people that may be affected.

The risk takes into account the population density and the percentage of time that a person is associated with the area. There are no residential areas within the vicinity of the Project Footprint. The area bordering the Project Footprint is sparsely, if at all occupied. The frequency of fatalities associated with The Project in relation to the number of fatalities for the community is deemed to be an acceptable risk level. The societal risks for the outside community are expected to be negligible.

Technical and management safeguards

The following detail on the preliminary design of the Project demonstrates that the technical and management safeguards associated with the preliminary design stage of the Project are well understood and readily implementable. Further information on the Projects' safety management is detailed in Chapter 20 Health and Safety.

Ethanol product tank storage area

The storage tanks would be designed to AS1692 (Standards Association of Australia, 2006) and operated in accordance with the requirements of AS1940-2004, "The storage and handling of flammable and combustible liquids" (Standards Association of Australia, 2004). As part of this, the following safety features would be installed:

- Tank level instruments (high and low) with independent high/high alarms.
- Tank vents with anti-flash gauze to prevent potential for sparking and ignition from external sources.
- Multi-level temperature measurements.
- Water draining/pump away facilities for bunds to prevent water build up in the tank bund area and potential corrosion in the tank base.
- Appropriate separation distances between the tanks and on site protected places
- Appropriate bund sizing in accordance with AS1940-2004 (Standards Association of Australia, 2004).

Ethanol loading facilities (including pipeline transfer)

The ethanol loading areas would be fitted with the following safety systems in accordance with AS1940 (Standards Association of Australia, 2004):

- Project Site security measures eliminating unauthorised access to the loading facilities and site in general.
- Overfill protection for the tankers and static connections to prevent the potential for electrostatic build-up and spark/ignition source.
- A dead-man button requiring regular activation by the vehicle driver, integrated into the gantry emergency shutdown system.
- Automatic/remote isolation valves at the loading arm feed point to provide loading emergency shut down in the event of incident at the loading bay.
- Appropriate fixed detection and fire suppression systems.

Fire safety systems

The following fire safety systems and services would be provided for the Project:

- Fire water pumps to cool surrounding areas in accordance with the requirements of AS2419.1 (Standards Association of Australia, 2005) and AS1940 (Standards Association of Australia, 2004).
- Fire water tank to provide a minimum of 90 minutes fire water on site (exact storage capacity of tanks to be determined by a Fire Safety Study in accordance with the requirements of AS1940).
- Fire ring main, with hydrants, monitors and foam generating facilities at selected locations around the Project Site.
- An access fire road to provide fire tender access as required.
- Hose reels and fire extinguishers located throughout the Project Site (installed in accordance with the applicable Australian Standards).
- Fire protection facilities at the hazardous chemicals loading and unloading facilities.
- The Project Site would be staffed at all times during road tanker deliveries, transfers and product loading.

Sensitive surrounding land uses

Detailed technical and management safeguards are proposed for the Project to minimise the hazards and risks associated with the storage and handling of hazardous chemicals.

Based on the site location, surrounding land uses, distances to sensitive uses and proposed safeguards, there are no sensitive surrounding land uses impacted by the Project.

13.4.6 Risk evaluation

The PHA risk assessment (Level 1) for grain dust and corrosive chemicals, qualitatively assessed that these activities do not pose a significant risk with appropriate controls in place.

The PHA partial quantitative assessment (Level 2) for ethanol and CNG addressed the elements as described in a Level 1 assessment and provided sufficient quantification of risk contributors to demonstrate the following:

- consequences of events using appropriate modelling tools
- an estimate of the likelihood for each event confirmed to have significant off-site effects
- an indicative estimate of the societal risk as negligible
- demonstration in principle that no individual event would have a fatality or injury frequency greater than that appropriate for the exposed land use based on *(HIPAP) No. 4, "Risk Criteria for Land Use Safety Planning*
- demonstration in principle that no combination of events would cumulatively cause individual risk criteria to be exceeded.

Land use safety planning is the principal driver for assessment of risks in the context of statutory development assessment and regulation. Given the size of the Project, distances to site boundaries and surrounding receivers, the PHA has appropriately detailed the hazards associated with the Project and demonstrated through risk assessment that the hazards do not pose a significant risk to surrounding land uses.

13.4.7 Potentially offensive industry assessment

In addition to assessing hazards, *Applying SEPP 33 Guideline* (NSW DP&I, 2011) can be used to determine if the Project is potentially offensive. The key consideration in the assessment of a potentially offensive industry is to ensure that there are adequate safeguards. This is to ensure emissions from a facility can be controlled to a level that is not significant.

The following information was used in assessing offensives:

- A list of any materials or processes that could produce air, noise, water or other emissions with a potential for pollution.
- Details of known requirements for compliance with DP&E consent conditions

The most significant process at the Project is the production and storage of ethanol. Possible impacts include emissions for air, noise, water and waste.

Applying SEPP 33 Guideline lists industry types with potential for significant environmental impact. These industries are further detailed in Part 2, Schedule 3 of the EP&A Regulation. This regulation identifies triggers for certain types of development which may be potentially offensive.

Clause 8 (a), Part 2, Schedule 3 of the Environmental Planning and Assessment Regulation (2010) for breweries or distilleries producing alcohol or alcoholic products has the following trigger*;*

- *An intended production capacity of more than 30 tonnes per day or 10,000 tonnes per year*.

The proposed production of ethanol for the Project is expected to be approximately 90,800 tonne per year. As the operations would exceed the 10,000 tonne per annum threshold stipulated in Clause 8 (a), the proposal may be a potentially offensive industry.

As the Project may be regarded as a potentially offensive industry under *Applying SEPP 33,* an analysis of the potential impacts to neighbouring facilities and land uses is required.

A detailed description of the quantity, nature and significance of all offences likely to be caused by the development that could produce air, noise, water or other emissions have been provided in the following Chapters.

- Chapter 9 Surface Water
- Chapter 10 Ground Water
- Chapter 11 Co-products and Waste Management
- Chapter 16 Air Quality
- Chapter 17 Noise
- Chapter 23 Environmental Management and Monitoring

The chapters also detail the safeguards that would be put in place to ensure potential offensives can be controlled to a level which is not significant. Compliance with DP&E consent conditions from the Environmental Protection Authority for the site is sufficient to demonstrate the facility is not an ‘offensive industry’.

13.5 Mitigation measures

13.5.1 Application of the risk management standard

In line with risk management principles described in AS/NZS ISO 31000, the objective of a risk assessment is to identify all hazards, assess the risks, identify controls, implement controls and review the effectiveness of the controls, to ensure that risks arising from the operation or maintenance of the Project are managed to an acceptable level. When selecting control methods to manage risk, the hierarchy of risk treatment methods shall be as follows:

- **Elimination**: hazard is eliminated and associated risk is removed.
- **Substitution**: if hazard cannot be eliminated, minimise the risk through substitution of a substance or process that has less potential to cause injury.
- **Isolation**: engineering, design, structural changes to the work environment, plant or equipment which shall isolate persons from the potential risk.
- **Administration**: risk may be reduced through the provision of training, procedures, and other methods.
- **Personal protective equipment (PPE)**: this control should be used in conjunction with other controls and should not be relied upon in isolation.

These principles have already been followed in the preliminary design of the Project namely through the elimination of the largest significant off site risk with the storage and handling of LNG. This risk has been removed by substituting the storage and transport of large quantities of LNG with a gas pipeline supplying CNG to the Project Site.

13.5.2 Summary of site safety features

Based on the qualitative risk analysis presented in Section 13.4.3 key risk control, minimisation and management opportunities have been identified. A number of mitigation measures have been proposed that limit the consequences of major incidents including:

- layout of storage and process vessels
- design of vessels and ancillary equipment
- mitigating systems such as fire protection and adequate bunding.

Safeguards have also been proposed that limit the likelihood of hazardous events including:

- process control systems
- operating practices
- safety management procedures including fire, incident and emergency management.

Risk management is a continuous improvement process. Safeguards would continually be monitored and reviewed as the Project matures and through the entire project lifecycle, including detailed design, construction, operation, maintenance and eventual decommissioning as outlined below.

13.5.3 Mitigation measures

Potential mitigation measures have been considered in identifying credible hazards scenarios (refer to Table 13.6) and qualitatively analysing potential risks posed by those scenarios. Below is a summary of key control measures that are considered of importance in minimising and managing risks posed during the detailed design, construction, operation end eventual decommissioning of the Project.

Table 13.6 Hazard and risk mitigation measures

Impact	No.	Environmental management measure	Timing
Safety in design	HR1	Locate product storage tanks at separation distances with specific reference to the applicable Australian Standards AS 1940:2004 *The storage and handling of flammable and combustible liquids.*	Detailed design phase
Safety in design	HR2	Conduct a fire safety study for the Project to determine appropriate fixed and portable fire protection systems for the Project Site to ensure the consequences of major fire incidents are adequately mitigated.	Detailed design phase
Safety in design	HR3	Conduct a Hazard and Operability (HAZOP) study for the processes and plant items within the Project Site to identify potential hazards and operational problems in terms of plant design and human error. HAZOPs seek to minimise the effect of an atypical situation in the operation/process by ensuring that control and other safety systems such as functional safety (e.g. emergency safe shutdown) are in place and operate with a high level of reliability to achieve a safe outcomes.	Detailed design phase
Explosive atmospheres and ignition sources	HR4	Conduct a Hazardous Area Classification Study in accordance with *AS/NZS 60079* series which considers explosive dust atmospheres and explosive gas atmospheres and develop comprehensive ignition source control measures for the Project Site.	Detailed design phase
Emergency response plan	HR5	Develop an emergency response plan in accordance with *HIPAP No.1 – Industry Emergency Planning Guideline* for the site including scenario based emergency response plans developed for the range of incident scenarios that have been identified as having significant consequences.	Detailed design phase
Dangerous goods transport	HR6	Develop a Traffic Risk Assessment and a detailed route selection study in line with *HIPAP No. 11 –Route Selection* and *Australian Dangerous Goods Code* for the dangerous goods transport activities particularly for the transport of ethanol from the Project Site.	Detailed design phase
Health and safety management	HR7	Develop a detailed Safety Management System prior to the commencement of operation in accordance with the requirements of the *NSW Work Health and Safety Regulation 2011 and DP&I's HIPAP No. 9 – Safety Management*	Pre-construction, prior to commencement of operations
Hazard analysis	HR8	The results of the preliminary hazard analysis (PHA), would be used as inputs into other safety studies required to be developed as a part of the design,	Detailed design phase and other subsequent phases

Impact	No.	Environmental management measure	Timing
		construction / commissioning and operations phases of The Project	
Safety Instrumented Systems	HR9	Identification and implementation of Safety Instrumented Systems in line with AS IEC 61511.1 - 2004, *Functional safety – Safety instrumented systems for the process industry sector*	Detailed design phase
Safety in design	HR10	Conduct safety in design reviews in accordance with *WHS Regulations and Code of Practice – Safe Design of Structures*.	Detailed design phase and other subsequent phases
Safety for construction activities	HR11	Develop and implement an appropriate Safety Management Plan in line with *HIPAP No. 7 – Construction Safety Study Guidelines*. This should include access by workers to a risk register for all construction activities.	Construction phase
Emergency response	HR12	Develop an Emergency Response Plan in accordance with DP&I's *HIPAP No.1 – Industry Emergency Planning Guideline*, including actions to be taken in the event of an emergency.	Construction phase
High risk activities	HR13	Ensure a permit to work system is implemented, in particular where workers may be exposed to high risk activities.	Construction phase
Appropriately managed and audited construction activities	HR14	Undertake audits on construction activities, and address and communicate any findings to relevant workers	Construction phase
Staff training and competency	HR15	Ensure workers have appropriate training and the necessary competencies.	Construction phase
High risk activities	HR16	Implement actions / risk reduction strategies as identified through Safety in Design reviews	Construction phase
Safety Management Plan	HR17	Develop an appropriate Safety Management Plan. This should include access by workers to a risk register for all operational activities.	Operation phase
Hazard scenarios	HR18	Development of Emergency Response Plan to ensure a co-ordinated response to hazard scenarios	Operation phase
Operational environmental health	HR19	Develop an Operations Environmental Management Plan	Operation phase
Appropriately managed and audited operational activities	HR20	Undertake audits on operational activities, and address and communicate any findings to the relevant workers	Operation phase
Staff training and competency	HR21	Ensure all workers have appropriate training and necessary competencies.	Operation phase
Preventative maintenance programs	HR22	Implementation of appropriate preventive maintenance programs.	Operation phase
Exceedance of Schedule 15 chemicals threshold	HR23	Notify Work Cover NSW that the quantity of ethanol in relation to the Schedule 15 chemicals is likely to be exceeds 10% of the threshold quantity	Operation phase
Decommissioning plan	HR24	Develop a decommissioning plan. This should include a project risk register that is available to all workers, including any risk items added during the construction and operations phases	Post closure phase

Impact	No.	Environmental management measure	Timing
Appropriate records for future audits	HR25	Keep records of all workplace health and safety related information relating to the Project post closure phase	Decommissioning phase

13.6 Summary and conclusion

The hazard analysis was carried out in accordance with the requirements of *Applying SEPP 33 Guideline*. The analysis identified that the Project could have the potential for possible offensives in relation to air, water, noise, waste and other environmental impacts. A number of safeguards are in place to ensure potential offensives can be controlled to a level which is not significant.

All hazardous chemicals were identified, assessed and preliminary screening carried out in accordance with the requirements of *Applying SEPP 33 Guideline*. Although no hazardous chemicals definitively exceeded the screening assessment requirements when *Applying SEPP 33* criteria, four hazardous chemicals were identified to have possible potentially offsite effects, namely ethanol, grain dust, corrosive Class 8 chemicals and CNG. The study further followed the *Multilevel Risk Assessment Approach* and the applicable Hazardous Industry Planning Advisory Papers.

Appendix N Preliminary Hazard Analysis Technical Report found that the hazards associated with the facility are not significant with respect to land use safety planning criteria and that appropriate safeguards have been proposed to prevent and mitigate the hazards and risks associated with hazardous chemicals within the Project Site.

14.0 Soils, land capability and land use

This chapter provides an assessment of the potential impacts of the Project in relation to soils, land capability and land use, as well as providing a description of appropriate mitigation and management measures that would be implemented to minimise any potential impacts.

14.1 Director General's Requirements

This chapter addressed the DGRs as detailed in Table 14.1.

Table 14.1 DGRs for the assessment of land and soils

DGRs - Soils and Water
- Description of the construction erosion and sediment controls
- Details of impact mitigation, management and monitoring issues
- A technical assessment of the suitability of the soil for use in the construction of the onsite water storage compounds, and to sustain ongoing wastewater irrigation; and
- An assessment of the potential existing soil contamination

14.2 Methodology

The land and soils impact assessment was conducted by undertaking a range of desktop studies and detailed technical studies. The approach was designed to gather suitable information in order to assess the potential impacts arising from Project and, where relevant, and provide mitigation measures as per the requirements of the DGRs.

14.2.1 Topography

The topography of the Project Site and surrounds was derived relative to the Australian Height Datum (AHD) and drafted according to the Geocentric Datum of Australia (GDA) 94 datum. Imagery was obtained from aerial photography and available LiDAR data.

14.2.2 Tenures and infrastructure

Title searches for land tenures surrounding the Project Site were conducted. Mining and petroleum tenements were searched on the NSW Government Department of Trade and Investment, Resources and Energy division MinView online mineral records search tool.

14.2.3 Land use and planning provisions

The assessment of the Project's impact upon existing and future land uses, as well as implications and inconsistencies with statutory planning instruments, was undertaken by reviewing:

- The provisions of the Deniliquin LEP 2013
- Census data from the ABS (ABS, 2015)
- Review of Current Development Applications (Deniliquin Council, 2015).

14.2.4 Geology and geomorphology

Geology and geomorphology information for the region and the Project Site was obtained through a combination of literature reviews and database/mapping interrogation. Resources include reports and publications issued through the NSW Government, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Geoscience Australia, Six Maps, the Geological Survey of NSW, the Australian Geological Survey Organisation, and the Commonwealth DoE resources.

14.2.5 Soils

Soil data for both the region and the Project Site were obtained through interrogation of available mapping resources from the Australian Soil Resource Information System (CSIRO, 2015) and through desk-based literature reviews. This included information from an electromagnetic survey for soil investigation for the Project Site, conducted by Advanced Soil Mapping on behalf of the Deniliquin Council in 2009 (Bates, 2009).

To determine the suitability and quality of the land from an agricultural perspective, a review of mapping data provided on the DP&E website was conducted to determine whether any biophysical strategic agricultural land (BSAL) was present. BSAL is land with high quality soil and water resources capable of sustaining high levels of productivity.

14.2.6 Contaminated land

Under Section 5 of the *Contaminated Land Management Act 1997*, contamination is defined as the presence in, on or under the land of a substance at a concentration above the concentration at which the substance is normally present in, on or under (respectively) land in the same locality, being a presence that represents a risk of harm to human health or any other aspect of the environment. Poor environmental management procedures, accidental spills, industrial activities and poor waste disposal procedures can all contribute to land contamination. To provide an understanding of the potential contamination status of the Project Site, the following methodology was undertaken:

- A desktop review of the current and historical land uses on properties within or adjacent to the Project Site.
- Identification of historical land uses undertaken on the properties within the Project Site that are considered to have the potential to cause contamination.
- Reviews of available NSW EPA records to assess whether properties within the Project Site are recorded on the public access registers containing land use planning information, or have been issued with contaminated land notices.
- A review of available information from the Department of Defence on unexploded ordinance (UXO) using the summary reports for the Deniliquin region.
- A review of land potentially impacted by land contamination and the likelihood of impacts to the Project Site, based on proximity and contaminants of concern.

14.3 Existing environment

14.3.1 Geology

Regional geology

The Murray Geological Basin is a large but relatively shallow, intracratonic, Cenozoic sedimentary basin, extending over 300,000 km^2 of south eastern Australia. The Basin contains sedimentary sequences formed in Aeolian, fluvial, marine and marginal marine depositional environments (DoE, 2007).

Local geology

Deniliquin is situated in the Riverine Plain province of the Murray Geological Basin, characterised by mainly fluvio-lacustrine sediments (Brodie et al. 1993). The geology of the Plain consists of large unconsolidated deposits of Cenozoic sands and Quaternary flood plain and channel alluvium. Although the Riverine Plain has received sediments over millions of years, primarily derived from adjacent basement rocks along its eastern margin, major palaeochannels that transect much of its surface largely developed during the last full glacial cycle between about 105 ka and 10 ka (Whitehouse, 2009).

Patches of Cenozoic alluvial deposits follow key creek and river basins, particularly along the Edward River, which flows through the centre of the Deniliquin Township.

The Project Site sits in its entirety on a large deposit of unconsolidated Cenozoic sand plain.

14.3.2 Stratigraphy

The stratigraphic sequences of the Murray Geological Basin, which is dominated by variably consolidated and unconsolidated sand, silt clay, and lime rich sediments, formed in a diverse array of marine to marginal marine, deltaic, fluvial and Aeolian depositional environments (Whitehouse, 2009).

The stratigraphic units of the Murray Basin form important regional aquifers. Very low rates of sedimentation and restricted sediment supply resulted in development of a relatively thin sequence, commonly less than 200 m thick, of flat-lying, poorly lithified, partly consolidated sand, silt, clay and lime-rich sediments (Whitehouse et al. 1999).

14.3.3 Geomorphology

The geomorphology of the Murray Basin and Riverine Plain province has been characterised by the movement of shallow seas across the plain over the past 50-60 million years, leaving traces of parallel beach ridges and limestone sediments under the dunefields. Sandy surface sediments have been extensively reworked into dunes and sand plains that have blown onto the Cobar Peneplain. The Darling River and streams in the Riverina have cut through the sands and constructed numerous overflow lakes such as the Sayers Lake system and the abandoned Pleistocene channels and basins of the Willandra Lakes complex. Saline groundwaters have formed salt basins in many places where the sand plain or dune topography intersects the water table. All lakes and

swamps have well-formed lunettes on their eastern margins that record evidence of climate change and human occupation. A few bedrock ridges rise above the sand plains as isolated ranges (OEH, 2015a).

These actions and depositions have resulted in a relatively flat, rolling, low-lying plain, which is characteristic of sandy coastal backshores.

The Project Site geomorphology is representative of the regional geomorphology, with a gently sloping sand plain characterising the majority of the Project Site. Small dunal knolls characterise the north-west corner of the Project Site; the only gemorpohological variance within the site boundary.

14.3.4 Geotechnical stability

Intermittent faulting since the Miocene along reactivated basement faults has produced areas of differential uplift and subsidence creating extensive north east trending concealed basement ridges (Whitehouse, 2009). The Neckarboo and Iona ridges, which dominate the central NSW portion of the Murray Basin (within which the Project Site sits), consists of numerous upthrown fault blocks. In contrast, downthrown fault blocks appear to be marked by normally dry lakes with associated lunettes (Whitehouse, 2009).

Aside from these historical faults, the Project Site is considered to be reasonably geotechnically stable.

14.3.5 Paleontological significance

The Murray Basin has the geological distinction of having an extraordinary, almost-complete, record of ancient shorelines formed over the past six million years that extend in a south-westerly direction from about 500 km inland to the present coast.

14.3.6 Topography

Local topography

Contours for the base of the Cenozoic sediment deposits within the Murray Geological Basin show a dominant north east trend, to which the Project Site is consistent with.

The Deniliquin regional topography is dominated by lowland arable plains with little variation in height.

Project Site topography

The Project Site sits on a gently sloping to flat plain, with its highest point at the southern boundary, and its lowest at the northern boundary. High points of the Project Site are below 97 m AHD, gently sloping in a south west to north east direction, and dropping to just above 94 m AHD in the north east corner of the Project Site. The slope falls gently across the Project Site across the first 800 m (from the southern boundary), falling by approximately 1 m. There is a small knoll in the north west corner of the site, rising approximately 1 m before falling approximately 2 m over 400 - 600 m until the northern boundary.

Cross sections were developed to illustrate the Project Site topography and are illustrated in Plate 14.1 to Plate 14.7. These cross sections demonstrate the following:

- A low ridge (approximately 0.3 - 0.5 m high), runs in a south east to north-west direction in the northern half of the Project Site, creating a localised watershed.

The ridge creates a local depression to the south, which would capture and hold surface water runoff. Further detail is provided in Chapter 10 Surface Water and Appendix L Surface Water and Groundwater Technical Report.

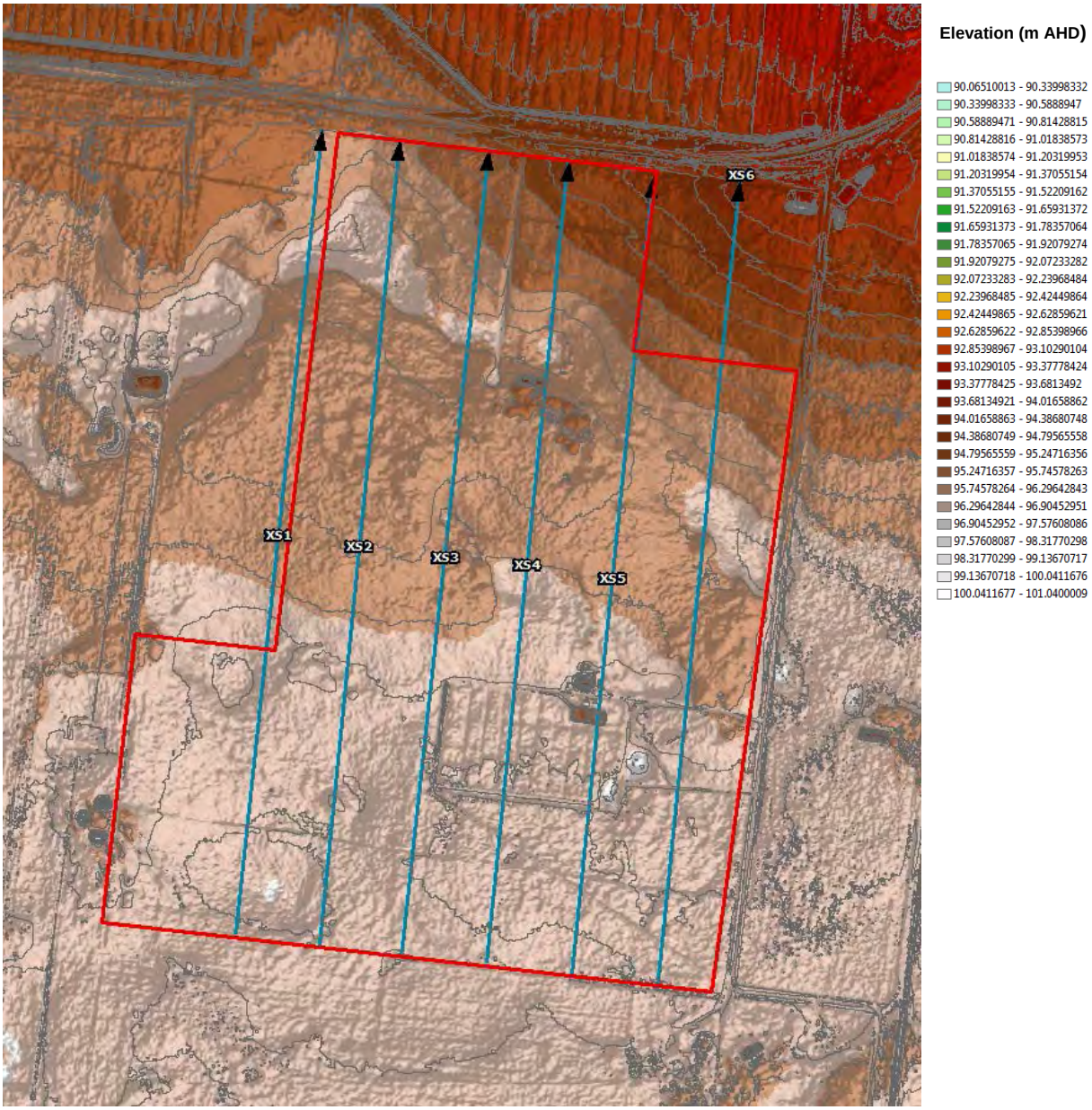


Plate 14.1 Overview of cross sections

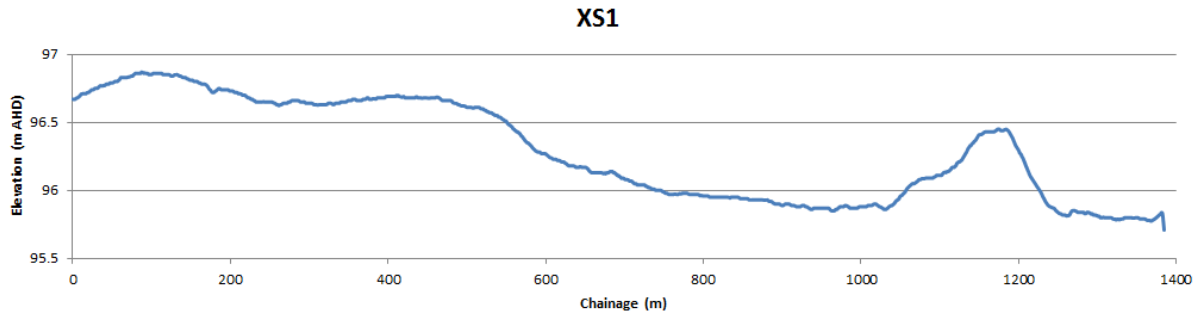


Plate 14.2 Cross section 1

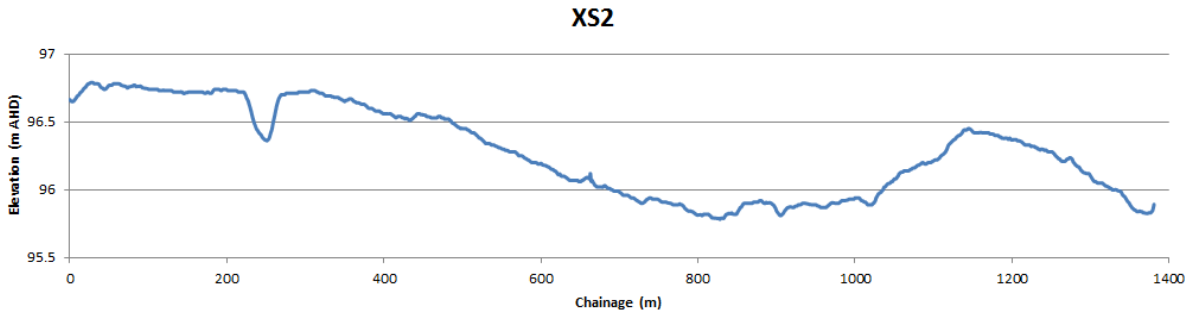


Plate 14.3 Cross section 2

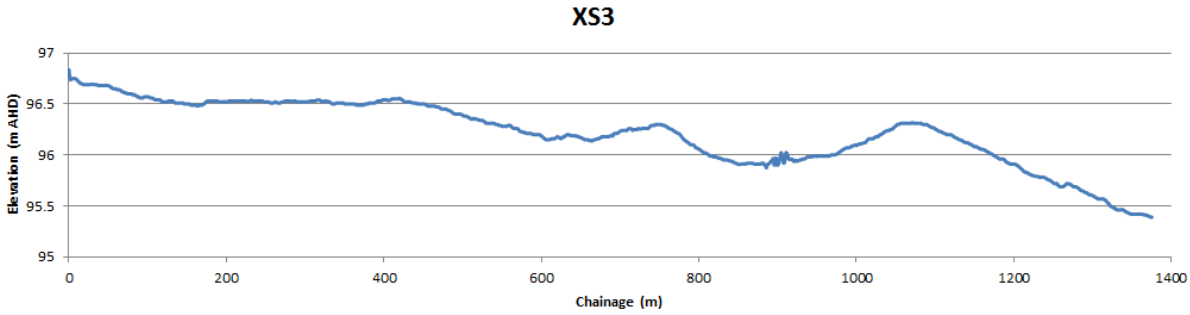


Plate 14.4 Cross section 3

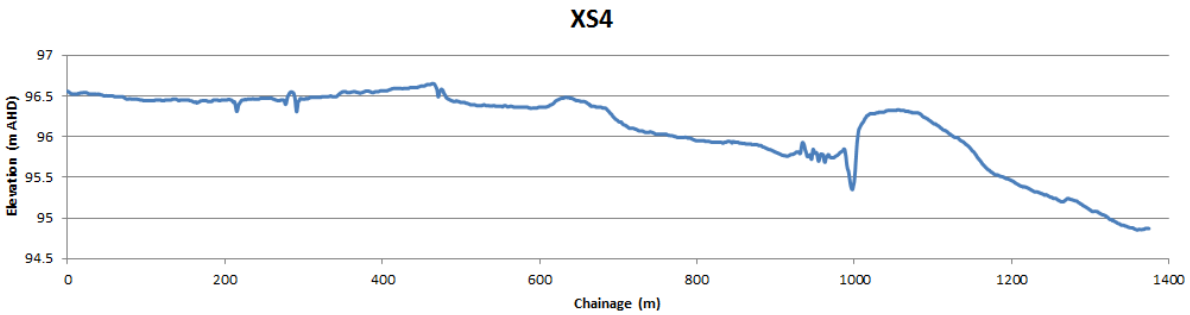


Plate 14.5 Cross section 4

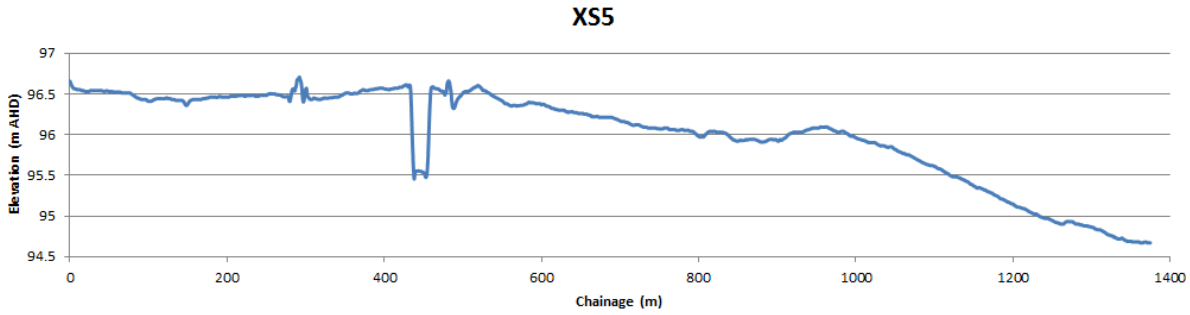


Plate 14.6 Cross section 5

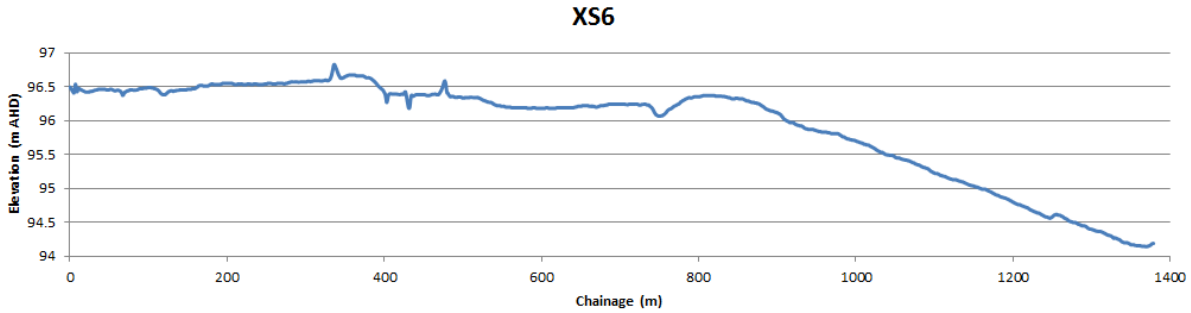


Plate 14.7 Cross section 6

14.3.7 Land use

Land use in the Deniliquin region is dominated by agricultural farmland. The ABS census information for Deniliquin details the following land uses recorded (by area) in Deniliquin:

- Conservation and natural environments: 1,527 ha (10.7 percent)
- Production from relatively natural environments: 414 ha (2.9 percent)
- Production from dryland agriculture and plantations: 5,761 ha (40.1 percent)
- Production from irrigated agriculture and plantations: 3,130 ha (21.9 percent)
- Intensive uses: 3,150 ha (22 percent)
- Water: 337 ha (2.4 percent).

The Census data from 2008 is detailed above, and is representative of the latest available data on land use in Deniliquin (ABS, 2015).

ABS also provides details of the dynamic land cover in the Deniliquin district, which provides insight into the predominant types of agriculture occurring in the area. This information is as follows:

- Rainfed cropping: 3,361 ha (23.5 percent)
- Rainfed pasture: 3,582 ha (25.1 percent)
- Tussock grasses – open: 307 ha (2.1 percent)
- Shrubs – sparse: 86 ha (0.6 percent)
- Trees – closed: 421 ha (2.9 percent)
- Trees – open: 1,770 ha (12.4 percent)
- Trees – scattered: 36 ha (0.4 percent)
- Trees – sparse: 4,168 ha (29.2 percent)
- Built up area: 549 ha (3.8 percent).

This data indicates that the predominant land use in the Deniliquin region is agriculture, with pasture and cropping in almost equal proportion.

The Project Site is pasture. The northern two Lots, Lot 272 and 234 are now Deniliquin Council owned lots that have been de-stocked in the last 10 years (Pers. comm. Jeff Shand, Deniliquin Council). Lot 273 is privately owned and is still actively being used for sheep grazing. Chapter 18 Cultural Heritage, discusses the historical land use of the Project Site and surrounding region.

14.3.8 Bushfire

Bushfire can present a major threat to communities as well as environmental, economic and cultural values. As a result of past bushfire events, the NSW Government amended the EP&A Act and the *Rural Fires Act 1997* requiring all new development on bushfire prone land to comply with *Planning for Bush Fire Protection 2006* (NSW Rural Fire Service, 2006). To determine the level of risk of land in the vicinity of the Project Site, consultation was undertaken with the NSW Rural Fire Service in November 2014. Their response concluded that the Project Site was not on bushfire prone land. Standard management procedures such as adequate firefighting equipment and water supply, access to firefighting appliances and staff evacuation procedures would be

implemented on the Project Site as part of Dongmun Greentec's standard operating procedures. Bushfire risk has therefore not been considered further in this chapter.

14.3.9 Tenure

Land ownership within and surrounding the Project Site is detailed in Table 14.2 and illustrated on Figure 2.3, Chapter 2 Site Location and Regional Local Context.

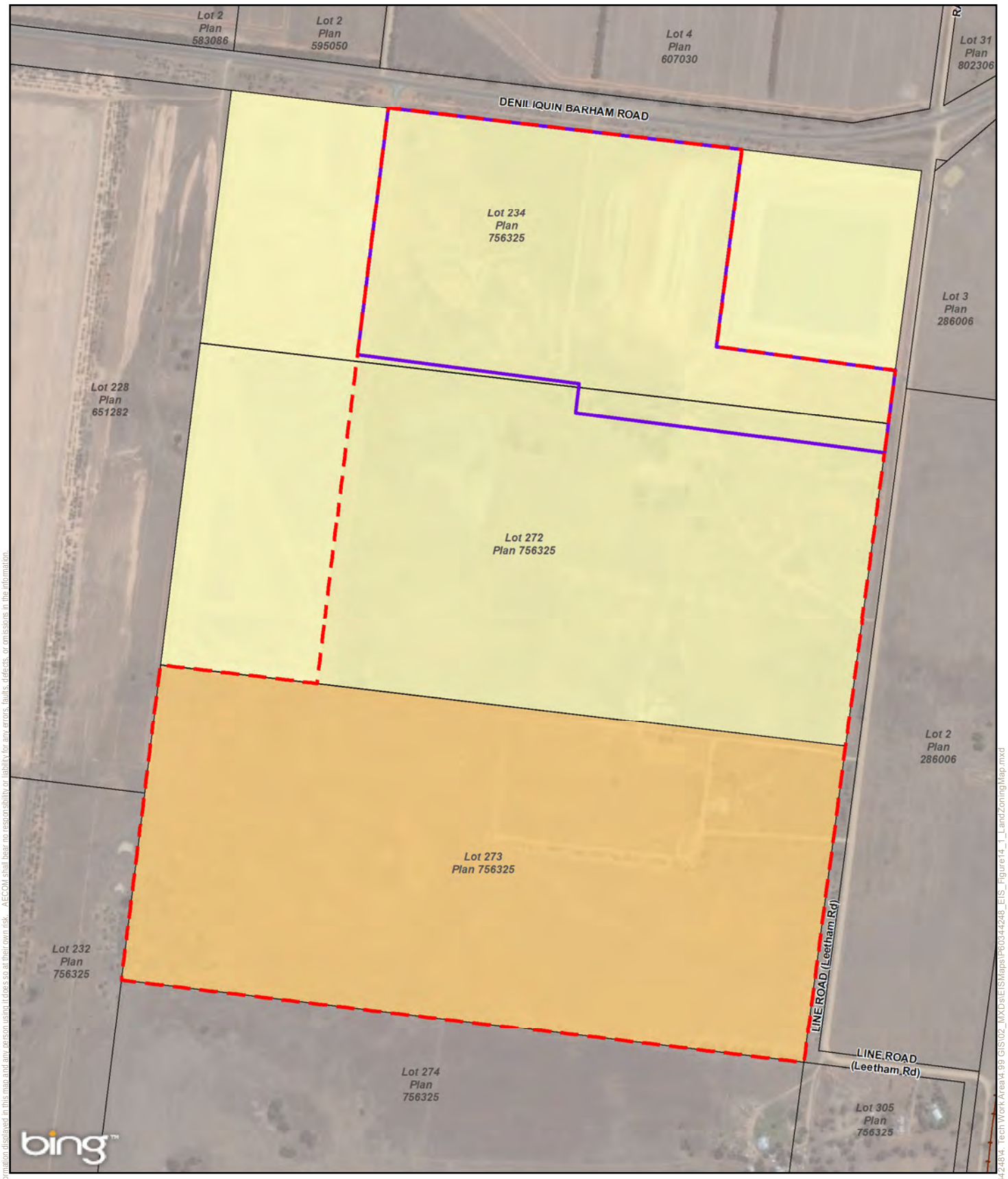
Table 14.2 Land ownership details

Lot	Plan	Owner	Proximity to Project Site boundary
234	DP756325	Deniliquin Council	Located within the Project Site and contains the majority of the Project Footprint
272	DP756325	Deniliquin Council	South of the Project Footprint and within the Project Site
273	DP756325	M&A Trotman	Located wholly within the Project Site
274	DP756325	Lavars	Located immediately south of the Project Site
3	DP286006	N/A	Located immediately north east of the Project Site
305	DP756325	Cannard and Godden	Located immediately south east of the Project Site
31	DP802306	Jansen	Located to the north east of the Project Site, north of Deniliquin Barham Road
4	DP607030	N/A	Located to the north of the Project Site, north of Deniliquin Barham Road
2	DP595050	N/A	Located to the north west of the Project Site, north of Deniliquin Barham Road
2	DP286006	N/A	Located immediately east of the Project Site

14.3.10 Land zoning

Lot 234 and Lot 272 are zoned SP2 Infrastructure (Sewerage Systems) under the Deniliquin LEP 2013 and Lot 273 is zoned RU1 Primary Production (refer to Figure 14.1). For further details regarding land zoning, refer to Chapter 5 Statutory Controls and Approvals, Section 5.6.

Deniliquin Local Environmental Plan 2013 Zoning



LEGEND

- Project Site
- Project Footprint
- Cadastral Boundaries

Land Zoning

- RU1, Primary Production
- SP2, Infrastructure

Data Sources:
1.Imagery: © 2015 DigitalGlobe © 2015 GeoEye Earthstar Geographics SIO © 2015 Microsoft Corporation
2. Roads, Railway, Drainage, Suburbs, Parks, Localities: @ Street Pro, 2011
3. Key Map Base Layer: ESRI Online
4. Site Layout: based on CAD Drawingd prepared by DONGMUN I.R.S. Co. Ltd.
5. Land Zoning: Based on Deniliquin Local Environmental Plan 2012, Land Zoning Map - Sheet LZN_003 @ http://www.deniliquin.nsw.gov.au/images/documents/deniliquin/Draft%20LEP%20Docs/ annexure%20c%20-%20draft%20deniliquin%20local%20environmental%20plan%202012% 20-%20mapping.pdf

Disclaimer:
Site Layout is indicative only. To be used for information only. For detailed design reffer to CAD Drawings

AECOM
www.aecom.com

DATUM GDA 1994, PROJECTION MGA ZONE 55

N 0 50 100 150
Metres

FIGURE 14.1

A4

14.3.11 Soils

Regional

The Deniliquin region is characterised predominantly by sandy clay loam over clay. The Australian Soil Resource Information System (ASRIS, 2015) characterises the area being part of the Murray Lowlands Province, more-or-less coincident with the Murray sedimentary basin from a soils perspective. The Province consists of flat alluvium with Aeolian cover in places. Broadly, alluvial sediments account for greater than 50 percent of the regional soil profile, 20 to 50 percent Aeolian sand, and less than 20 percent parna (dust deposits on land).

ASRIS mapping also reports an extremely low probability of occurrence of Acid Sulfate Soils in the region (ASRIS, 2015).

Local

Advanced Soil Mapping (ASM) conducted an electromagnetic survey for soil investigation at the Project Site for Deniliquin Council in 2009 (Bates and Bates, 2009). Eleven bores were sampled from across the Project Site and their locations are shown in Figure 14.2. The red areas show the location of previous ephemeral water courses, yellow areas and green areas are those with stronger structure and greater geotechnical stability.

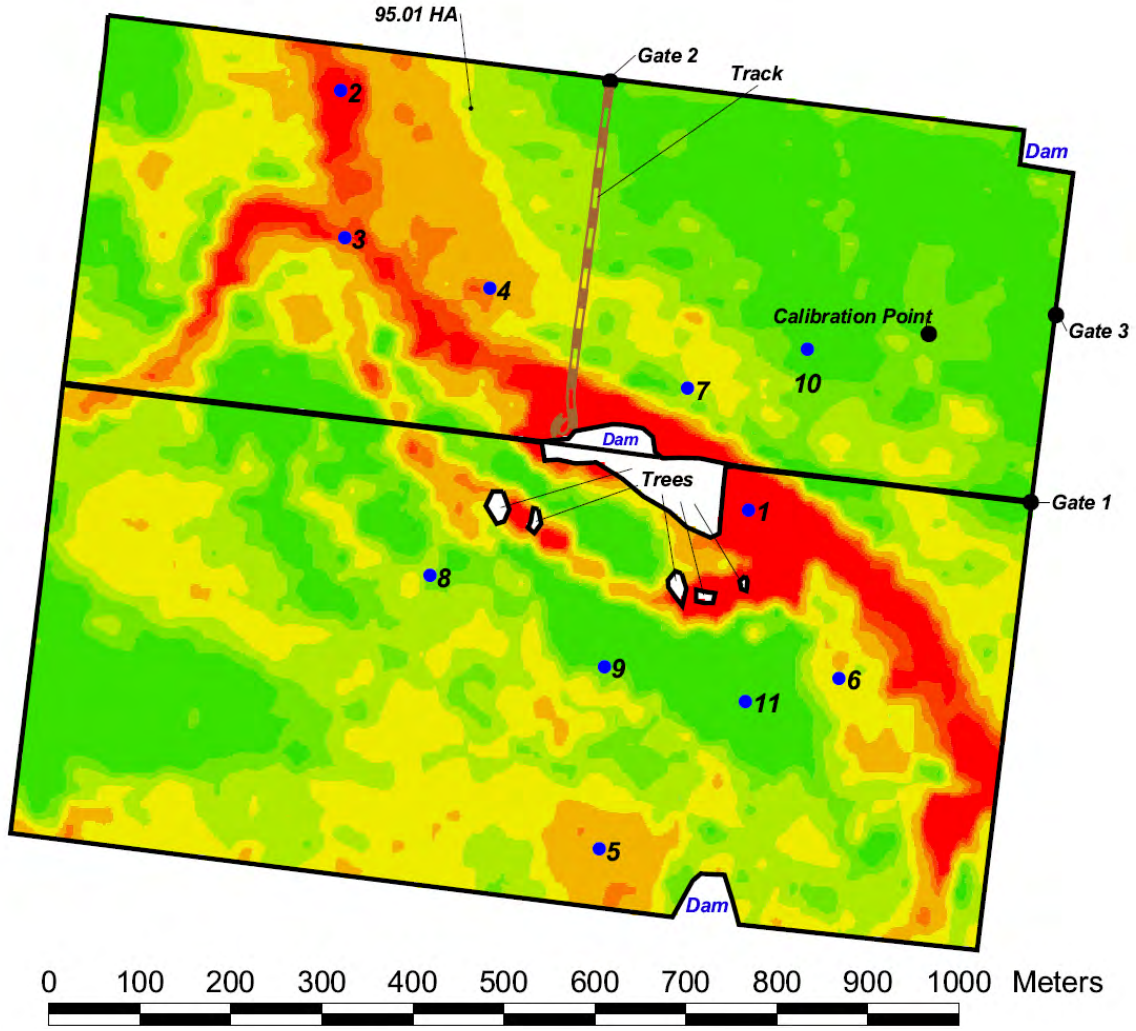


Figure 14.2 Bore sample locations (EM31 Vertical) (Bates and Bates, 2009)

The north west of the Project Site (bores 2, 3 and 4) is characterised by a shallow layer (less than 0.5 m) of red/brown medium clay. From 0.5 m below to the extent of the sample (4 m), the profile becomes silty sand, to fine sand, and coarse sand at the bottom of the sample.

The north east of the Project Site (bores 7 and 10) is dominated by layers of grey/brown medium and fine sandy clay. Some silty layers are noted in bore sample 10, and both samples had traces of Gypsum.

The centre of the Project Site (bores 8 and 9) is characterised by grey/brown medium clay deposits through the full 4 m of the sample. Some presence of silt and gypsum was also noted.

The south of the Project Site (bore 5) is characterised by grey/brown medium clay deposits through the full 4 m of the sample. Some presence of silt and fine sand was also noted.

The south east of the Project Site (bores 11 and 6) showed some diversity in soil horizon, likely due to the presence of historical fluvial sediments running through the site (represented by the red shaded area in Figure 14.2). Bore 11 showed little diversity, with the sample showing consistent layers of grey/brown medium clay, with an orange/brown clay cap on the top 0.5 m. Bore 6 also had a red/brown medium clay cap on the first 0.5 m of the sample; however, the horizon sample progressively became sandier, with a large layer of silty sand dominating the sample from 1.5 m downwards.

Bore 1, taken from the central area in the site to the east of the existing patch of trees in the centre of the Project Site, further indicated historical fluvial activity through the centre of the site, with the sample progressively altering from a top layer of sandy loam, through to 1 m of silty sand, 1.5 m of fine sand, and the final metre of the sample dominated by coarse sand.

The soil types characterising the site are consistent with the regional and local geology, and represent areas of Tertiary and Quaternary fluvial and coastal deposits.

The soil type found on the Project Site by Bates and Bates (2009) is generally consistent with the Australian Soil Classification (ASC) Brown Chromosol [CH] [AB]. ASRIS classify the soil types in the Deniliquin area, including the Project Site as Bunnaloo (bn). The highest percentage soil type in this unit is a sub-plastic red or brown chromosol (Transitional Red Brown Earth/Red Brown Earth) which occurs on level and gently undulating plains– 70 percent. This soil typically has sodic subsoil and would be classified as a sodosol apart from the special exception made for this soil type by R. Isbell in the ASC. The topsoil is prone to structural decline and wind erosion. However, it is widely cultivated and cropped. Calcareous nodules are common in the subsoil. The erodability of Bunnaloo soils is recognised to be highly susceptible to sheet erosion due to the sodic nature of Red Brown Earth topsoils at depth and prone to structural decline and wind erosion. There is also the potential for the presence of cracking clay on the site, given the local soils commonly found in the region. Cracking clays have a high shrink swell and poor drainage, which can cause significant issues during construction, and are particularly unsuitable for earthen structures (such as dam walls).

Mapping did not deem the Project Site to comprise any Biophysical Strategic Agricultural Land (BSAL).

14.3.12 Contaminated land

The NSW EPA holds a record of contaminated land regulatory notices issued by the EPA to sites and landowners across the State. A search of the register provided no results for the Project Site.

The Department of Defence notes in their NSW UXO summary report that the Deniliquin region was used by the Royal Australian Air Force (RAAF) during WWII. Defence has classified the area as having a ‘slight’ level of UXO. The instructions for sites of slight classification are provided by Defence as follows:

- Areas with a confirmed history of military activities that have resulted in residual UXO, but Defence consider it inappropriate to assess as substantial.
- All land usage and development, within these areas, should continue without further UXO investigation or remediation.

No other desktop searches revealed any records or reference to contaminated land occurring at the Project Site.

14.4 Assessment of potential impacts

The Project’s construction and operations phases have the potential to impact upon existing land use and land related environmental values.

14.4.1 Land use

Land use within the Project Site would change upon construction and operation of the Project. As discussed in Chapter 5 Statutory Controls and Approvals, the land would need to be re-zoned in order for the Project to be developed. Changing the current land use designation to that applicable to the Project would have a potential impact on the availability of land, or on future development in the immediate area.

Areas within the Project Site but beyond the Project Footprint would not experience significant changes in landform or use. Significant changes in land use outside the Project Site and as a result of the Project are not anticipated. In the regional context, the Project’s overall impact on land use is considered to be negligible.

The Project has not been allocated a specific life span and is anticipated to be in operation for an indeterminate period of time beyond 20 years. As such, no closure planning has been considered as part of this EIS. Closure

planning and decommissioning would be carried out in line with established practices and relevant policies and regulations at the time of the decision to close the site operations.

The Project Site is not situated adjacent to any incompatible land uses, with the surrounding Deniliquin area generally designated as RU1 Primary Production, with the exception of the Deniliquin Township (5 km away). To this extent, the likelihood of encountering incompatible land uses is low, considering that most ancillary infrastructure required for the Project, such as powerlines and water supply, already exists close to the Project Site. Therefore, the overall impact on land use is considered to be low and not significant.

14.4.2 Land disturbance

The Project's construction and operational activities would be carried out with the aim of minimising the amount of land disturbed. The Project would disturb approximately 25.6 ha of land as a result of construction and operation.

The disturbance of land due to construction would result in an increased potential for wind and water erosion, causing the propagation of sediment into receiving downstream environments. The pre-controlled risk is considered to be high. Detailed descriptions of the erosion and sediment controls are described in Table 14.3.

14.4.3 Land degradation and contamination

The Project would include a number of activities that have a relatively high potential to cause contamination if not managed effectively. Construction and operational activities, such as waste management, chemical and fuel handling and storage, have the potential to release contaminants.

Project elements with an increased potential to cause land contamination include:

- Storage tanks and process equipment
- Bunds containing flammable liquids tanks
- Chemical storage area
- Grain storage and processing areas
- General plant area.

A search of the NSW EPA Contaminated Land Public Record register (NSW EPA, 2014) provided no results for the Project Site. The Project's construction stage would therefore be unlikely to disturb, remove or transfer material from land previously contaminated with potentially hazardous substances. Acid sulfate soils have not been found to be present during the literature and data review process and mapping also reports an extremely low probability of occurrence of acid sulfate soils in the region.

Potential contamination impacts during Project operations may include the following activities:

- Spills of fuels, greases and lubricating oils which may cause localised contamination
- Spills of grain
- Spills of ethanol from production and storage
- Ineffective waste disposal (hazardous and non-hazardous liquid and solid) leading to soil and groundwater contamination
- Cargo spills during product transportation (rail and road), and during loading/unloading (from grain source material, ethanol, and produced fertiliser).

Further information related to these potential risks is provided in Chapter 13 Hazards and Risk.

14.4.4 Erosion and stability

The Project's construction and operational activities would be carried out with the aim of minimising the amount of land disturbance. Removal of vegetation from the Project Site during construction would increase the potential for wind and water erosion, resulting in the movement of sediment into receiving downstream environments. Detailed descriptions of proposed erosion and sediment controls are detailed in Section 14.5 and Appendix L Surface and Groundwater Technical Report.

Soil types

Soil descriptions provided by Bates and Bates (2009) as detailed in Section 14.3.11, have been compared to CSIRO's ASRIS soils mapping resource data. The soil type found on the Project Site by Bates and Bates (2009) is generally consistent with the Australian Soil Classification (ASC) *Brown Chromosol [CH] [AB].* ASRIS classify the soil types in the Deniliquin area, including the Project Site as *Bunnaloo (bn).* The erodability of Bunnaloo soils

is recognised to be highly susceptible to sheet erosion due to the sodic nature of Red Brown Earth topsoils at depth, and is prone to structural decline and wind erosion.

Land disturbance

Activities which broadly constitute land disturbance are those which involve the removal of topsoil. The following impacts associated with land disturbance activities are specifically those which have the potential to cause erosion and stability issues:

- Loss of the protective vegetative cover.
- Loss/alteration of soil structure, where compaction leads to increased erosion potential (particularly where sodic subsoils are present).
- Loss of topsoil depth.

Mitigation measures in Section 14.5 are proposed for each activity based on the following aims and objectives:

- Prevention of soil loss in order to maintain land capability/suitability.
- Prevention of significant degradation of local waterways due to suspended solids and sediment deposition.
- Maintenance of land stability through mitigation of erosion and structural change.

Land cleared of vegetation

Land clearing on the Project Site would occur on the commencement of construction activities, with clusters of vegetation retained and/or reinstated prior to and during commissioning and operations. Clearing removes the protective cover media, specifically topsoil and vegetation, which can expose sub-soils. In sloping areas, this may increase the potential for erosion. If not managed, this erosion and resulting sedimentation can have downstream effects on receiving land and waterways.

The pre-control risk of land clearing is considered to be high, with unplanned and broad-scale clearing potentially exposing a large surface area of topsoil which could be eroded and discharged as sediment to waterways and neighbouring properties without proper pre-planning and control.

Topsoil

Topsoil would be scraped from the Project Site during the ground preparation works and stockpiled for use in landscape works and the creation of swales. Any topsoil not used in landscaping works would be stockpiled for future use, including future landscape works and swale construction. As such, the pre-control risk of topsoil erosion and sedimentation is considered to be high, due to the volume of topsoil to be stripped and stockpiled.

Building/plant sites

A significant portion of the Project Footprint would be hardstand building or plant laydown areas. These areas are proposed to be gravelled or concreted, dependent on the area and intended use. As such, these areas would introduce altered run-off coefficients, hold-up times, courses and diversions for overland flows across the Project Site. The pre-control risks to areas downstream and upstream of infrastructure hardstand areas have the potential to be high, particularly during heavy rainfall events, where the subsoil is high sodic and susceptible to erosion, and the potential presence of cracking clays may cause waterlogging on the Project Site. Recognising this, the project design has incorporated a range of stormwater management measures as detailed in Chapter 10 Surface Water.

14.5 Mitigation measures

The following plans and procedures would be prepared to manage potential impacts to land based values during construction and operation of the Project:

- CEMP
- EMP
- Integrated Management System (IMS)
- Environmental Management Systems (EMS).

Application of these plans and procedures would minimise or avoid the potential impacts relating to soil, land use, land disturbance, land degradation and erosion and stability, as considered in section 14.4. A detailed description of the CEMP, EMP and EMS can be found in Chapter 23 Environmental Management and Monitoring. Other

relevant mitigation measures that would be implemented are summarised in Table 14.3 and discussed in Chapter 13 Hazard and Risk.

Table 14.3 Soils, land capability and land use mitigation measures

Impact	No.	Environmental management measure	Timing
Soil, Land Capability and Land Use			
General	SL1	Prepare and implement a CEMP.	Pre-commencement, Construction Phase
	SL2	Prepare and implement an EMP.	Pre-commencement, Operations Phase
	SL3	Prepare an EMS to measure and manage environmental performance at the Project Site.	Pre-commencement, Operations Phase
	SL4	All storage areas for chemicals, oils, fuels, solvents and other potentially hazardous materials would have adequate signage and comply with Australian Standards.	Operations Phase
	SL5	All storage and handling areas would be sufficiently bunded.	Construction Phase, Operations Phase
	SL6	The storage, handling and use of chemicals would adhere to the provisions outlined in the relevant Materials Safety Data Sheet (MSDS).	Operations Phase
	SL7	Monitoring of environmental practices would be undertaken across the Project Site through regular site inspections.	Operations Phase
	SL80	Where applicable, site workers would be trained in visually identifying gross contamination.	Operation Phase
Erosion and Stability	SL9	Carry out progressive clearing, restricting clearing to areas of imminent development.	Construction Phase
	SL10	Minimise length of time bare ground is exposed should stockpiling of topsoil be undertaken.	Construction Phase
	SL11	Undertake clearing outside the wet season, where possible.	Construction Phase
	SL12	Prevent run-off from undisturbed areas flowing over cleared land.	Construction Phase, Operations Phase
	SL13	Direct run-off from cleared land to appropriate sediment-controlling structures or facilities.	Construction Phase, Operations Phase
Building / Plant Sites	SL14	Follow suggested methods of land clearance and topsoil handling prior to and throughout construction, including temporary diversion and drainage construction.	Construction Phase
	SL15	Stabilise disturbed areas as quickly as practical to limit erosion, with progressive revegetation undertaken.	Construction Phase

14.6 Summary and conclusion

This chapter has outlined the land based environmental values that would be affected by the Project. Due to the nature of the Project, existing environmental values pertaining to land use of the project Site would be altered.

The potential environmental impact on adjacent uses is largely limited as land disturbance and vegetation clearing would only occur within the Project Site boundaries. In terms of future land uses, the Project Site development would require the reclassification of the Lots it occupies, therefore altering the intended land use from a planning perspective.

An assessment into erosion risks as a result of the Project's activities considered that residual risks were low following the application of suitable mitigation and control measures, and outside of extreme weather events, which may result in waterlogging or localised flooding.

The chapter has demonstrated that although construction and operational activities may have the potential to impact on land based environmental values, the application of mitigation and control measures where appropriate,

as well as adherence to proposed plans and procedures, reduces the residual risks to an acceptable level in terms of this environmental impact assessment.