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Dyno Nobel Asia Pacific Pty Ltd

Moranbah Ammonium Nitrate Project

Environmental Impact Statement

October 2006

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

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Executive Summary

The proposed development of an Ammonium Nitrate (AN) Plant in Queensland will supplement the supply of explosives to the coal mining operations in the northern Bowen Basin. Currently there are a two AN Plants in operation within Queensland. These include the Moura AN Plant in the southern Bowen Basin (operated by Dyno Nobel Asia Pacific Pty Limited (DN)) and the Orica AN Plant in Gladstone. Dyno Nobel Asia Pacific Limited also operates an AN Plant in Western Australia through a joint venture with Wesfarmers CSBP Ltd in Kwinana WA.

The significant expansion of mining in Queensland following the resources boom has placed a significant requirement on the production of AN for use in explosives.

DN has significant experience in the development of AN and in the production of detonators for explosive manufacture. DN operates in Australia and America and has been producing AN and other explosive components since 1965.

The proposed AN Plant will provide a capacity of 260,000 T per year of AN Prill (solid) and approximately 90,000 T per year of AN Emulsion (nominal 350,000 T per year). Movement of the material and equipment for construction of the project will be over the existing road infrastructure leading into Moranbah. The AN Plant will initially service mining operations in the northern Bowen Basin but would be subsequently expected to service other operations located further afield.

Ammonium Nitrate produced from this Plant will be used as the raw material for explosive production in open cut mining. The construction of the AN Plant will increase the permanent workforce in Moranbah and will provide an opportunity for growth within Moranbah.

The transportation of product to these operations will be through the use of trucking operators. This was selected as the preferred method for transport as there is limited infrastructure in place for rail transport to the existing clientele of the project.

The AN Plant is proposed to be located approximately 4.5 km to the west of the township of Moranbah along Goonyella Road. This site was selected as it is in a location suitable for the development of heavy industry and provides a buffer from the operation of the facility to the township. The AN Plant will take an estimated 22 months to construct and employ at its peak approximately 550 staff.

This Environmental Impact Statement (EIS) is focused on the development and operation of the AN Plant and its impact on the environment, surrounding land uses, infrastructure and community. The development of the project will be phased over the construction period to ensure the efficient construction of the facility. To service the construction workforce for the project DN proposes to develop a construction camp. This construction camp is proposed to have in place both a wet (with alcohol) and dry canteen to provide for the staff housed there.

The construction camp is designed to be expandable up to 550 staff if required and has a significant area available for irrigation. The construction camp is also proposed

to be connected to the AN Plant by an internal road to minimise the impacts on Goonyella Road during peak periods. A sewage treatment plant for the site has been investigated to manage the effluent generated from the construction camp.

Water for the project will be obtained from the Burdekin water pipeline (currently under construction) through contracts with both the BHP Mitsubishi Alliance Pty Ltd and Sunwater. The water for the project is intended to provide for both the construction and operation of the facility as well as the provision of water supply for the operational and construction workforce based in and around Moranbah.

Legislative Framework

The proposed Moranbah AN Plant was declared a Significant Project on the 31st of March 2006 by the Queensland Coordinator-General (CG) under Section 26(1)(a) of the *State Development and Public Works Organisation Act 1971* (the SDPWO Act). The declaration of this project as significant requires the development of an EIS.

The EIS is a key information source for the development of an assessment report from the CG (the CG Report). The CG report may streamline the subsequent approvals processes of the applicable State legislation including the *Integrated Planning Act 1997 (IPA)* and the *Environmental Protection Act 1994 (EPA)*.

In accordance with Part 4, Section 31(1) of the SDPWO Act, the CG may seek information to assist with the preparation of the EIS. The CG Report is then prepared in accordance with Part 4, Section 35(4) of the SDPWO Act, and may be based on different advisory agency and general public responses on the project. The Advisory Agencies include:

- The Department of Main Roads (DMR);
- The Department of Transport (QT);
- The Environmental Protection Agency (EPA);
- The Department of Natural Resources and Water (DNRW);
- The Department of Mines and Energy (DME);
- The Department of Communities;
- The Department of Housing (DEH);
- The Department of Emergency Services (DES);
- The Department of Primary Industries and Fisheries (DPIF);
- The Department of Aboriginal and Torres Strait Islander Policy (DATSIP);
- Belyando Shire Council.

The CG Report provides recommendations on the project including any conditions that must attach to any subsequent Development Approval. The CG Report provides the minimum approval conditions for the Material Change of Use (MCU) for the project on application to the Assessment Manager (Belyando Shire Council). This MCU then provides for the finalisation of detailed design and submission of the design to the Assessment Manager for operational works approval.

Project Need and Alternatives

The rapidly expanding coal mining industry is driving the need for AN production capacity in the northern section of the Bowen Basin. The options and alternatives for the project are limited due to the production methodology relying on the provision of adequate supplies of methane gas and water.

Appropriate gas supplies are available at different locations around the Bowen Basin, however, the supplies of water are limited. During the initial stages of the project, an investigation was undertaken by DN into the expansion of the existing AN Plant in Moura, Central Queensland.

This alternative had a number of limitations especially with regard to an adequate water supply. The proposed site at Moranbah provides both a reliable supply of coal seam methane gas for production of the AN, good access to the mines in the northern section of the Bowen Basin and an adequate water supply from the Burdekin Pipeline.

If the project were not to proceed it would limit the further production and development of AN for the expansion of minerals and energy development in Queensland and significantly increase the cost and import dependency of AN products to Queensland industries.

Land uses, topography, soils and geology

Both mining and grazing interests dominate the surrounding land use for the project. The site also has nearby industrial operations including gas pipeline and extraction infrastructure for the coal seam methane, the Enertrade Compression Station and the Blair Athol railway line.

A number of leases also cover the proposed project site including a Mineral Development Lease and a Petroleum Lease. Two pipelines run along the front of the proposed site and will require measures to protect this infrastructure from any potential damage. There are two remnant ecosystems that cover part of the site that has been used for grazing purposes. There is evidence of past chemical clearing of vegetation on the western side of the site.

There are two watercourses in the general vicinity of the project site. These are Grosvenor Creek 1.5 km to the southwest of the proposed site and the Isacc River 4 km to the north of the site. The proposed site is fairly flat, with slope over the site generally less than 5%.

A Land Suitability Study has been undertaken in accordance with that requested by DNRW and based on the *Planning Guidelines: The Identification of Good Quality Agricultural Land* (Queensland Department of Local Government and Planning, 1993)(GQAL) and the *Guidelines for Agricultural Land Evaluation in Queensland* (QDPI Land Resources Branch, 1990).

The study area has been assessed to be suitable for pastoral land, and is not considered to be good agricultural land. This land is suitable for native and marginal for improved pastures. Limitations preclude continuous cultivation for crop production, but

some areas may tolerate a short period of ground disturbance for pasture establishment, although vegetation clearing would first be required.

The geology of the site encompasses a number of coal seams that underlie the project site. These include the Harrow Creek, Dysart and P seams. An assessment of the impact on these coal resources was undertaken as part of the EIS.

Water resources and energy

The water resources surrounding the site are fairly limited. Grosvenor Creek and the Isaac River are ephemeral watercourses. The groundwater in the area predominately follows the coal seams. During brief periods of flow these watercourses are characterised by high turbidity from cleared land adjacent to the watercourses.

The proposed development of the AN Plant aims to provide a significant buffer for the site and to minimise the amount of clearing required. These measures, along with the low slope of the land, will assist in minimising the erosion resulting from the project. Additional measures include the use of diversion drainage on the site to prevent water from impacting on disturbed soils on the site.

The development of the AN Plant and its operation should have minimal impacts on soil erosion over the site, provided appropriate erosion controls are implemented.

The power for the operation of the site will be provided through an onsite power generation facility, which will provide up to 15 megawatts of power for the AN Plant. These gas powered generation units will be purpose built for power supply to the project.

The implementation of a power generation facility has been instigated for the project as development of the proposed Transfield Moranbah and Nebo Power Stations Project has been delayed.

Air Quality

An assessment of the existing air quality in Moranbah and the impacts of the project was undertaken for the different emission sources from the project. The assessment included NO_X (Oxides of Nitrogen) and particulate emissions from the AN Plant and the power generation facility.

The modelling undertaken assessed the ground level concentrations of different emissions against the National Environmental Protection Measure (Air) (NEPM) and the state Environmental Protection Policy (Air) 1997. The assessment found that the air emissions from the project did not exceed the air emission criteria provided by either of these government policies.

Waste

An assessment of the waste generation from the proposed AN Plant was undertaken as part of the EIS. This included the solid and liquid waste from construction activities and operational wastes resulting from the production of AN Prill and AN Emulsion.

An assessment was also undertaken of the waste generation and management from a sewage treatment facility that will be operated as part of the construction camp for the

project. The waste generated from the project can be effectively managed through the implementation of good practice, the development of new infrastructure and the use of existing infrastructure for waste disposal (e.g. effluent irrigation and landfill disposal).

Noise and Vibration

An assessment was undertaken for noise generation during both the construction and operation of the facility. The location of the AN Plant and the type of operation are unlikely to impact on the nearest sensitive receptors to the site (the Marley Accommodation Camp, approximately 2.5 km toward Moranbah). Vibration impacts for the project will be generated during construction operations. However the impacts of this vibration will be minimised by both the separation distance from the site to adjacent infrastructure and the method of construction.

Nature Conservation

A site survey for the project was undertaken to identify and assess the mapped regional ecosystems (REs) on the site and also to identify fauna that may occur on the site. As a part of the assessments, a number of survey transects were established across the site. These transects confirmed the current mapping of REs from the area, with some variations. A Vegetation Management Plan has been prepared for the proposed clearing on the site that impact on the remnant ecosystems.

The fauna assessment of the site identified a number of different species. None of the species found are listed threatened species under the Commonwealth *Environmental Protection Biodiversity Conservation Act 1999* (EPBC Act) and therefore referral to the Commonwealth Department of Environment and Heritage was not required. No other matters of National Environmental Significance (NES) under the EPBC Act will be impacted by the project.

Native Title & Cultural Heritage

At the time of the commencement of the project there where two Native Title claims current for the area. This included the Wiri #2 and the Barna, Barada, Kalamra, Yetimarla #4 (BBKY) Native Title claims. Both of these claims covered the area of the proposed site. It is believed that current leasehold tenure over the site has extinguished Native Title.

Searches of the Cultural Heritage databases managed by the DNRW and surveys of the site by the Traditional Owners (the BBKY) and a qualified archaeologist identified a number of culturally significant sites and items over the project area.

These sites were catalogued and recorded. The Traditional Owners of the site have requested that the location of the culturally significant sites remain confidential between themselves and the proponent. The Traditional Owners have also advised that they would refer the locations of the culturally significant sites to the Cultural Heritage Unit of the DNRW. In accordance with this request no referral has been made to DNRW of these sites.

The layout of the site has been designed to avoid the disturbance of the known Cultural Heritage sites. A draft CHMP has been prepared for the development of the

site and is currently in discussions between the Traditional Owners (BBKY and Wiri) and DN.

Social Impact

A Social Impact Assessment (SIA) was undertaken to identify the impacts on the local and regional communities in the area.

Primarily the area is focused on mining and cattle grazing, with these two land uses represented in close proximity to the project site.

As with other shires in the area, there is a skills shortage as a result of the current resources boom. Housing in the area is significantly restricted due to mining interests surrounding the town and current limitations on land available for housing. DN has taken steps to minimise the impact of the project on the existing housing infrastructure through the proposed provision of housing for the operational workforce and the provision of a temporary construction camp during construction of the facility.

Moranbah has good community and infrastructure services. However, there is a drift of population occurring in some surrounding townships towards the coastal city of Mackay. The SIA provides details of the community concerns in relation to the project and a more detailed assessment of impacts from the project.

A community consultation report has also been prepared for the project and provides the outcomes of community consultation undertaken for the Terms of Reference (ToR).

Economic Environment

The character and basis of the economies of Moranbah and Belyando Shire are described, including:

» Current local and regional economic activity;

» Existing labour force and unemployment statistics;

» Types and numbers of businesses; and

» Availability and prices of goods and services.

The development of the AN Plant will have a number of positive and negative impacts. The employment within the area is primarily focussed around the operations of the mining activities. There is a significant skill shortage in the area and it is likely that the majority of the operational workforce will be sourced from outside of Belyando Shire.

The proposed development of the AN Plant will increase pressures on housing in the area. To address this, DN has undertaken investigations into the purchase of housing for the operational workforce. While the construction workforce will place additional pressures on the township of Moranbah, the construction workforce will be housed in a construction camp to limit the impact on the community.

The local economy of Moranbah however will benefit considerably from the project, both directly and indirectly, as a result of the long-term employment that will occur during the operational phase of the development, and short-term employment during the required 22-month construction phase. Importing of AN into the State will also be reduced as a result of the project, resulting in an improvement in Gross State Product.

Competition for explosives will be maintained at a state level through this facility, and the contribution to the economy of Australia from export earnings, taxes, salaries and purchases of goods and services during the construction and operation phase of the development will have a flow on effect for the economy at a state level.

Contribution to the economy of Australia will also be felt from export earnings, taxes, salaries and purchases of goods and services during the construction and operation phase of the development.

The existing landholders of the area surrounding the AN Plant have been consulted regarding the operation of the facility and allowances have been made to ensure the operation of the AN Plant does not negatively impact on the grazing operations undertaken in the surrounding area.

Transport Infrastructure

The transport infrastructure has been assessed through modelling of the impacts from both the construction workforce and the heavy vehicle traffic on the existing infrastructure servicing the site, specifically Goonyella Road and the Peak Downs Highway.

The modelling undertaken has indicated that the proposed intersections into and out of both the AN Plant and construction camp are suitable for the facility. Modelling has also identified that the traffic generated during construction will not significantly impact on the existing road infrastructure.

A Pavement Assessment has been completed to assess the impacts of the heavy vehicle traffic on the transportation routes around Moranbah. This Pavement Impact Assessment follows the DMR calculation methodology for assessing impacts on the road infrastructure. The assessment indicates that there are a number of roads that will be impacted by the project and will require the payment of pavement maintenance for the project's contribution of heavy vehicle impacts.

Hazard and Risk

A Preliminary Risk Assessment (PRA) was undertaken for the facility incorporating the power generation facility. This risk assessment identified key risks from the facility that may have offsite impacts. The risks assessed included:

- Explosion risk;
- Ammonia gas release;
- Toxic gas release;
- Projectile risk; and
- Natural hazard risk.

The layout and proposed development of the AN Plant was adjusted to minimise the potential for offsite impacts from the project. The report also recommend updating the Quantitative Risk Analysis once the facility design is finalised and modifying the Safety Management System via the Major Hazard Facility Safety Case. The update should

incorporate onsite risks and any potential changes to the population in the area since the PRA was completed.

Preliminary health and safety provisions have been incorporated as part of the workplace health and safety for the project site, including emergency and safety systems planning. These workplace health and safety provisions will be updated on finalisation of the design.

Greenhouse Gas

An assessment of the greenhouse gas (GHG) emissions from the AN Plant and the operation of the power generating facility has been undertaken. This assessment focussed on the volumes of GHG generated by the operation and the construction of the facility.

This preliminary assessment indicates that emissions of GHG directly attributable to the operation of this plant are likely to be approximately 430,000 T CO_2 equivalent per year (maximum 469,000 T). The 469,T CO_2 equivalent per year of GHG allows for 145,000 (electricity), 38,000 (natural gas) and 286,000 (fugitive emissions).

Opportunities to offset GHG emissions from the plant construction and operation process are currently being considered to establish the magnitude of the work required to produce a significant impact. An option being considered is tree-planting and landscaping at the Moranbah site.

The cost of importing AN from overseas would substantially increase the amount of GHG produced taking into account the production and transportation costs. Additionally the importing of other constituents for AN manufacture is also a potentially significant increase in GHG emissions over the production of AN in the Northern Bowen Basin.

Conclusions and Recommendations

The development of an AN Plant in this part of the Bowen basin is important for the effective provisioning of constituents for explosive manufacturing for mining. The project will provide significant employment opportunities and may attract skilled workers into the area. The project also provides an alternative employer to the area that is not solely dependent on coal mining.

The major impacts / potential impacts identified in the EIS include:

» Increased potential risks from the operation of a major industrial facility;

» Increased need for housing and infrastructure;

» Benefits to local, regional and state economy;

» A manageable increase of traffic; and

» Minor impacts on the air quality of the area during construction and operation.

The EIS concludes that after the implementation of appropriate mitigation measures, the benefits from the proposed AN Plant can be realised without causing undue risk to the environment, the community or cultural heritage over the area.

Glossary

Abbreviation	Description
A-weighted	The overall level of sound is usually expressed in terms of dbA, which is measured using a sound level meter with an "A-weighting" filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.
AHD	Australian Height Datum.
ALARP	As Low As Reasonably Practicable.
AN	Ammonium Nitrate.
ANSOL	Ammonium nitrate solution.
ANZECC	Australian and New Zealand Environmental Conservation Council.
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand.
AS	Australian Standard.
BOM	Bureau of Meterology.
BSC	Belyando Shire Council.
CadnaA	Computer Aided Noise Abatement software used for calculating predicted noise emissions.
CoRTN	Calculation of Road Traffic Noise algorithm is published by the UK Department of Transport, 1998.
CG	The Coordinator-General of the State of Queensland.
CH_4	Methane (major component of coal seam gas).
CHMP	Cultural Heritage Management Plan.
CO	Carbon monoxide.
CO_2	Carbon dioxide.
^0C	Degrees Centigrade.
Core	Piece of stone from which flakes have been removed.

Abbreviation	Description
dB	Decibel, which is 10 times the logarithm (base 10) of the ratio of a given sound pressure to a reference. Pressure; used as a unit of sound.
dB(A)	Unit used to measure 'A-weighted' sound pressure levels.
DCS	Distribution Control System.
DEH	Commonwealth Department of the Environment and Heritage.
DME	Queensland Department of Mines and Energy
DMR	Queensland Department of Main Roads.
DN	Dyno Nobel Asia Pacific Limited.
DNRW	Queensland Department of Natural Resources and Water
DPIF	Queensland Department of Primary Industries and Fisheries.
Edge ground axe	Axe shaped piece of stone that has been knapped and ground to produce sharp edges.
EIA	Environmental Impact Assessment.
EIS	Environmental Impact Statement.
EMP	Environmental Management Plan.
EP	Environmental protection.
EP Act	*Environmental Protection Act 1994 (Qld).*
EPA	Queensland Environmental Protection Agency.
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999 (Cwlth).*
EPP	Environmental Protection Policy.
ERA	Environmental risk analysis.
ERPG	Emergency Response Planning Group.
GHG	Greenhouse gas.
IAS	Initial Advice Statement as defined the *State Development and Public Works Organisation Act 1971.*
IPA	*Integrated Planning Act 1997 (Qld).*

Abbreviation	Description
Flake	A piece of stone which is removed (knapped) from a core; the flake may be a planned artifact or a waste by product which is discarded.
Grinding	Manual abrasion.
Grindstone	A stone artifact, with relatively flat surfaces used as a base to grind seeds, roots or tubers and/or ochre; a rounded stone (muller) was used as a pestle to grind the material; grindstones are made from coarse-grained abrasive material such as sandstone.
Ha	Hectares.
HIPAP	Hazardous Industry Planning Advisory Paper.
Hz	The units for frequency are known as Hertz (Hz).
Knapping (flaking)	The process of hitting one stone (a hammerstone) on another (a core) to produce flaked stone artifact.
kg/ha/yr	Kilograms per hectare per year.
kg/month	Kilograms per month.
kPa	Kilopascals
L_N	Statistical sound measurement recorded on the linear scale.
L_{AN}	Statistical sound measurement recorded on the “A” weighted scale.
$L_{A10\ (Time)}$	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
$L_{A10\ (1\ hour)}$	The L_{A10} level measured over a 1-hour period.
$L_{A10\ (18\ hour)}$	The arithmetic average of the L_{A10} levels for the 18-hour period between 0600 and 2400 hours on a normal working day. It is a common traffic noise descriptor.
$L_{Aeq\ (Time)}$	Equivalent sound pressure level: the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.
$L_{Aeq\ (15\ hr)}$	The L_{Aeq} noise level for the period 7 am to 10 pm. (Day and Evening).
$L_{Aeq\ (9\ hr)}$	The L_{Aeq} noise level for the period 10 pm to 7 am. (Night).
$L_{Aeq\ (1\ hr)}$	The L_{Aeq} noise level for a one-hour period. It represents the highest tenth percentile hourly A-weighted L_{eq} during the period 7 am to 10 pm, or 10 pm to 7 am, (whichever is relevant).
$L_{A90\ (Time)}$	The A-weighted sound pressure level that is exceeded for 90 per cent of the time over which a given sound is measured. This is considered to represent the background noise e.g. L_{A90} (15 min).

Abbreviation	Description
$L_{AMax\ (Time)}$	The maximum sound level recorded during a specified time interval.
$L_{AMin\ (Time)}$	The minimum sound level recorded during a specified time interval.
Linear	Sound levels measured without any weightings are referred to as “linear” and the units are expressed as dB(lin).
MAC	Marley accommodation camp
MEDLI Model	Nutrient balance model, used as a modelling tool for assessment of water and effluent disposal.
ML	Megalitres.
MSDS	Material Safety Data Sheet.
MW	Megawatt.
NCA	*Nature Conservation Act 1992 (Qld).*
NDT	Non-destructive Testing.
NEQ	Net Equivalent Quantity.
NEPM	National Environmental Protection Measure.
NH_3	Ammonia.
NA	Nitric acid.
NH_4NO_3	Ammonium nitrate.
Nm^3/s	Normal cubic metres/second.
Nodule	A natural concretion.
NOHSC	National Occupational Health and Safety Commission.
NO_x	Oxides of Nitrogen.
NO_2	Nitrogen Dioxide.
DNRW	Queensland Department of Natural Resources and Water.
DME	Queensland Department of Mines and Energy
ML	Megalitres
m/s	Metres per second.
Ochre	Soft varieties of iron oxide materials such as haematite (red ochre), goethite and limonite which are used as pigments for

Abbreviation	Description
	painting and personal decoration.
pa	Per annum.
Pebble	Stone worn and rounded by natural forces such as water.
Petrified wood	Wood that has undergone the process of fossilisation to produce a stonelike substance.
PFD	Process Flow Diagram.
PHAST	Process Hazard Analysis Software Tool.
PJ/a	Petajoules/year.
PLL	Potential Loss of Life.
PM_{10}	Particles smaller then 10μm.
PPE	Personal Protection Equipment.
PRA	Preliminary Risk Assessment.
Primary flake	One of the first pieces to be struck off a block of stone; retains the cortex (the original outside surface) of the core.
PSA	Pressure Swing Adsorption.
QLD	Queensland.
QRA	Quantitative Risk Assessment.
Rating Background Level (RBL)	The overall single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period (as opposed to over each 24 hour period used for the assessment background level). This is the level used for assessment purposes. It is defined as the median value of: All the day assessment background levels over the monitoring period for the day; (7 am to 6 pm); All the evening assessment background levels over the monitoring period for the evening; (6 pm to 10 pm) or All the night assessment background levels over the monitoring period for the night. (10 pm to 7 am).
Retouch (secondary flaking)	The working of a primary flake to make a tool.
RF	Reformer furnace.
RO	Reverse osmosis.

Abbreviation	Description
Scraper	Retouched flake with a thick working edge; probably used to scrape skins or for woodworking.
SDPWO Act	*State Development and Public Works Organisation Act 1971 (Qld).*
Secondary flake	Struck off a core early in the flaking process, but retains some cortex and some flake scars.
SIS	Safe instrument system.
SLM	Sound level meter.
SMS	Safety Management System.
SSAN	Security Sensitive Ammonium Nitrate.
SO_x	Oxides of Sulphur.
T	Tonnes.
Taphonomy	The study of the processes that have acted on an archaeological site to make it as it appears today.
Tertiary flake	Product of the last stages of the knapping process; no cortex remains.
ToR	Terms of Reference.
Tpa	Tonnes per annum.
Tpd	Tonnes per day.
TSP	Total Suspended Particulates.
Tula or tula adze	Hafted chisel with a semi-circular working edge made from a thick flake; used to work hardwoods.
V	Volts.
WWTP	Waste Water Treatment Plant.

1. Introduction

1.1 Project Proponent

Dyno Nobel Asia Pacific Limited (DN) is a leading producer of explosives and explosive precursors. Dyno Nobel Asia Pacific Limited is widely acknowledged to be one of two significant suppliers of Ammonium Nitrate (AN), emulsion precursors, packaged explosives and initiation systems in the world.

Dyno Nobel Asia Pacific Limited produces and markets explosives and detonation systems for coal mining, metals mining, quarrying, tunneling, construction and seismic industries. DN's strategy combines growth through incremental expansion of existing operations with acquisitions and the development, commercialisation and marketing of new products.

1.1.1 Dyno Nobel contact details

This project is being managed by DN through the Sydney Office for the project and has the following key contacts for the project:

» Ian Smith, Vice President Business Development;

» Owen Williams, Project Director; and

» Alistair Burch, Principal Engineer.

The contact details are:

Dyno Nobel Asia Pacific Limited (Australian office postal address)

Locked Bag No 2113

North Sydney NSW 2059

Australia

Ph: (02) 9968 9000

1.1.2 GHD contact details

Dyno Nobel Asia Pacific Limited commissioned GHD Pty Ltd (GHD) to prepare the EIS for the project. The key contacts for the project are:

» Claire Gronow, EIS Project Director, Principal Environmental Scientist

» David McLean, EIS Project Manager, Senior Environmental Scientist

The contact details are:

GHD Pty Ltd (Brisbane office postal address)

GPO Box 668

Brisbane QLD 4001

Australia

Ph: (07) 3316 3000

1.2 Project Description

Dyno Nobel Asia Pacific Limited is looking to increase its production capabilities within Australia to meet growing demands in the region. Demand for AN is highest in Queensland and the timing of new supply must be consistent with the development of new mines and the expansion at existing mines.

Dyno Nobel Asia Pacific Limited is seeking to construct and operate a new AN Plant incorporating an emulsion manufacturing facility at a site approximately 4.5 km west-north-west of the township of Moranbah, Queensland (see Figure 1) (the "project"). Recently, DN finalised investigations into the potential for expansion of the existing Queensland Nitrates Plant (QNP) facility at Moura, and concluded that the Moura expansion will not occur.

The proposed AN Plant would produce AN and emulsion to service the rapidly expanding demand for AN Prill and AN emulsion for mining, primarily in Queensland. The proposed project includes a nominal 350,000 tpa per annum (tpa) AN Plant capable of making 260,000 tpa of AN Prill (solid) per annum and an Emulsion Plant to produce about 90,000 tpa of AN emulsion (viscous liquid). The total value of the project is approximately $500 million.

Technical grade AN and emulsions are the major raw materials for the most widely used explosives in open cut mining operations. Prilled AN (Prill) is produced as small, solid, round non-volatile granules and is classified as a class 5.1 oxidising agent under the *Queensland Workplace Health and Safety Act 1995* (WH&S) and associated codes and regulations. This product is stable and non-volatile. Ammonium Nitrate emulsion is a precursor for explosives manufacturing in situ (at the blast site). Technical grade AN is classified as a Security Sensitive Ammonium Nitrate (SSAN). Access to SSAN is restricted under a national licensing system. Section 3 provides a detailed description of the project.

1.2.1 Key Elements of the Project

The AN Plant has four components, each produce a separate product i.e. ammonia (NH_3 gas); NA; AN solution and AN Prill. The ammonia is made from coal seam methane gas. The NA and ammonia react to produce AN. Ammonium Nitrate solution from this reaction is then used to make AN Prill, and AN emulsion (a viscous liquid) in the separate Emulsion Plant.

The An Plant and associated infrastructure (the project) will involve construction and operation of the following major components:

- A plant for the manufacture of ammonia from methane in coal seam gas;
- A plant for the manufacture of nitric acid from ammonia;
- A plant for the manufacture of AN from ammonia and nitric acid;
- A plant for the manufacture of AN emulsion from AN and fuel oils;
- A plant to generate electricity from coal seam gas. This is a facility separate from the AN Plant but will also derive waste heat (steam) as the power source from the AN plant;

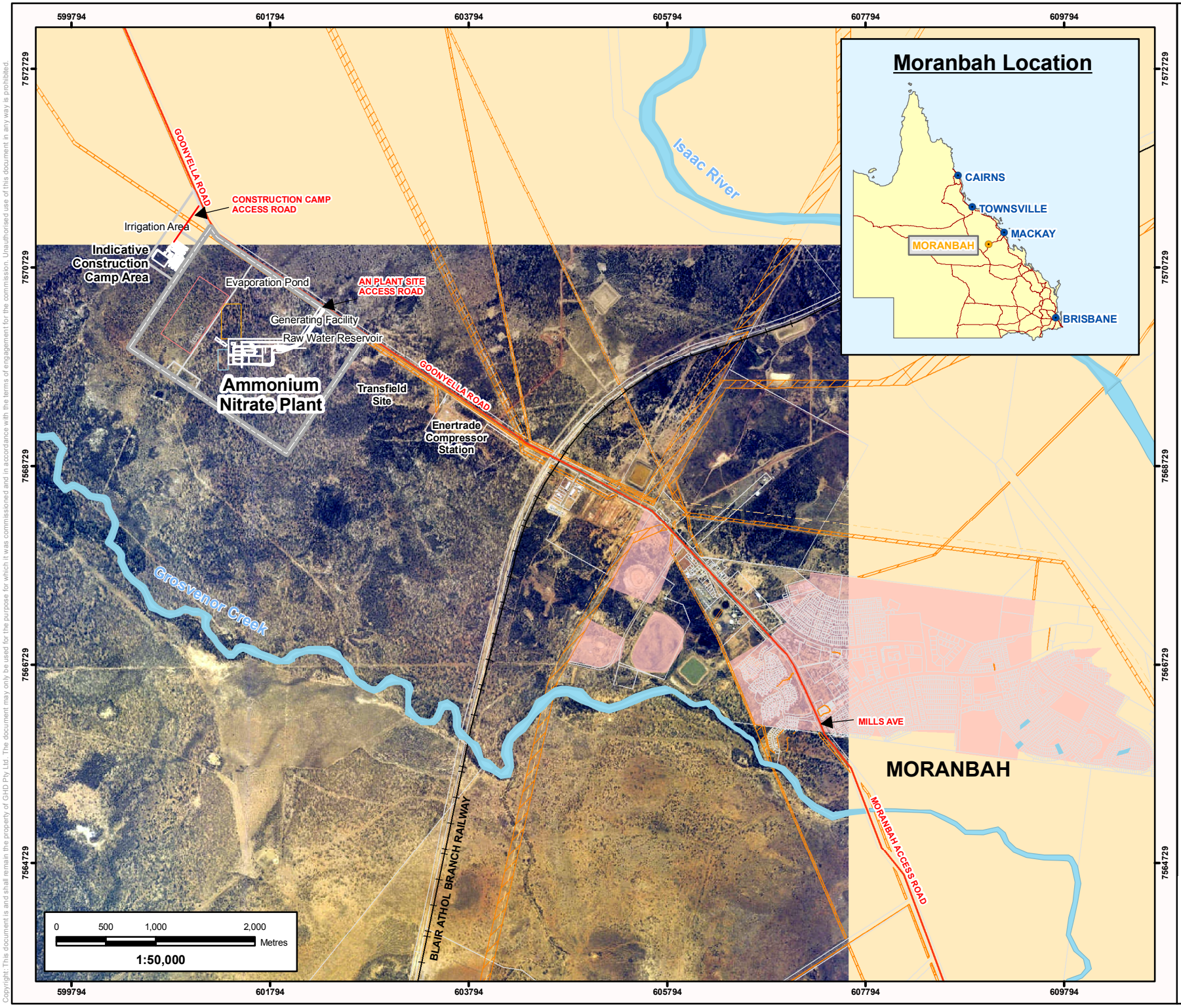
- Ammonia storage facilities of 2,000 tonnes;
- Nitric Acid product storage facilities of 2,400 tonnes (1 tank) 60% concentration;
- AN Prill storage facilities of 11,000 tonnes;
- AN solution (concentrated liquid AN (ANSOL)) stored in a 1,000 tonne storage;
- Plant infrastructure (systems required to operate the AN Plant but not part of the manufacturing process such as roads, buildings, building services, security, communications etc.);
- Utilities (fluids not directly in the manufacturing process such as steam, compressed air, water, power etc.);
- Imported utilities and services including water and communications;
- Access roads to Queensland DMR standards, and connecting water and gas pipelines;
- Pipelines for off-site connections for water and gas supplies;
- A plant for the supply of treated water; and
- A plant for the treatment of wastewater prior to reuse or discharge into the evaporation lagoons).

The operational plant will require 70 personnel for 24-hour operation and maintenance. The project is anticipated to have a lifespan of at least 35 years. Section 3 provides more details regarding the key elements of the project.

1.2.2 Interactions with the Moranbah & Nebo power stations project

The Transfield Pty Ltd Moranbah and Nebo Power Stations Project, planned to be constructed on the adjacent site, was to be constructed at approximately the same time as the AN Plant and was considered as a viable power supply. However development of the project has been delayed and there was consequently, limited available data regarding the proposed PowerStation, during the preparation of the AN Project EIS. Dyno Nobel Asia Pacific Limited has therefore decided to construct a power generation facility for the AN Plant.

Dyno Nobel Asia Pacific Limited has designed the site to minimise the potential risks associated with the operation of the AN Plant and to ensure that these risks are contained within site boundaries at an acceptable level and will therefore not impact on developments on adjacent sites



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DYNO
Dyno Nobel

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Date: 02-10-06 Rev C
Datum: GDA94 (MGA) Zone 55
Source: Base data sourced from the State of Queensland, Department of Natural Resources, Mines. All other infrastructure supplied by Dyno Nobel Asia Pacific Ltd.
File: G:\41\15824\GIS\Maps\Final\MXD\fig1_Site_Location_RevC.mxd

Legend

- Ammonium Nitrate Plant Site
- Evaporation Pond
- Generating Facility*
- Raw Water Reservior
- Cadastre
- Easements
- Developed Area
- Watercourse
- Major Road
- Railway
- Powerlines

*Generating Facility location is subject to detailed engineering.

Moranbah Ammonium Nitrate Plant

Environmental Impact Statement

Figure 1
Site Location

GHD
CLIENTS | PEOPLE | PERFORMANCE

1.2.3 Project Specialist Studies and Surveys

A number of studies and surveys have been undertaken for the purposes of developing the project and providing input into the Environmental Impact Statement (EIS). The studies assessed a range of environmental issues. These include the assessment of existing environmental conditions and the potential impacts of the project, including mitigation measures to address the impacts from the AN Plant. The EIS specialist studies are listed below.

- Soil survey and suitability;
- Terrestrial flora and fauna surveys;
- Traffic impact assessment;
- Pavement Impact assessment;
- Hazard and risk assessment;
- GHG assessment;
- Air assessment
- Noise assessment;
- Cultural heritage assessment;
- Wastewater effluent assessment;
- Community Consultation; and
- Social Impact Assessment.

Each specialist study report is included in Volume 2: Appendices. Summaries of the studies results are contained within the EIS: Volume 1. Additional assessments were undertaken as part of this EIS, which did not justify a separate appendix. These have been included within the text of the EIS.

In addition to the EIS studies, most of the basic engineering was carried out to finalise the processes required for the plant and to develop a layout for the plant and associated infrastructure. This information was required to provide input to the EIS studies. Geotechnical and topographical surveys were also carried out.

1.3 Project Objectives and Scope

1.3.1 Project objectives

Demand for AN from the mining industry in Queensland is expanding at a rapid rate. This has led to the project objective to provide AN emulsion and AN Prill to service the rapidly expanding demand for mining resources. This project aims to maintain and enhance regional competition for explosives, supplement the current shortage of AN product presently required by the Queensland mining industry, and contribute to the local economy of Moranbah. The project will also aim to reduce imports, improving Gross State Product through local AN production.

1.3.2 Size and type of operation

Dyno Nobel Asia Pacific Limited aims to construct and operate a new AN Plant capable of producing a nominal 330,000 tpa expandable to 350,000 tpa of AN (combined prill and AN emulsion production).

Section 3.3 provides more details regarding the size and type of operation.

1.3.3 Processes and products

The AN Plant produces separate products including; Ammonia (NH_3 gas); Nitric Acid (NA); and AN. The ammonia is made from coal seam methane accessed through the gas fields adjacent to the proposed site, the NA and the ammonia react to form AN. Ammonium Nitrate solution will be used to make AN Prill (a solid) in a prilling tower and AN emulsion (a viscous liquid) in the adjacent emulsion manufacturing plant.

Sections 3.3. and 3.4 provide the details regarding the processes and products.

1.3.4 By-products and wastes

Construction by-products and wastes

Construction of the AN Plant is anticipated to generate approximately 43x10 m^3 bins per week of solid waste for the duration of the construction phase, estimated to be 22 months. Construction wastes will be divided into hazardous and non-hazardous materials. These wastes will be recycled and/or disposed of as deemed appropriate, ie to local landfill areas (subject to agreement with the Belyando Council), licensed regulated waste facilities (where required) and wastewater treatment plants.

Section 3.2 provides the details of construction waste generated.

Operational by-products and wastes

Effluent treatment

The facility will include treatment for both the plant wastewater streams and contaminated storm water. A final effluent stream from the water treatment plant will be discharged to the evaporation ponds. The cooling tower (blowdown) will discharge to the water treatment plant. Storm water will be routed to an oil/water separator unit for removal of oil, grease and suspended solids. A separate treatment plant will be provided to handle domestic wastewater. The evaporation ponds have been designed for zero discharge from the site (waste water will evaporate from the dam). The plant will be designed to maximise water re-use and minimise the consumption of process water.

Typical solid and liquid wastes

From DNs experience at other integrated AN manufacturing facilities, the expected operational solid and liquid wastes will be:

» Waste oil;

» Empty drums;

- Rags and absorbents;
- Sewage waste;
- Non-hazardous chemical additive drums; and
- Catalysts.

Air emissions

Key air emissions from the operational plant are anticipated to include:

- Oxides of Nitrogen (NO_X);
- H_2O as water vapor;
- Ammonium Nitrate (NH_4NO_3) as particulates.

The proposed technologies for the plant incorporate selective catalytic NO_X reduction system, 100% air recycling in the prilling tower and control of venting from the ammonia storage tank. These measures ensure ambient air quality is maintained and emissions to atmosphere are minimised.

Sections 3.3 and 3.4 provide the operational details.

The power generation facility on the AN Plant site increases emissions from the operation of the facility. Section 3.5.2 provides details of the energy requirements and the emissions generated.

1.3.5 Anticipated level of performance in meeting required environmental standards and cleaner production principles

The specialist studies in Volume 2 of the EIS provide a detailed assessment of the environmental performance of the project. The AN Plant processes maximise the reuse and minimise the volumes of wastewater and solid wastes generated.

The proposed measures for the construction and operational phases of the AN plant are designed to minimise the impacts on the environment. The provision of evaporation ponds to ensure nil off-site discharge, and the use of a power generation facility on site to avoid off-site power demand and the water recycling measures will all assist in minimising impacts on infrastructure in the area.

1.3.6 Staging and timing

The staging of the project covers the construction, operation and commissioning of the facility. The project's indicative key completion dates are as follows:

Table 1 Project Completion Dates

Key Tasks	Indicative Completion Dates
Impact Assessment & *Integrated Planning Act 1997* Approval	December 2006
Access to Site	December 2006
Construction of Plant	January 2007-December 2008
Commissioning	October 2008
Supply Product to Customers	January 2009

Construction of the AN Plant is expected to take approximately twenty-two months in total. The main activities and estimated timeframes associated with construction (a number of which are concurrent) are:

Foundations	nine months
Steel structure work	four months
Equipment installation	six months
Piping prefabrication and installation	seven months
Electrical installation and instrumentation	six months
Painting	eight months
Insulation	five months

1.4 The Environmental Impact Assessment Process

The project was declared a 'significant project' by the Queensland Coordinator-General (CG) pursuant to Section 26(1)(a) of the Queensland SDPWO Act on the 31st of March 2006. This declaration requires DN to prepare an EIS for the project under the SDPWO Act.

The CG issued the final Terms of Reference (ToR) for an Environmental Impact Statement under Part 4 of the SDPWO Act on the 26th July 2006. This EIS has been undertaken to meet the ToR.

1.4.1 Methodology of the EIS

The EIS has been developed in the following phases:

Initial Advice Statement: This phase was completed in March 2006 and included an initial review of available documentation to determine the key issues that should be addressed in the EIS ToR.

Data Collection and Review: This phase was completed in April 2006 and included the collation of all available relevant data for the project area from previous studies,

specific to the development of the AN Plant or general studies within the region. New data was also collected where existing references were insufficient.

Specialist Studies: These studies completed in July 2006 were undertaken to provide input into the EIS (see list in Section 1.2.1). These study reports are included in the Appendices of the EIS: Volume 2.

Existing Environment: This component was completed in August 2006, based on the data collection and specialist studies conducted for the project. A detailed description of the existing environment was then prepared. The purpose of this phase is to provide a baseline from which to determine potential impacts associated with the project.

Environmental Impacts: This component was completed in September 2006, including the identification and quantification of potential impacts that may result from development of the project is based on an analysis of known impacts associated with the proposed works, from previous knowledge and experience, and the characteristics of the areas to be impacted. From this analysis, potential impacts can be identified and quantified (where possible) and possible mitigation strategies developed where necessary to minimise the potential impacts.

Environmental Management Plan: The Environmental Management Plan (EMP) for construction and operation was outlined in September 2006 and details the implementation strategies for the development of the project to achieve the mitigation strategies identified to minimise potential impacts. The EMP for construction will be updated prior to construction commencing. The operation EMP will be updated prior to operations commencing. See Section 5 for further details on EMPs.

1.4.2 EIS Study Team

Dyno Nobel Asia Pacific Limited commissioned GHD Pty Ltd (GHD) to prepare the EIS for the project. A list of key personnel involved in the preparation of this EIS is provided below.

Organisation	Team Member	Position / Role
GHD Pty Ltd	Claire Gronow	Principal Environmental Scientist
GHD Pty Ltd	David McLean	Senior Environmental Scientist
GHD Pty Ltd	Rachael Gibson	Senior Social Scientist
GHD Pty Ltd	Terry Harris	Principal Risk Engineer
GHD Pty Ltd	Andrew Lewis	Senior Air Specialist
GHD Pty Ltd	Greg Collins	Senior Noise Specialist
GHD Pty Ltd	Simon Danielsen	Senior Botanist
GHD Pty Ltd	Natasha Witting	Senior Zoologist
Dyno Nobel Asia Pacific Limited	Peter Eatough	Senior Engineer
Dyno Nobel Asia Pacific Limited	Alistair Burch	Principal Engineer

1.4.3 Objectives of the EIS

The objectives of this EIS are to:

» Provide an assessment of potential impacts associated with the proposed project and identify appropriate mitigation strategies to minimise or negate any adverse impacts;

» Consult with the community and potentially affected stakeholders with the process of identifying, assessing and responding to queries and/or submissions to the project;

» Identify all relevant approvals required for the project to proceed; and

» Provide information to the community, relevant regulatory authorities and other stakeholders regarding the proposed project and the likely positive and negative impacts as a basis for decision making in relation to the approvals required for the project.

Table 2 Summary of Terms of Reference Requirements for the Environmental Impact Statement

Terms of Reference Objective for the EIS	Relevant EIS Sections	EIS Description
Provide a basis for understanding the project	Sections 1.1, 1.2, 1.3, 2.1 and Chapter 3.0	The EIS provides relevant information on the need for the project and a description of all aspects of related to construction and operation of the project.
Legislative and policy provisions	Section 1.6	All legislative and policy requirements are described and a list of relevant approvals, license and permits provided for all aspects of the construction of the project.
Alternatives to the project and preferred solutions	Section 2.2	Project alternatives are described based on environmental, social, cultural, engineering and economic considerations.
Description of existing environment	Chapter 4.0	The existing environment (land use/infrastructure, climate, water resources, air, waste, noise and vibration, nature conservation, cultural heritage, social and economic, traffic, health and safety, and GHG emissions that will be affected by the project, both on and off site has been described.

Terms of Reference Objective for the EIS	Relevant EIS Sections	EIS Description
Potential impacts to the existing environment and measures to mitigate adverse impacts	Chapter 4.0	Potential impacts, both adverse and beneficial, to the existing environment have been discussed and where possible measures and recommendations provided to avoid or mitigate adverse impacts provided.
Environmental Management Plan (EMP)	Chapter 5.0	Measures and recommendations to minimise potential adverse impacts during construction and operation have been provided as an EMP.

1.4.4 Submissions

Submissions on the project have been made through the public consultation process to DN and GHD described under Section 1.5 below. This included detailed interviews with targeted representatives of the community and through a public consultation including advertising, pamphlet drops, presentations and a public information day prior to finalisation of the ToR.

Submissions are invited by the Coordinator-General for comment on the EIS. The EIS is on public display at the Belyando Shire Council (BSC) office in Moranbah or a printed copy or CD-ROM can be purchased from DN on request (see contact details in Section 1.1.1). Copies are also available on the:

» DN Website, www.dynonobel.com/dynonobelcom/en/global; or at

» The Coordinator-Generals website www.coordinatorgeneral.qld.gov.au/eis.

Properly made submissions must be signed, made out to The Coordinator-General and include name and address details. Submissions will be treated as public documents unless confidentiality is requested. Copies of all submissions will be forwarded to DN.

A properly made submission on the EIS will be considered a properly made submission for application for development approval of material change of use for this project under the *Integrated Planning Act 1997* (IPA). If such an application is made to the BSC, the information and referral stage and the notification stage outlined in the IPA will be deemed to be fulfilled by the EIS process managed by The Coordinator-General. Formal submissions need to be made in writing and addressed to:

The Coordinator-General
Attention: EIS Project Manager
Moranbah Ammonium Nitrate Project
Major Projects
The Coordinator-General
PO Box 15009
CITY EAST QLD 4002
Fax: (07) 3225 8282

1.5 Public Consultation Process (Prior to the release of the EIS)

The main aims of community consultation for significant projects are generally to develop awareness and understanding of the project, target specific stakeholders in identifying impacts and developing appropriate mitigation measures, and seeking community input into the EIS process. The community consultation strategy undertaken as part of the EIS process was conducted according to these objectives. The community consultation strategy for the project included the following key features:

- **Project goals and justification** - benefits arising from the project;
- **Identification of key messages for the project** - key messages for the project reflected the needs and benefits of the project;
- **Identification of negotiables and non-negotiables for the project** – these were important for setting out the parametres for developing community consultation objectives for the project Environmental Impact Assessment;
- **Identification of community engagement objectives** – community objectives, based on negotiables and non-negotiables, focused on information provision and consultation;
- **Stakeholder identification** – the range of community stakeholders consulted was broad and covered landowners, residents, businesses and service providers;
- **Issues matrix** – was developed based on desk based research and consultations already undertaken by DN;
- **Development of an issues database** – a range of information was included in the database, including contact details of key stakeholders, outcomes of consultations, and issues raised;
- **Risk and opportunity assessment** – addressed risks associated with the EIS for the project and recommended actions to reduce identified risks; also identified opportunities that could be enhanced through the Community Consultation Strategy;
- **Media protocol** – outlined protocol to be undertaken regarding media enquiries;
- **Implementation plan** – protocol for implementation of Community Consultation Strategy;
- **Monitoring and evaluation of community engagement** – outlined the monitoring process, responsibilities, and associated timings for each monitoring technique;
- **Reporting** – identified where the information in the Community Consultation Strategy will be reported, and what the Community Consultation Report will cover.

Full details of the community consultation strategy, including details of the key features listed above, are located in Volume 2: Appendix 7.3. The community consultation strategy and SIA have been joined together to form one broad impact assessment process.

Stakeholders that were identified for consultation during the stakeholder identification process included directly affected landowners and their families, residents and

businesses in Moranbah, and service providers in Moranbah (including emergency, health, education, housing, recreation and cultural). Other significant stakeholders identified included local and state government departments.

The Community Consultation Strategy's key approach was to consult directly with key stakeholders. Direct consultation with key stakeholders included a meeting with the Moranbah Rotary Club, a focus group meeting, and a number of in-person interviews. Appendix B of the SIA Report (see Volume 2: Appendix 7.4), documents the key stakeholders associated with the project and the method of consultation that was undertaken for each stakeholder. Outcomes of the community consultation process provided within the community consultation plan are also included.

1.6 Project Approvals

Dyno Nobel Asia Pacific Limited is seeking a Material Change of Use (MCU) for the development of an AN Plant in Moranbah.

The approvals process for the AN Plant follows the provisions under Part 4, Division 4 of the SDPWO Act and the *Integrated Planning Act 1997* (IPA). Under IPA, the Integrated Development Assessment System (IDAS) establishes the process that an application for development must progress through in order to attain development approval.

The significant project status assigned to a proposal under the SDPWO Act overrides the requirements of the IDAS process. In accordance with Section 37(1)(a) of the SDPWO Act, the information and referral stage, and the public notification stage of IDAS do not apply to the application. After submission of the development application to the assessment manager, the process moves to the decision stage.

In accordance with Section 38(a) and (b) of the SDPWO Act, the decision stage of IDAS does not start until:

> *(a) if the Coordinator-General is not the assessment manager for the application—the Coordinator-General gives the assessment manager a copy of the Coordinator-General's report; or*
>
> *(b) if the Coordinator-General is the assessment manager for the application—the Coordinator-General gives the proponent a copy of the report.*

The SDPWO Act also establishes the EIS process and as a requirement, the preparation of a CG report that evaluates the EIS. In accordance with Section 35(4), the CG may, when evaluating the EIS:

> *(a evaluate the environmental effects of the project and any other related matters; and*
>
> *(b) state conditions under section 39, 45, 47C, 49 or 49B; and*
>
> *(c) make recommendations under section 43 or 52; and*

(d) if division 8 applies to the project—impose, under that division, conditions for the undertaking of the project.

On completion of the report, the CG must provide a copy of the report to the proponent, and publicly notify the report.

Any conditions of development approval required by the CG report must be attached to the Development Approval for the project. The assessment manager may then issue a Development Approval for an MCU. An MCU development approval establishes approval for the use or operation of an activity on a subject site.

An MCU approval also provides the basis on which additional development approvals such as for operational works or building work may be obtained under IPA. Operational Works or Building Works approvals are based on detailed design documentation for the project and provide approval for construction of the facility.

Construction and operation of the AN Plant will require a number of different approvals, including approvals required under the *Environmental Protection Act 1994* for Environmentally Relevant Activities (ERAs). Table 3 identifies all of the required approvals.

Table 3 Project Approvals

Legislation	Application	Administering Authority	Permit
Approvals obtained through the Integrated Development Assessment System (IDAS)			
Environmental Protection Act 1994	Operation phase	Environmental Protection Agency (EPA)	ERA 6 (c), Chemical Manufacturing, processing or mixing. 100,000 tonnes or more per year.
	Operation phase	EPA	ERA 7 (b), Chemical Storage in volumes of 1000 m^3 or more.
	Operation phase	EPA	ERA 11(a), Crude Oil or Petroleum Product storage in volumes up to 500,000 litres.
	Operation phase	EPA	ERA 15 (h), a special sewage treatment works having a peak design capacity to treat sewage of 21 or more equivalent

Legislation	Application	Administering Authority	Permit
			persons.
	Operation phase	EPA	ERA 18 (a), Power station—generating power by consuming fuel at a rated capacity of 10MW electrical or more if the fuel used is natural gas
	Construction phase	EPA	ERA 65, concrete batching.
Integrated Planning Act 1997	Construction Phase	Belyando Shire Council	Development Approval incorporating the Material Change of Use (MCU) of the site for all of the activities on site (eg: ERAs).
Integrated Planning Act 1997 Belyando Shire Transitional Planning Scheme	Construction phase	Belyando Shire Council	Operational Works, Building Works for construction of the project.
Vegetation Management Act 1994 (VMA)	Construction phase	DNRW	Operational Works, Vegetation Clearing Permit.

1.6.1 Relevant Legislation and Policy Requirements

Dyno Nobel is required to give due consideration to the likely environmental impacts of the project under Commonwealth, State and local legislation, guidelines and policies. This section identifies legislation and provides a brief description of other documents and guidelines relevant to the environmental management of the proposal.

The decision-making authority for this project is the BSC as the Assessment Manager with the CG providing the State's concurrence agency response under the IPA. The advisory agencies for this project are listed below.

- Department of Emergency Services (DES);
- Department of Communities (DC);
- Department of Aboriginal and Torres Straight Islander Policy (DATSIP);
- Department of Natural Resources Water (DNRW);
- Environmental Protection Agency (EPA);
- Department of Local Government, Planning, Sport & Recreation (DLGPSR);

- Department of Employment & Training (DET);
- Department of State Development & Industrial Relations (DSDIR);
- Department of Main Roads (DMR);
- Department of Primary Industries & Fisheries (DPI);
- Department of Housing (DH);
- Department of Mines & Energy (DME);
- Queensland Transport (QT); and
- Belyando Shire Council.

Other Groups

Industrial Capability Network (QLD);

BHP Billiton Mitsubishi Alliance (BMA);

Anglo Coal Australia Pty Ltd; and

Sunwater.

1.6.2 Commonwealth Legislation

Environment Protection Biodiversity and Conservation Act 1999

The Commonwealth Department of Environment and Heritage (DEH) manages the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC). The EPBC Act requires that actions that may have a significant impact on matters of national environmental significance be assessed and approved by the Federal Environment Minister. Matters of national environmental significance (called Protected Matters by the EPBC Act) include:

- Ramsar wetlands of international significance;
- National Heritage places;
- Threatened species and ecological communities;
- Migratory species; and
- Commonwealth marine areas.

Protected Matters are listed on a database held by the DEH, and the results of a search for protected matters listed over this site are presented in Appendix 7.5.

Under the EPBC Act, an approval must be sought prior to undertaking an action, which has, would have, or is likely to have a significant impact (defined in the Act) on a matter of National Environmental Significance (NES). An action includes a Project, development, undertaking an activity or series of activities.

The project does not appear to impact on a matter of NES, therefore the project has not been referred to DEH under the EPBC Act.

Native Title Act 1993

The *Native Title Act 1993* (NT Act) recognises the rights and interests over land and water possessed by Indigenous people in Australia under their traditional laws and customs. The NT Act established a Native Title Tribunal and set out processes for the determination of these Native Title rights and interests over land and water. The objects of the Act are:

- To provide for the recognition and protection of Native Title;
- To establish ways in which future dealings affecting Native Title may proceed, and to set standards for these dealings;
- To establish a mechanism for determining claims to Native Title; and
- To provide for, or permit, the validation of past acts and intermediate acts, invalidated because of the existence of Native Title.

Under the NT Act, Indigenous people may have rights to negotiate with private companies, seeking to develop land under a Native Title claim. The Native Title claims over the area are for both the Wiri people and the Barada, Barna, Kabalbara & Yetimarla (BBKY) people. Existing tenure (perpetual lease) appears to extinguish the Native Title claims over the project site.

1.6.3 Queensland State Legislation

State Development and Public Works Organisation Act 1971

The SDPWO Act establishes an environmental assessment process for projects declared to be 'significant projects.' This process can replace referral and assessment stages of the IDAS under the IPA. Under a bilateral agreement with the Commonwealth Government, the significant project EIS process is also an acceptable form of assessment for the decision making under the EPBC Act (but this is not required for this project).

The SDPWO Act provides coordination for the different state departments concurrence agency responses, which form the basis for a development approval under the IPA.

Environmental Protection Act 1994

The EP Act provides a legislative framework for environmental protection within Queensland. The provisions under the Act allow the development of subordinate legislation including policies and regulations to manage activities that have the potential to cause environmental harm.

A core component of the legislation is the General Environmental Duty, which establishes an obligation on all persons in Queensland under Section 319 of the EP Act. The General Environmental Duty states, "a person must not carry out any activity that causes or is likely to cause environmental harm unless the person takes all reasonable and practicable measures to prevent or minimise the harm". This obligation provides for a person to take all reasonable and practical measures to prevent or minimise the impacts of their actions on the environment.

A number of other pieces of applicable subordinate legislation developed under the EPA include:

» Environmental Protection Regulation 1998 (EP Reg);

» Environmental Protection (Waste Management) Policy 2000;

» Environmental Protection (Waste Management) Regulation 2000;

» Environmental Protection (Interim Waste) Regulation 1996;

» Environmental Protection (Water) Policy, 1997 Qld (EPP Water);

» Environmental Protection (Air) Policy, 1997; and

» Environmental Protection (Noise) Policy, 1997.

Environmental Protection Regulation 1998

The EP Reg provides for the regulation of ERAs for which a development approval must be obtained. Schedule 1 of the EP Regulation lists the ERA that are required to go through an approval process as defined under the EP Act. Table 4 outlines the ERAs that will be required for the development of this project.

Table 4 Environmentally Relevant Activities

ERA	Comments
6(c) *Chemical manufacturing, processing or mixing—Manufacturing or processing an inorganic chemical, organic chemical or chemical product, or mixing inorganic chemicals, organic chemicals or chemical products (other than mixing non-combustible or non-flammable chemicals or chemical products by dilution with water), in a plant or works having a design production capacity of— >100,000 tonnes per year*	Chemical Manufacturing: This is the process through which the manufacturing of AN prill and AN emulsion is undertaken. This activity is a notifiable activity under Schedule 2 of the *Environmental Protection Act 1994*.
18(a) Power station—generating power by consuming fuel at a rated capacity of 10MW electrical or more if the fuel used is natural gas	The power generating facility will generate 15MW of power from coal seam methane gas.
7(b) Chemical storage—storing chemicals *(other than crude oil, natural gas and petroleum products), including ozone depleting substances, gases or dangerous goods under the dangerous goods code in containers having a design storage volume of—1000m^3*	Chemical Storage on site: 2,000 tonnes of liquid ammonia; 2,400 tonnes of nitric acid; 1,000 tonnes of AN solution; 14,000 tonnes of AN prill; 360 tonne storage AN Emulsion.
62 Concrete batching—producing concrete or a concrete product by mixing cement, sand, rock, aggregate or other similar materials in works (including mobile works) having a design production capacity of more than 100t a year.	Concrete batching will be required for the manufacturing of cement for the project. Dyno Nobel Asia Pacific Limited will seek a commercial operator for the manufacturing of concrete for the project. The contractor will either be an appropriately licensed contractor.
11 fuel storage- storing fuel on site having a capacity of 10,000 litres or more	Fuel storage will be required for the production of the emulsion at the emulsion plant on site. The volume required is 200 tonnes of oil/diesel emulsifying agent.
15(h) a special sewage treatment works having a peak design capacity to treat sewage of 21 or more equivalent persons	Two sewage treatment plants will be in operation for the proposal. One of these is for the construction camp, which will house approximately 400 people as well as provision for a peak capacity up to 550 people. The construction camp will include kitchen and shower facilities. The other sewage treatment plant will be for the 37 shift workers (total of up to a max of 90 (both shifts) on the site for the operation of the facility.

Although gas is used in the manufacture of ammonia it is not being burnt and therefore does not require licensing. Maintenance of equipment at the site will be undertaken in an on-site workshop, however, all motor vehicles will be maintained off site.

Transport Infrastructure Act 1994

This legislation provides for the implementation of obligations of the State of Queensland (the State) for government supported transport infrastructure. Section 10 of the Act notes that the State has a wide ranging responsibility to take into account national and international benchmarks, and international best practice while constructing, maintaining and operating infrastructure. The State is also to consider the safety of the infrastructure and the transport that operates on it.

As the project will impact on state and local roads in Central Queensland GHD has undertaken assessments of impacts on pavements and traffic resulting from the construction and operational aspects of the project.

Vegetation Management Act 1999

The *Vegetation Management Act 1999* (VMA) and associated Vegetation Management Regulation 2000 addresses the conservation and management of vegetation communities. Specifically it provides protection for mapped REs classified as "endangered", "of concern" or "not of concern" under the Act. The DNRW administers the Act.

The Vegetation Management Code for ongoing clearing for the Northern Highland (Brigalow Belt Region) is applicable to land clearing to be undertaken for the project. Broadscale clearing of remnant vegetation in Queensland will be phased out by December 2006. Applications to clear vegetation may now only be made for ongoing clearing purposes.

Applications for ongoing clearing purposes can be made at any time, if the chief executive is satisfied that the clearing is for the following purpose:

» A project declared to be a significant project under the *SDPWO Act*, Section 26;

The project will require a clearing permit for Ongoing Clearing Purposes to remove the mapped REs found along the proposed alignment. All applications to clear must be accompanied by a Property Vegetation Management Plan (PVMP). A copy of the PVMP is attached to the flora assessment report provided in Appendix 7.5.

Water Act 2000

The *Water Act 2000* provides for the sustainable management of water and related resources, a regulatory framework for providing water and sewerage services and the establishment and operation of water authorities. Under this Act, a permit is required to disturb the bed and banks of a stream.

The project is unlikely to have any direct impacts on watercourses from the construction of the facility. The nearest water body is Grosvenor Creek, approximately 2 km from the project site. Grosvenor Creek flows into the Isaac River, approximately 4 km east of the project site.

Nature Conservation Act 1992

The *Nature Conservation Act 1992* and Nature Conservation (Wildlife) Regulation 1994 is the principal Act in Queensland addressing nature conservation. The Nature Conservation (Wildlife) Regulation 1994 prescribes protected species of wildlife as presumed extinct, endangered, vulnerable, rare or common. The Queensland EPA administers the Act, which is responsible for the conservation of all protected wildlife in Queensland.

Dyno Nobel Asia Pacific Limited must ensure that it does not interfere with protected flora and fauna without the approval of the EPA. The Fauna assessment report is attached in Appendix 7.5.

Land Protection (Pest and Stock Route Management) Act 2002

The *Land Protection (Pest and Stock Route Management) Act 2002* (the Land Protection Act) outlines the Queensland Government's legislative approach to pest and weed management. Under the Land Protection Act, weeds are declared in three classes.

Class 1 pests and weeds are those currently not commonly present in Queensland, but which if introduced would cause an adverse economic, environmental or social impact. These weeds and pests are subject to control measures from the State Government. Landowners must take reasonable steps to keep their land free of Class 1 weeds and pests. No Class 1 weeds were identified on the site.

Class 2 pests and weeds are those that are already established, and which have, or could have, an adverse effect. They are subject to control measures managed by landowners, local government and the community. Landowners must take reasonable steps to keep land free of Class 2 pests and weeds. Class 2 weeds identified on the site were prickly pear (*Opuntia sp.* and *Eriocereus spp*.).

Class 3 pests and weeds are those already established in Queensland. The primary objective of the Land Protection Act in relation to Class 3 pests and weeds is to prevent sale, and therefore, spread. Landowners are not expected to control Class 3 pests and weeds unless their property adjoins an environmentally significant area (generally a national park or other protected area). There were no Class 3 weeds identified on the site.

Details of the weeds identified on site are provided in Appendix 7.5.

Aboriginal Cultural Heritage Act 2003

The *Aboriginal Cultural Heritage Act 2003* (ACH Act) came into force on 16 April 2004, replacing the *Cultural Record (Landscapes Queensland and Queensland Estate) Act 1987*. Underpinning the Act is a 'cultural heritage duty of care', which requires that a person who carries out an activity must take all reasonable and practicable measures to ensure the activity does not harm Aboriginal cultural heritage. The ACH Act establishes a framework for the conduct of assessment of cultural heritage impact and processes to be undertaken in preparing Cultural Heritage Management Plans to protect Aboriginal Cultural Heritage (CHMP).

Under the *Aboriginal Cultural Heritage Act 2003* a project such as this AN project, that requires an EIS must develop a CHMP for the protection of Aboriginal cultural heritage. Dyno Nobel Asia Pacific Limited is currently working with the Traditional Owners of the area to develop a CHMP.

Queensland Cultural Heritage Act 1992

The Queensland *Cultural Heritage Act 1992* provides for the preservation and management of all items and sites of historical significance from European occupation in Australia (where historical refers to the commencement of written recorded history in Australia). It is an offence under this act to knowingly destroy or otherwise interfere with such sites or items. This legislation provides for the maintenance of the Queensland cultural heritage register, which provides details of recognised items and sites of historical significance.

Dangerous Goods Safety Management Act 2001

The *Dangerous Goods Safety Management Act 2001(DGSM Act)* provides a framework for the management of a major hazard facility. The provisions under this legislation have specific application to the operation of these facilities and their regulation. The act also provides a duty of care in relation to the management and handling of hazardous goods and obligations in relations to major hazard facilities.

Under this legislation, referral is required for the operation of a major hazard facility to the DES. The DGSM Act regulates major hazard facilities to minimise the likelihood of accidents through:

- a systematic risk assessment;
- emergency plans and procedures;
- a safety management system;
- a program of induction, information, education, supervision and training for all persons at the facility;
- information to, and opportunities for, consultation with the neighbouring community; and
- a safety report.

Persons involved in storing or handling hazardous material (which is a substance with potential to cause harm to people, property or the environment) must take all precautions to minimise risk as far as reasonably practicable. Dyno Nobel will need to move through the processes defined under this legislation for a major hazard facility prior to operation.

Land Act 1994

This legislation provides for the management of state controlled lands in Queensland. Where land is leasehold tenure this legislation provides for the conversion of the tenure to freehold tenure. Dyno Nobel has commenced the process for the acquisition of the land for the project.

Integrated Planning Act 1997

The IPA and IDAS provide a framework for the assessment of a range of developments which are triggered by the IPA, and other legislation which has been rolled into the IPA. This includes approvals that are triggered under the *Transport Infrastructure Act 1994* and EP Act.

It should be noted that all project impacts have been addressed in this EIS process, whether or not they require specific approvals. Exemptions from approvals do not preclude addressing the impacts.

The significant project status assigned to the project under the SDPWO Act overrides some of the requirements of the IDAS process. In accordance with Section 37(1)(a) of the SDPWO Act, the information and referral stage, and the public notification stage of IDAS do not apply to the application. While there are no referral agencies for the applications, the Coordinator-General's report is taken to be a concurrence agency's response for the application under IDAS. After submission of the development application to the assessment manager, the process moves to the decision stage.

The following discusses the level of assessment as determined by Schedule 8 and 9 of IPA and the regional planning context under the Whitsunday Hinterland and Mackay Regional Plan. Section 1.6.4 discusses the level of assessment in relation to the *Belyando Shire Transitional Planning Scheme*.

Schedule 9 Exempt Development

The proposed development or aspects of the Material Change of Use (MCU) are not listed under Schedule 9 of IPA and therefore are not exempt from assessment under the local government planning scheme.

Assessable Development under Schedule 8

In accordance with Schedule 8, Part 1, Table 2 of IPA, making an MCU for an ERA for which no code of environmental compliance has been made under the Environmental Protection Regulation 1998, is Code Assessable development.

As identified under the EP Reg, the AN Plant is defined as 'chemical manufacturing, processing or mixing', and is therefore an ERA for which no code of environmental compliance has been made. As a result, such an application for a development permit for an ERA meeting the relevant provisions of the EP Act is required to be submitted to the EPA.

IDAS identifies the process and the applicable time frame for the assessment of the required Code Assessable development application. Application of the SDPWO Act with regard to an MCU will replace the referral, notification and public consultation stage of this process and thus reduce the timeframes described. It should be noted there are no statutory timeframes in place for the significant project process. The CG report may set conditions relevant to the ERA. It is however, desirable for the ERA component of the MCU application to be assessed separately by the EPA. This is because future aspects of an ERA approval including the registration process, auditing and review of ERA operations and management are more effectively assessed on the basis of the EP Act.

1.6.4 Planning Processes and Standards

Belyando Transitional Planning Scheme

The subject site (part of Lot 10 on SP175258) is located within Belyando Local Government Area and subject to the provisions of the Belyando Shire Transitional Planning Scheme. The provisions of the planning scheme relevant to the proposal are discussed below.

Local Laws of Belyando Shire Council

The Local Laws of BSC were reviewed and it was determined that none were applicable to the proposed project or subject site.

Approvals Required from Belyando Shire Council

Impact Assessable development will require the lodgement of a development application for MCU development application to BSC, to be assessed against the requirements of the *Belyando Shire Transitional Planning Scheme*.

Pursuant to the significant project process, the application will only be subject to the acknowledgement and decision stages. Belyando Shire Council is most likely to be the assessment manager; however, this role may be undertaken by other agencies if this was determined appropriate by the CG or the Minister under their powers under the SDPWO Act and the IPA respectively.

The Assessment Manager will therefore assess the application, taking into consideration the CG's report and any submissions received from the notification of the EIS. The approval in the form of a development permit for an MCU for Heavy industry and/or Noxious and hazardous industry would be issued by BSC.

In future stages of the development approval process, BSC may also be required to be assessment manager for other aspects of development including:

» Operational Works;

» Reconfiguration of a Lot (if this is required); and

» Plumbing and Drainage.

Private certifiers, as provided for under the IPA, could assess the Building Work aspects of the development. It is also possible that other MCU applications may be required if these activities were not included as part of this development, such as transport depots or storage/warehouses areas on other sites either adjacent to or separate from the subject site.

State Planning Policies

The State Planning Policies for Mitigating the Adverse Impacts of Flood, Bushfire and Landslide (State Planning Policy 1/03) and Development of Agricultural land (State Planning Policy 1/92) are discussed in section 4.1.1.1 (Land Use and Tenure).

An assessment in relation to good agricultural land was also undertaken for the site although this was not triggered through the State Planning Policy for Development of Agricultural Land. This is provided in section 4.1.1.1 and within Appendix 7.13 (Soil and Land Assessment).

Codes for Clearing of Vegetation

The DNRW will assess the application for this project to clear native vegetation against the Regional Vegetation Management Code for Ongoing Clearing Purposes - Northern Brigalow region. Regional vegetation management clearing codes seek to ensure clearing is conducted in an appropriate manner for the locale. Issues targeted by the codes include the adequate maintenance of RE diversity, salinity, erosion, fragmentation and acid sulphate soils. Clearing applications are processed by the Assessment Manager (DNRW) under the IDAS as established in chapter three of IPA. The clearing application for the project site is incorporated in Appendix 7.5 (Flora report).

2. Project Need and Alternatives

This section of the EIS provides details that justify the need for the project with particular reference to the environmental, economic and social costs and benefits. Several alternatives to the project have also been considered and are discussed in order to demonstrate that the proposal is the preferable alternative.

2.1 Project Justification

The project represents a value-adding downstream processing facility from the utilisation of the significant gas reserves in the Moranbah region. With a total capital investment of approximately $500 million, it will provide significant benefits for the local and regional economy including:

- Production of explosive precursor products for local markets;
- Local value adding to the coal seam methane resource;
- Diversion of methane to carbon dioxide emission, leading to a reduction in GHGs (CO_2 vs. CH_4);
- Maintain regional competition for explosives;
- Supplement the current shortage of AN product presently required (including imported) by the Queensland mining industry;
- Contribution to the regional economy of Australia resulting from export earnings, taxes, salaries, and purchases of goods and services during the construction and operation phase of the development;
- Contribution to the local economy of the Moranbah area;
- Significant diversification of economic use and employment opportunities;
- Provision of additional employment and training opportunities during the construction phase of the plant;
- Contribution to superior medium to long-term accommodation solutions in partnership with state, local government and other stakeholders; and
- Provide water security for Moranbah in partnership with state, local government, SunWater and other stakeholders.

The local economy of Moranbah will benefit considerably from the project, both directly and indirectly, as a result of the long-term employment that will occur during the operational phase of the development. The plant has an expected life span of over 35 years, ensuring secure long-term employment in skilled positions for employees, therefore proving a social benefit through the availability of long-term employment opportunities. Short-term employment during the required 22-month construction phase will also provides local economic benefits through the additional of up to 550 workers required during the peak construction period. A cost to some members of the local community may arise through attracting employment away from the cattle industry in and around Moranbah, which is currently suffering from a skilled worker

shortage in the region. A social cost may arise from the pressure on services in Moranbah through an increase in population, and through difficulties in providing accommodation for additional workers, particularly during the construction period. The pressure on accommodation will, however, be reduced by the provision of a construction camp and the proponent has made arrangements for longer-term housing and water supply for such additional workforce.

Import of AN into the State will be reduced as a result of the project, resulting in an improvement in Gross State Product and the balance of trade. At current import prices, the replacement value (including transport) of imported AN is greater than $125 million per annum.

Competition for explosives will be maintained at a state level through this facility, and the contribution to the economy of Australia from export earnings, taxes, salaries and purchases of goods and services during the construction and operation phase of the development will have a flow on effect for the economy at a state level.

Contribution to the economy of Australia from export earnings, taxes, salaries and purchases of goods and services during the construction and operation phase of the development will have a flow on effect for the national economy. A potential cost on a national level is a cost associated with air emissions arising from the operation of the plant, which may contribute to the national level of GHG emissions. However, the GHG effect is reduced by the collection of methane, a GHG with 21 x the impact of carbon dioxide. Some of the methane is converted to ammonia and the remainder to carbon dioxide.

Several utilities will be required as part of the project, during both the construction and operational stages. Utilities include water supply, electricity, and communications facilities. Infrastructure for power and water will be provided independently of the local infrastructure. The plant will require the use of local coal seam methane, a product lost to the atmosphere and/or required to be removed prior to coal production, as its primary feedstock for AN production.

Ammonium Nitrate has a sale value many times that of coal seam methane. The project represents a value-adding downstream processing facility from the utilisation of the significant gas reserves in the Moranbah region.

The project is dependent on a number of key resources to be viable;

» The first of these is access to water. The water for the operating facility will be obtained through the Burdekin Pipeline with an amount used by the project of approximately 6 megalitres per day with an additional supply for the workforce and families (water supply is discussed in further detail in Section 3.5.3). Water for the construction will be obtained from a third party.

» The second is the provision of a supply of coal seam methane gas for the manufacturing of ammonia to be used in AN production. A supply has been obtained through Arrow Energy Pty Ltd for the project.

» The third is a reliable power supply for the facility. Power will be provided for the plant operation by the construction of a 15 MW power station within the AN plant site. On-site generators will provide power for the plant construction.

2.2 Alternatives to Project

A number of alternatives were investigated with regards to development of an AN Plant in Central Queensland, these being:

» Taking no action;

» Expand the existing AN Plant at Moura;

» Development of a new facility in Moranbah.

Taking no Action

If the project does not go ahead, there will be a potential impact on the cost and provision of AN within the Bowen Basin. The existing facilities of Orica in Gladstone and the DN and CSBP Limited jointly owned and operated AN plant in Moura, Central Queensland are already operating at high levels of production.

The option of doing nothing may impact on the cost of extracting coal resources from the Bowen Basin and provide opportunities for a competitor to fill the capacity requirements within the market. The Moura AN Plant in its current capacity will not be capable of solely supplying AN to the rapidly expanding explosives markets in Queensland and NSW.

Expansion of the AN Plant in Moura

Investigations for expansion of the Moura facility have recently been completed. The viability of this alternative rested on the access to an economical supply of water for the project. This was not secured and the proposed expansion could not be justified. Alternative sites were investigated for a viable project to allow increased production.

Development of a new facility in Moranbah

The proposed development of the AN Plant in Moranbah is considered to be suitable for the site. The selected location has access to a consistent and reliable water supply in the form of the Burdekin Pipeline (see Section 3.5.3). There is a reliable access to coal seam methane gas as feedstock for the production of AN, and the site is in close proximity to the market. Orica Limited developed a facility in Moranbah, however this facility is no longer in operation.

An alternative to the proposed AN Plant in Moranbah is for the project to proceed in an alternative location. There are, however a number of reasons as to why Moranbah has been selected as the preferred site location. These include:

» Availability of sufficient freehold or leasehold land area on which Native Title has been extinguished;

» The fauna and flora in the area have been disturbed by activities associated with cattle grazing on and around the site;

» The relatively flat terrain minimises the need to disturb the existing landscape;

- A low risk site to minimise the potential disturbance of public amenity;
- The Regional Ecosystems identified on the site are classified as “not of concern” under the VMA;
- The site is in close proximity to a reliable gas source as a feedstock for AN production;
- The location of the site in the northern Bowen Basin; the AN plant a Moura will service the mines in the southern Bowen Basin.
- Proximity to road infrastructure for access to coal mines within the Bowen Basin;
- Accommodation security being developed through state, local government and industry initiatives;

If the project is proposed in a location other than Moranbah, many of the factors, which contribute to the suitability of the location, may not be available. This may make alternative locations unsuitable for development of an AN plant.

Further information regarding consideration of project alternatives can be found in some of the specialist studies provided in Section 7.5 of the EIS.

3. Project Description

This section of the EIS aims to provide a description of the project through the planning, construction and operation phases. Project development is currently in the early engineering phase with further detailed engineering to be completed prior to the finalisation of design.

3.1 Location

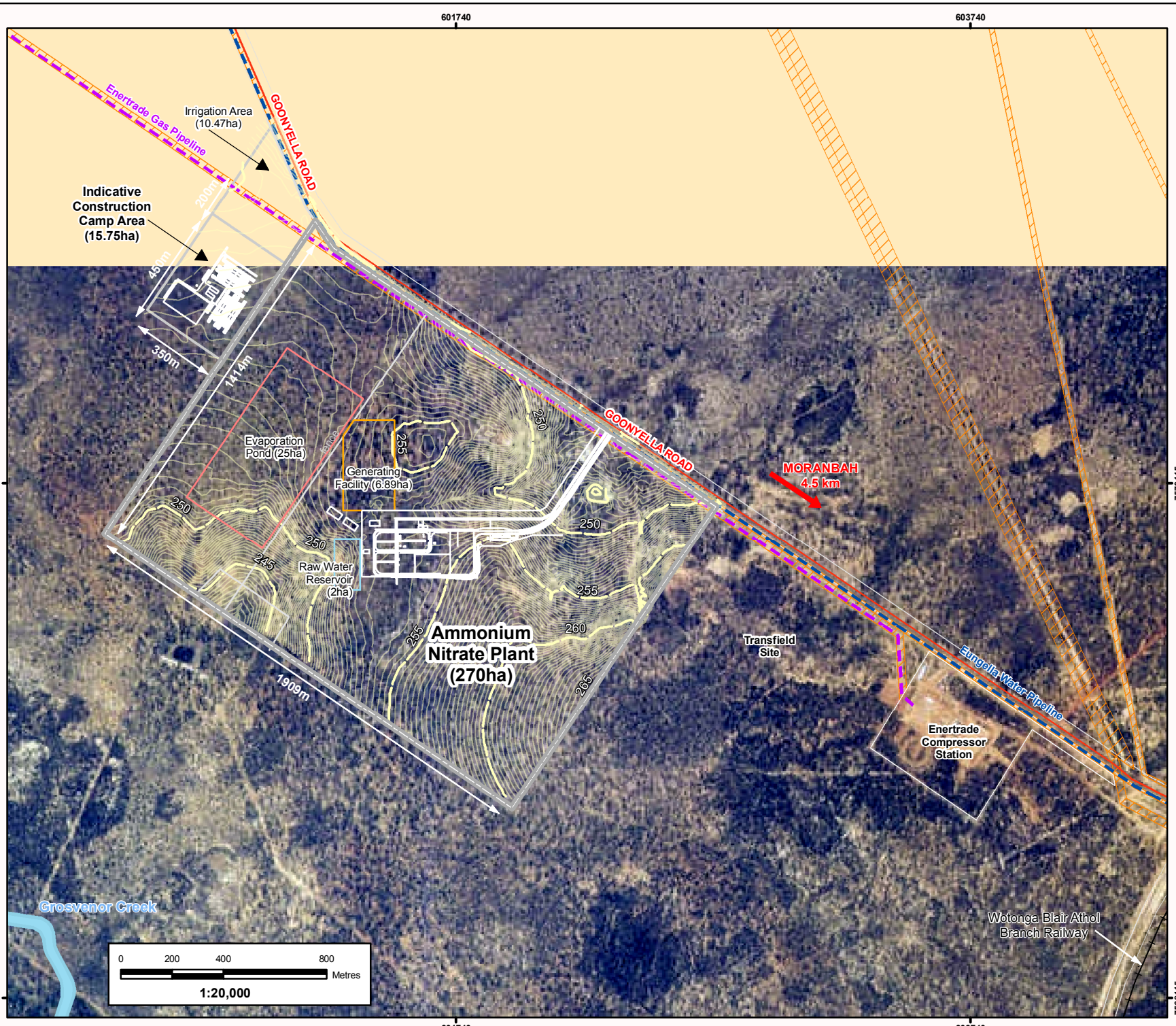
The proposed AN plant (the project) is located approximately 4.5 km north-west of the Moranbah township, adjacent to the Goonyella Road (see Table 5). Moranbah is part of the Belyando Shire, and is predominantly a town supporting the local mining industry. Moranbah was originally established by Utah Development Company during the construction of the Goonyella-Riverside and Peak Downs mines in the late 1960s and early 1970s. Employment is strongly based on the coal industry and grazing.

The town of Moranbah has a resident population of approximately 8,000 persons, plus 2,000 in the surrounding rural community. It provides a range of government and community facilities, and has a number of accommodation types.

Figure 2 shows the site infrastructure adjacent to the proposed project area. Located within the vicinity of the AN plant site is a Queensland Power Trading Corporation Pty Ltd (Enertrade) Compression Station site, Enertrade's North Queensland gas pipeline and the Eungella water pipeline. However, there is currently no infrastructure directly servicing the proposed AN plant and the construction camp. Adjacent to the proposed AN plant site, on the south-eastern side, is the proposed site for Transfield Holdings Pty Ltd (Transfield) Moranbah Power Station Project. Further towards Moranbah is the gas supplied Ergon Energy (Ergon) Power Station, which generates electricity for the town.

Transport infrastructure includes the Wotonga Blair Athol Mine Railway (Blair Athol Railway), located between the site and the Ergon Power Station. The Moranbah Access Road is controlled by the BSC from the Peak Down Highway along Goonyella Road to the Blair Athol Railway. Northwest of the railway crossing Goonyella Road is a private road controlled by BHP Billiton Mitsubishi Alliance (BMA). The Peak Downs services the towns of Clermont, Mackay, Moranbah and Nebo as well as providing access to a number of other smaller towns.

A number of maps (Figures 3-6) are provided of the transport routes impacted by the construction and operation of the project. These maps specifically cover district 15 of the Central Highlands, district 8 of Mackay, district 9 Northern and district 10 North Western of the DMR regions, respectively.



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Date: 02-10-06 Rev G
Datum: GDA94 (MGA) Zone 55
Source: Base data sourced from the State of Queensland, Department of Natural Resources, Mines. All other infrastructure supplied by Dyno Nobel Asia Pacific Ltd.
File: G:\41\15824\GIS\Maps\Final\MXD\fig2_Site_Infrastructure_RevG.mxd

Legend

- Ammonium Nitrate Plant Site
- Evaporation Pond
- Generating Facility*
- Raw Water Reservior
- Cadastre
- Easements
- Watercourse
- Major Road
- Railway
- Water Pipeline
- Petroleum Pipeline

*Generating Facility location is subject to detailed engineering.

Moranbah Ammonium Nitrate Plant

Environmental
Impact Statement

Figure 2
Site Infrastructure

GHD
CLIENTS | PEOPLE | PERFORMANCE

(c) The State of Queensland, 2004 (c) Sinclair Australia Pty Ltd, 2004

Based on [Dataset - Steps Digital Road Network (SDRN)] provided with the permission of Mapinfo Australia Pty Ltd [Current as at 07 / 04] and other state government datasets.

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Figure 3 District 15 of the Central Highlands

(c) The State of Queensland, 2004 (c) MapInfo Australia Pty Ltd, 2004

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Figure 4 District 8 of Mackay

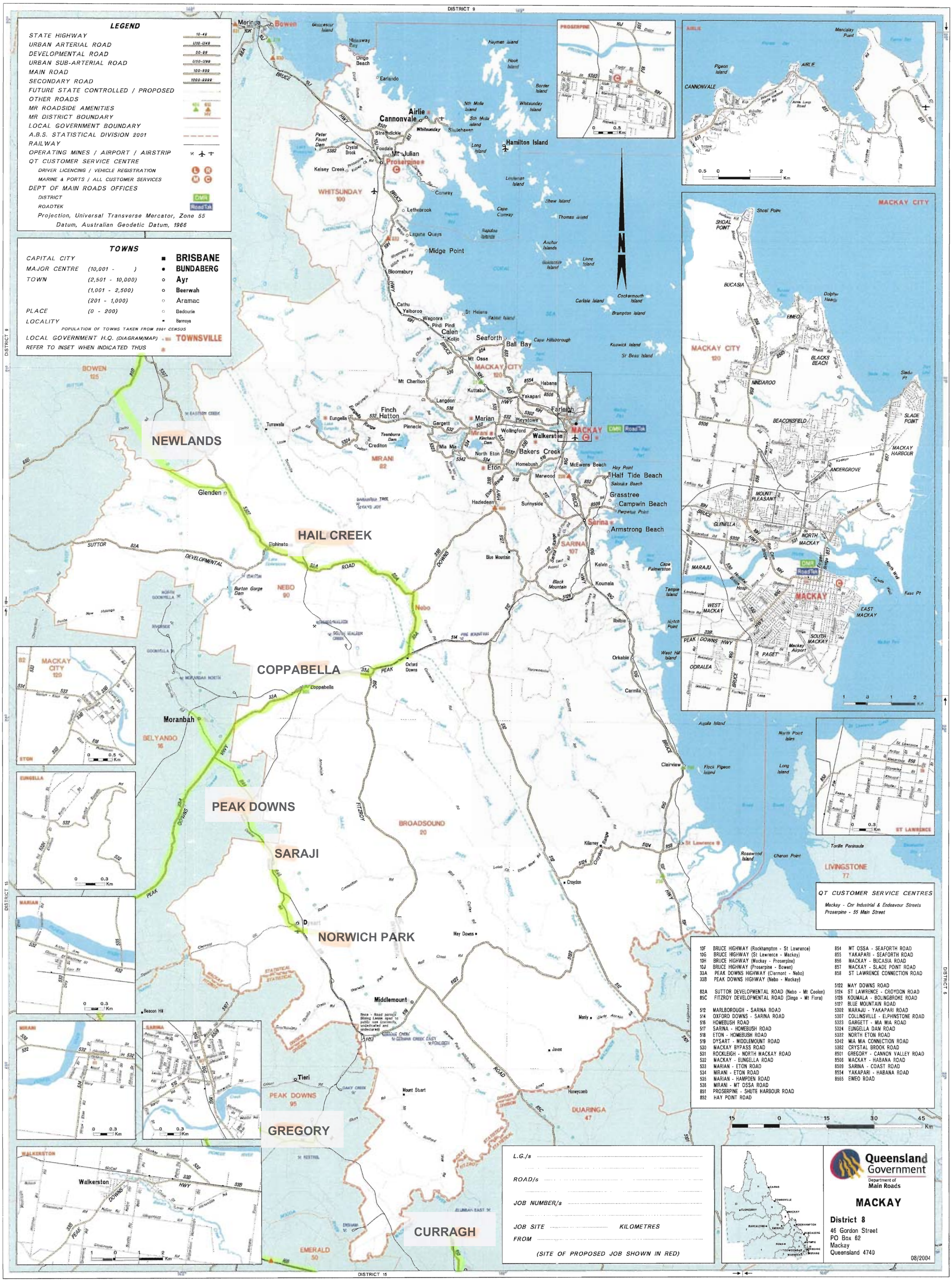

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Figure 5 District 9 Northern

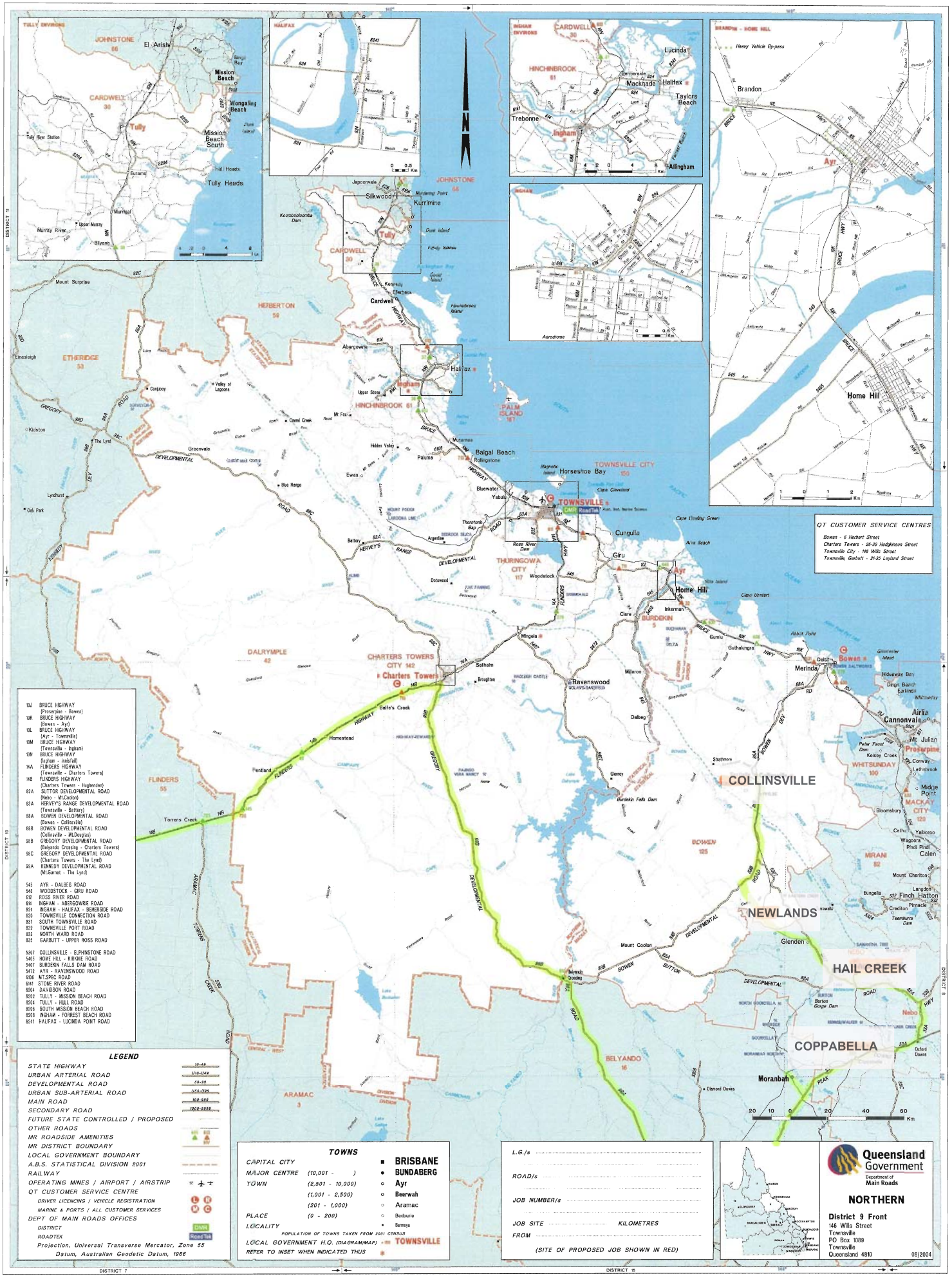

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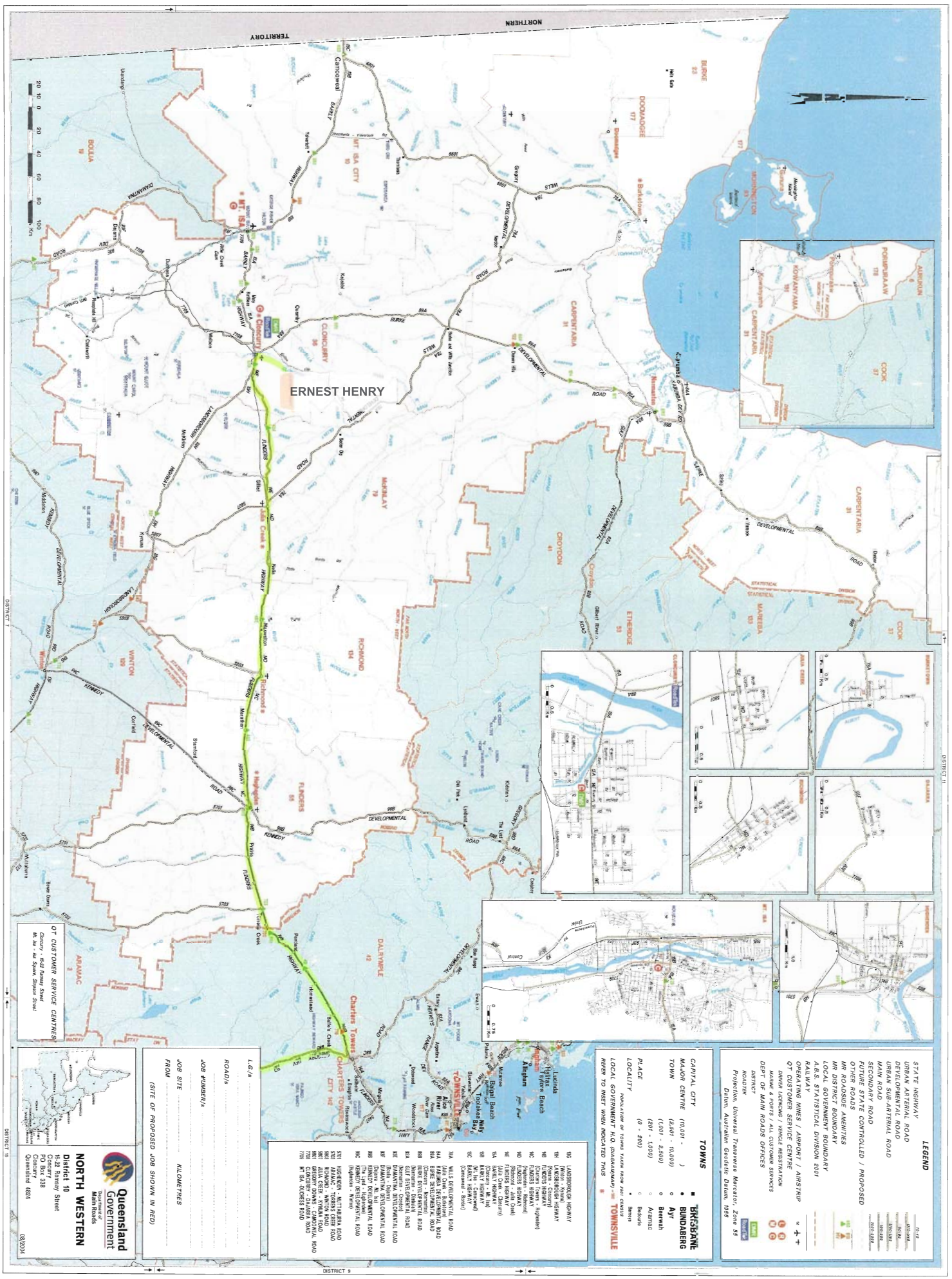
Figure 6 District 10 North Western



3.1.1 Regional Context

The project is located in Belyando Shire, within which Moranbah is located. Belyando Shire is located in Central Queensland, southwest of Mackay (refer to Figure 1). Belyando Shire is surrounded by Bowen, Dalrymple, Nebo, Broadsound, Peak Downs, Aramac and Jericho Shires. It covers an area of approximately 30,000 square kilometres (BSC, 2006).

The population of the Belyando Shire is located mainly in the towns of Clermont and Moranbah. A smaller proportion of the population comes from the surrounding rural community. Located in the southern part of the Shire, Clermont is approximately 400 km from Rockhampton and is the service town for the Blair Athol Coal Mine and the surrounding rural properties. Located in the northern part of the Shire, Moranbah is approximately 200 km southwest of Mackay and is the service town for Goonyella/Riverside, Peak Downs and Moranbah North Coal mines.

3.1.2 Site Overview

The proposed development site is located on part of Lot 10 on SP175258. Figure 8 shows the land uses of the site and surrounds. The project site is currently "zoned rural grazing", being undeveloped land, largely vegetated with open woodland. There are no buildings or structures on the site. The site topography is gently undulating sand plains with lateric outcrops, with the majority of the site 250 – 260 m above sea level.

Land tenure for the proposed area is Grazing Homestead Perpetual Lease (GHPL), with current planning scheme zoning of Rural A. This land forms part of Picardy Cattle station which is a GHPL held by Judith Flora Camm.

The total AN Plant site area is 270 ha, which includes approximately 60 ha that is required for the AN plant, emulsion plant, evaporation pond, clean water reservoir, power generation facility and site access road (Figure 2).

An additional land parcel of approximately 25 ha (15.75 hectares construction Camp and 10.5 hectare effluent irrigation area) is proposed for a construction camp adjacent to the northwest of the proposed AN Plant site.

The Isaac River flows to the north of the site and Grosvenor Creek to the south. Grosvenor Creek runs approximately 1.5 km to the south of the site and the Isaac River approximately 4 km to the northeast. There is an unnamed gully within the site in the western corner and drainage generally across the site from the proposed site area to the southwestern corner (see Figure 2). The site is largely vegetated and uncleared except on the northwestern side of the site, which shows evidence of chemical clearing.

Site Tenure

The land was held by Judith Camm as leasehold land, held as GHPL *30/4123* for grazing and/or agricultural purposes, a corporation may not acquire or hold an interest in this tenure. A GHPL extinguishes Native Title over the subject land.

Following consultation with the Camm family, BSC and DNRW, survey plans of the excision were prepared and a compensation agreement was settled.

DN has applied to DNRW to convert the surrendered land to freehold land. This entails two separate applications, one for the plant site and one for the construction camp.

An access agreement between DN and BHP Billiton / Mitsubishi Alliance (BMA) has been reached, allowing right of way from Goonyella Road.

Mining and Petroleum Tenure

There are a number of different petroleum and mining interests in the immediate vicinity of the project. Figure 7 provides a map of the mining and petroleum tenure over the project site. There is a Mineral Development Lease (MDL) held by The Shell Company of Australia Limited that covers the proposed site. Coal reserves in this area are located under the proposed site and to the west. An assessment of the coal resources affected is provided in Section 4.1.1.3 of the EIS.

In addition, a Petroleum Lease is held by Arrow Energy Pty Ltd. over a portion of the Camms property (GHPL 30/4123) which does not encroach onto the AN Plant site. The Petroleum Lease is granted pursuant to the *Petroleum and Gas (Productions and Safety) Act 2004* (PGPS Act), which specifically includes coal seam methane. The PGPS Act allows for incidental activities to be carried out on land subject to the lease.

Native Title Claims

The surrounding land use of the site is cattle grazing and the tenure is GHPL. At the time of the preparation of this EIS there were two Native Title claims current for the site, these where the BBKY#4 Native Title claim and the Wiri#2 Native Title claim (Copies of these Native Title Claims are provided in Appendix 7.14).

1 Wiri #2 QC98/011;

2 BBKY #4 QC01/25.

The type of tenure over the site (GHPL) extinguishes Native Title while this tenure is over the site. A Native Title claim can be made over the area after GHPL tenure is relinquished or surrendered, however such a claim may only be undertaken during the period when the land is unallocated state land; prior to the land's conversion to freehold tenure

The two Native Title claims cover the whole area of the project but do not impact on the Native Title rights to this area as Native Title has been extinguished. The Native Title claims do provide rights to the Traditional Owners for participation in the development of a Cultural Heritage Management Plan (CHMP).

Recently the Federal Court in Townsville handed down a decision in relation to the Wiri#2 claim (on the 19th of June 2006). The finding of the Federal court was that the Wiri#2 claim was not a valid claim for the area and therefore the Wiri#2 claim was not considered as a registered Native Title claim. As this was the finding of the Federal Court the claim was removed from the register of National Native Title Tribunal's register of Native Title claims. An appeal has subsequently been lodged by the Wiri people regarding the Federal Court finding and the Claim has been reinstated on the National Native Title Tribunals register of Native Title claims.

The development of the CHMP has been in conjunction with the Traditional Owners represented under the BBKY#4 claim and under the Wiri#2 claim. A copy of the archaeological survey of the site is incorporated in Appendix 7.11. A CHMP is currently being negotiated with the Traditional Owners.

Easements

McInnes Wilson lawyers have conducted a search of all easements affecting Lot 10 on SP175258. The State Tenure Search for the lot indicates eight easement agreements (refer to Figure 18) between different parties including the following:

» Easement No 602812048 (EMT A on GV37) granted on the 8th October 1969 between the lessee and the Queensland Electricity Commission for the purpose of an Electric Transmission Line.

» Easement No 602812049 (EMTS B, C, D, E on GV47 and EMT C on GV112) granted on the 25th January 1977 between the lessee and Mitsubishi Development Pty Ltd and Utah Development Company for the purpose of conveying electricity.

» Easement No 602812050 (EMT A on GV98) granted on the 25th January 1977 between the lessee and Mitsubishi Development Pty Ltd and Utah Development Company for the purpose of a pipeline for conveying water.

» Easement No 702033513 (EMT F) granted on the 16th June 1997 between the lessee and BHP Mitsui Coal Pty Ltd for the purpose of an electricity transmission.

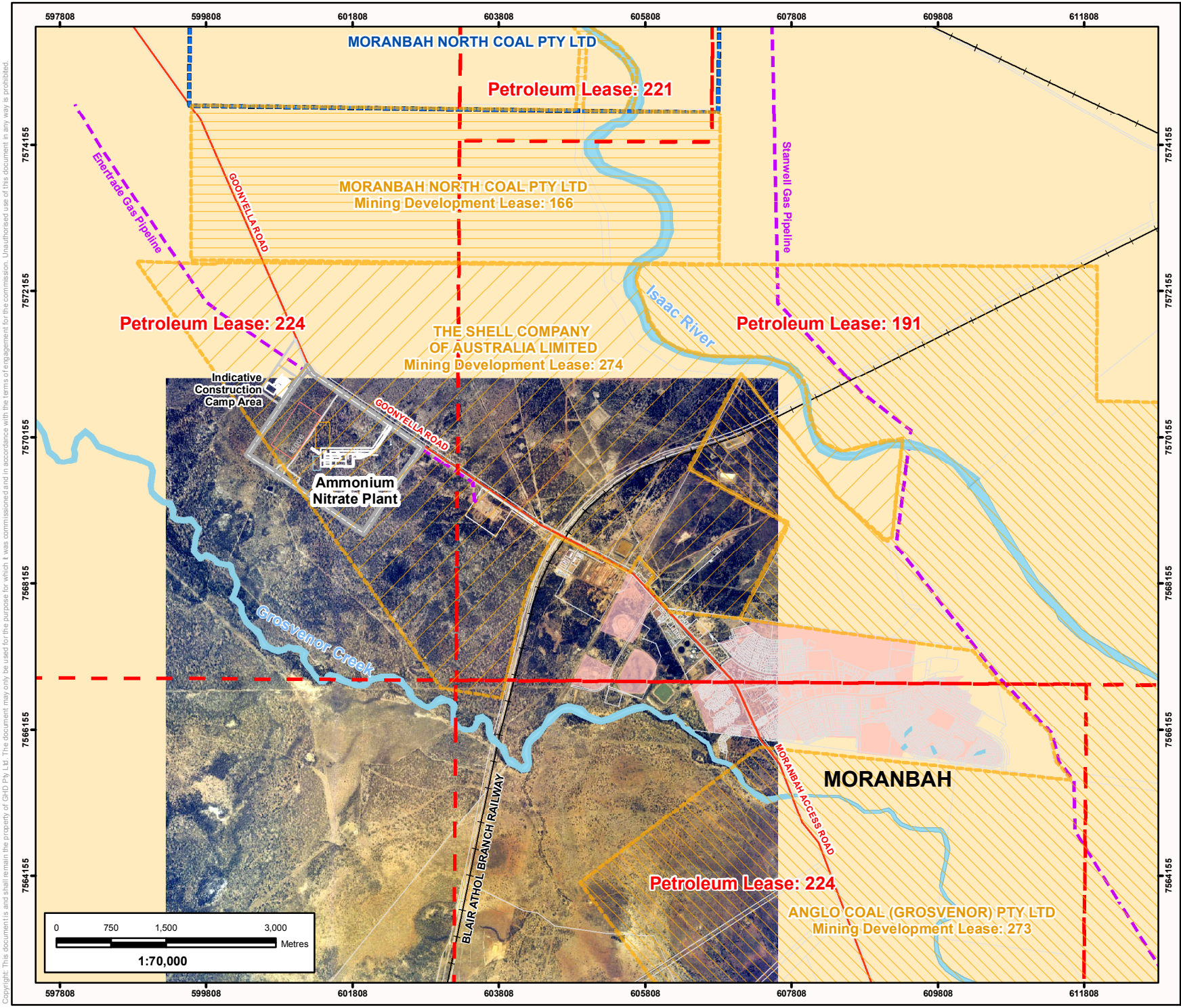
» Easement No 702476916 (EMTS H and J) granted on the 29th January 1998 between the lessee and Moranbah North Coal Pty Ltd for the purpose of an electricity transmission.

» Easement No 708797454 (Easement AA) granted on 5th July 2005 between the lessee and Enertrade (NQ) Pipeline No 1 Pty Ltd and Enertrade (NQ) Pipeline No 2 Pty Ltd for the purposes of a gas pipeline.

Inspection of the survey plan confirmed only Easement AA burdens the subject site for the proposed plant. Pursuant to the agreement between the lessee and Enertrade (NQ) Pipeline No 1 Pty Ltd and Enertrade (NQ) Pipeline No 2 Pty Ltd (Pipeline Owner) for Easement AA, the lessee may use the Easement Area for agricultural and maintenance purposes including cultivation, grazing, noxious weed control and normal burning practice. However, the lessee must obtain the Pipeline Owner's consent to:

» Excavate, drill, install or erect any structures or installation in the Easement Area;

» Alter or disturb the present grades or contours of the Easement Area;



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Date: 02-10-06 Rev A
Datum: GDA94 (MGA) Zone 55
Source: Base data sourced from the State of Queensland, Department of Natural Resources, Mines. All other infrastructure supplied by Dyno Nobel Asia Pacific Ltd.
File: G:\41\15824\GIS\Maps\Final\MXD\fig7_Moranbah_Min_Pet_Ten.mxd

Legend

- Ammonium Nitrate Plant Site
- Evaporation Pond
- Generating Facility*
- Raw Water Reservior
- Cadastre
- Developed Area
- Watercourse
- Major Road
- Railway
- Petroleum Pipeline
- Mining Lease
- Petroleum Tenure

Mineral Development Licence

Principle Holder

- Anglo Coal (Grosvenor) Pty Ltd
- Moranbah North Coal Pty Ltd
- The Shell Company of Australia Ltd

*Generating Facility location is subject to detailed engineering.

Moranbah Ammonium Nitrate Plant

Environmental Impact Statement

Figure 7
Mining and Petroleum Tenure

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- Plant any tree or install any fence posts within 3 metres of the Pipeline;
- Undertake any ground penetrating activity associated with regrowth control, water diversion or pipeline installation; or
- Do anything that would jeopardise the safety or operation of, or interfere with, the Pipeline.

With regard to access to and through the easement, clause 5.1 of the agreement requires that the lessee shall have access to the Easement Area at all times provided that when accessing the Easement Area the lessee complies with any reasonable safety directions of the Pipeline Owner. In addition, Annexure A (of the agreement) requires to the extent reasonably possible, all vehicles are to be driven at a moderate to slow speed and on established tracks and roads and keep and maintain all such tracks or roads in good and trafficable condition.

3.1.3 Land Use

Existing Land Use

The site and surrounding land is currently used predominantly for grazing purposes. Land uses immediately adjacent to the site are described in Table 5 shows the land uses near the proposed site.

Table 5 Nearby Land Uses

Direction	Land Use
North	» Goonyella Road runs along the northern boundary of the site. » Land on the north side of Goonyella Road is grazing land. » Moranbah North coal mine is approximately 30 kilometres north of the site. » The Isaac River is 4 km northeast of the site.
East	» An Enertrade Compression Station is 1 km east of site. » Wotonga Blair Athol Mine Railway is located approximately 3 kilometres east of the site. » An Ergon Power Station lies immediately approximately 0.5km East of the railway on the northern side of Goonyella Road. » The Marley Accommodation Camp (MAC) is located 2.5 km to the east of the site boundary. » Coal seam methane gas extraction (refer to Figure 7). » The township of Moranbah.
South	» Land to the south is grazing land. » Grosvenor Creek is approximately 1.5 km south of the site boundary. » Coppabella coal mine is approximately 30 km southeast of the site. » A farm water dam is located approximately 0.5 km from the south western corner of the site.
West	» Land to the west is grazing land. » Picardy station cattle yards are located approximately 5km to the Northwest.

The nearest industrial development is the Enertrade Compression Station, which is 1 km from the eastern boundary of the site. An Ergon Power Station is approximately 3 km east of the site. The Marley Accommodation Camp is also located near the Power Station and is the nearest residential development to the site.

The nearest residential dwelling to the study area is approximately 2.5 km to the south east of the site. Arrow Energy Pty Ltd is currently using land north and east of the site for gas extraction. Consequently, an extensive network of subterranean gas piping exists in the area, including pods (for coal seam gas extraction) and surface holding ponds. A map of the area is provided in Figure 8. Moranbah North coal mine is located approximately 30 kilometres north of the site and Coppabella coal mine is approximately the same distance southeast of the site.

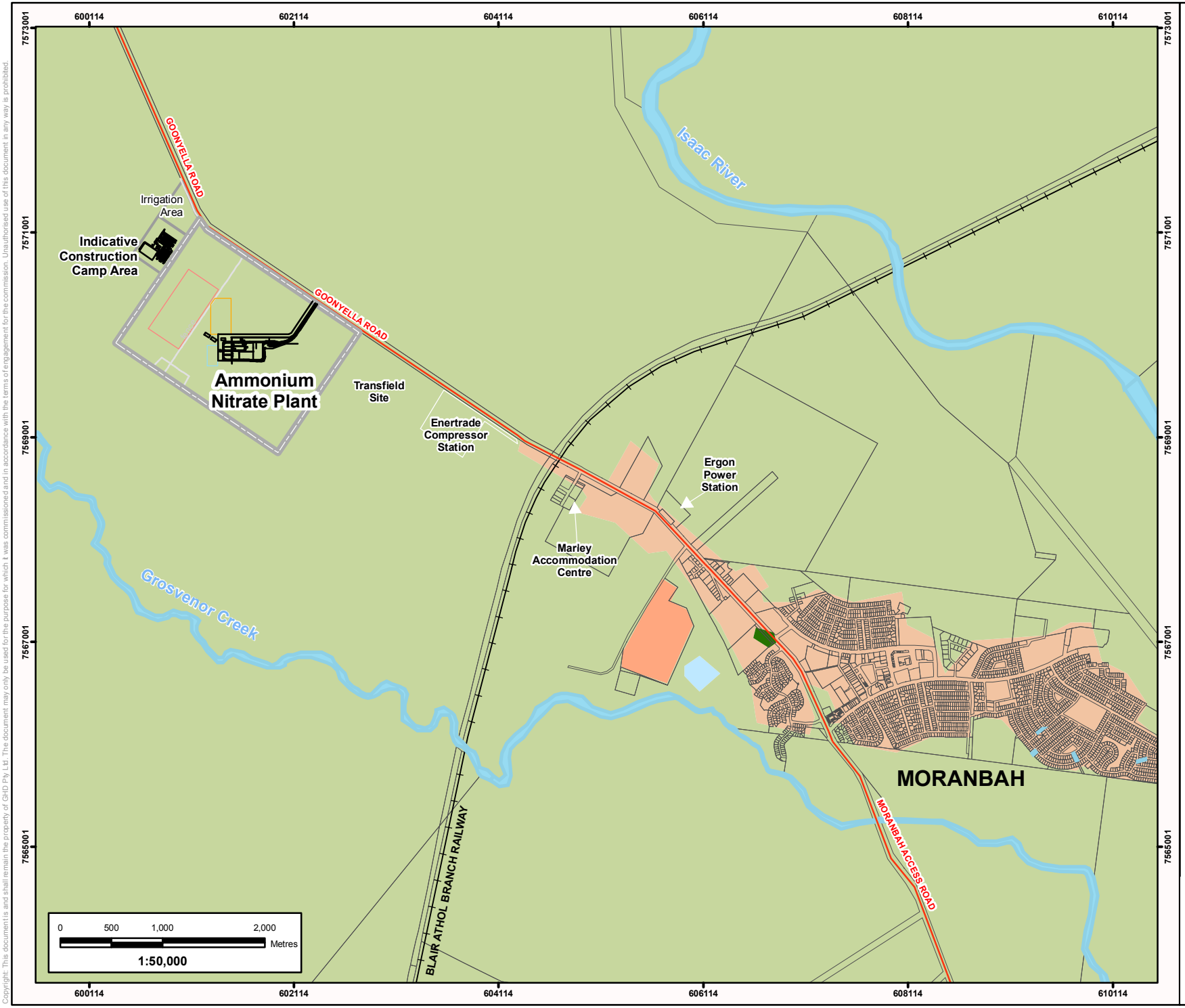
An investigation of the significance of the flora and fauna contained within and surrounding the subject site was undertaken and identified the following.

» The proposed development site contains the Brigalow Belt Bioregion and the Northern Bowen Basin Sub Bioregion. Although this remnant vegetation is classified as 'Not of Concern', pockets of this vegetation forms part of a bioregional corridor.

» 'Endangered' and 'Of Concern' remnant vegetation is located about 2 km southwest and northeast of the site.

Appendix 7.5 of this EIS discusses this in more detail.

Searches were also conducted of the Environmental Management Register and the Contaminated Land Register for Lot 10 on SP175258. Results of the searches showed that the site is not included on either of the registers (Refer to Appendix 7.14).



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Date: 02-10-06 Rev B
Datum: GDA94 (MGA) Zone 55
Source: Base data sourced from the State of Queensland, Department of Natural Resources, Mines. All other infrastructure supplied by Dyno Nobel Asia Pacific Ltd.
File: G:\41\15824\GIS\Maps\Final\MXD fig8_Land_Use_RevB.mxd

Legend

- Ammonium Nitrate Plant Site
- Evaporation Pond
- Generating Facility*
- Raw Water Reservior
- Cadastre
- River

Land Use

- Conservation and natural environments
- Intensive uses - Residential
- Intensive uses - Services - Recreation and culture
- Production from relatively natural environments - Grazing natural vegetation
- Water - Reservoir/dam

*Generating Facility location is subject to detailed engineering.

Moranbah Ammonium Nitrate Plant

Environmental Impact Statement

Figure 8
Land Use

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3.2 Construction

3.2.1 Construction of the Plant

General

To efficiently manage construction activities at the project site, equipment and materials will be procured in a manner to reduce the number of on-site construction man-hours and will include the following considerations:

- Equipment will be prefabricated off-site and transported and installed as skid packages or small modules. This will include major components of the individual process equipment.
- Large equipment items such as pressure vessels will be located such that they can be transported and installed in one piece. Consideration will be given to site access and special lifting methods.
- Workshop prefabrication and painting of steelwork and pipe spools will be undertaken prior to delivery to site.
- All equipment and vessels will be finish painted prior to delivery to site.
- The extent of off-site fabrication, and skid or small module fabrication would typically be reviewed during the detailed design. Where possible, off-site fabrication will be maximised.

Following establishment of the project site and prior to the commencement of site activities, environmental controls and site safety protocols will be implemented. The construction will be undertaken in an orderly and phased manner, generally as outlined in Table 6.

Civils

The earthworks will include the formation of both permanent and temporary access roads, equipment laydown areas, platforms for the process areas, evaporation ponds, drainage, administration and warehouse buildings, parking and landscaping. Structural fill, in limited quantities, may be imported as required to provide stable footing platforms.

To facilitate heavy lifts, it will be necessary to provide a level surface and high compaction adjacent to the ammonia and nitric acid plants for the large cranes to undertake these lifts.

Generally, equipment foundations will be raft slab type footings, poured in-situ. The larger concrete slabs will use low shrink concrete to minimise the number of expansion joints. Piled foundations will be adopted for selected areas (eg, ammonia tank). Process and storage areas subject to occasional liquid spills and plant washings will be bunded and surfaces provided with a protective finish. Liquid spills and plant washings will be directed to collection sumps and, where appropriate, returned to the process.

The raw water and firewater ponds will be lined with a HDPE membrane. The plant surrounds will be sloped and graded with blue metal and gravel to facilitate a smooth

run off of storm water during heavy rain. A hydrant (fire water) ring main will be installed to service all areas of the plant.

A temporary concrete batch plant is proposed for the AN plant site. The batch plant will cater for the major concrete pours, resulting in a reduction in the number of trucks entering and exiting site whilst delivering ready mix concrete from Moranbah.

Equipment Installation

The plant consists of numerous large vessels, equipment and tanks requiring special techniques to install. Work method procedures will be approved prior to equipment installation. In the case of heavy lifts, calculations and lift simulations will be approved to check all phases of positioning the items onto their foundations.

Generally, the larger equipment consists of free-standing vessels placed on their foundations at grade level. Vessels and towers will be assembled and fitted-out on the ground prior to lifting into place. Generally, vessel internals, packings and insulation will also be completed prior to placement.

The shop-manufactured sections of the ammonia tank will be assembled and progressively welded-out in-situ. The roof, assembled on site at ground level, will be floated to its final position and welded in place.

The equipment located within the AN building will be installed progressively with the building steelwork and access platforms, and prior to the fixing of the building roof and wall cladding.

Concurrently with the main equipment installation, the utilities, piping and electrical systems will be installed and tested, allowing a staged verification of plant installation and completion.

The plant will be tested, pre-commissioned and commissioned by qualified personnel to ensure compliance with all design, statutory regulations and approvals.

Buildings

The administration building construction will be a slab on ground with block walls and a metal roof. A separate control room will house the laboratory and operator change rooms.

The maintenance workshop and warehouse will be single span portal frames with colour-bond sheeting. Construction will generally follow four key phases as outlined in Table 6.

Construction Camp

A construction camp is proposed for the housing of the construction workforce for the project. The construction camp will be constructed prior to and during early earthworks at the site. An access road is proposed from the Goonyella road into the construction camp, which is designed to have a peak capacity of 550 workers. The construction camp will be constructed using demountable style blocks with a self contained canteen and laundry (see Section 3.2.6).

Table 6 Phases of Construction

Stage	Description
Site Preparation and Earthworks	This stage will involve the preparation of the site and the construction of evaporation lagoons. This will involve: » Identification and marking of boundaries (clearing boundary, access etc) » Clearing for access and construction area » Earthworks to establish the necessary building platforms for plant, construction area and access and evaporation lagoons » Expansion of site drainage.
Foundations	Foundations will be established for major plant items and buildings. This phase is may involve the most frequent number of deliveries to the site due to the volume of concrete required.
Equipment Installation and Construction	Construction of the plant will essentially involve assembling and installing equipment generally manufactured off-site. The heaviest and largest components would be hauled to site on heavy road trucks and assembled using heavy lift cranes. Shop fabricated steelwork; pipe work and electrical work will be progressively installed concurrent with the installation of the equipment. Equipment, and systems will be precommissioned after installation.
Plant Commissioning	This stage involves the testing and commissioning of all equipment on the site, in preparation for production.

Site preparation and earthworks activities on the site will generally follow the following process:

» Initial investigation of the site and geotechnical assessment (this has been completed).

» Clearing for road access onto the site and construction camp and access between the sites (approximately 10 hectares). This will require the development of sufficient measures to prevent any impacts on the two pipelines (gas and water) that are located parallel to Goonyella Road (see Figure 2). This may include building an access structure over the pipelines or encasing the pipelines to prevent any impacts from heavy vehicles.

» Clearing for the footprint of the site including the plant itself (approximately 26 hectares), clearing of the evaporation ponds for the site (approximately 25 hectares), clearing for the power generation facility (approximately 7 hectares) and clearing for a lay down area for the plant and equipment (approximately 3 hectares).

» To provide an adequate site for construction an area of approximately 25 hectares plant area and 25 hectares for the evaporation ponds will be levelled with some

benching to minimise the amount of earthworks required (the remaining area is for road access). Approximately 1500m^3 of soil and subsoil will be removed and reused as selected backfill throughout the project. Excavation will be conducted using conventional earthmoving equipment.

Land disturbance and vegetation clearing will be limited to the minimum required to accommodate necessary infrastructure and lay-down areas. Figure 9 shows the areas to be cleared over the existing site plan.

The following utilities will be required during the construction stage:

» **Water:** Approximately 2 kl/hr (17ML / yr) may be required during the construction phase. This water will be used for dust suppression, commissioning requirements as well as domestic water supply;

» **Electricity:** Power for construction needs up to 0.52 MW at 415 V capacity;

» **Communications:** During construction, it is envisaged that local phone communications may be established in conjunction with other users in the area.

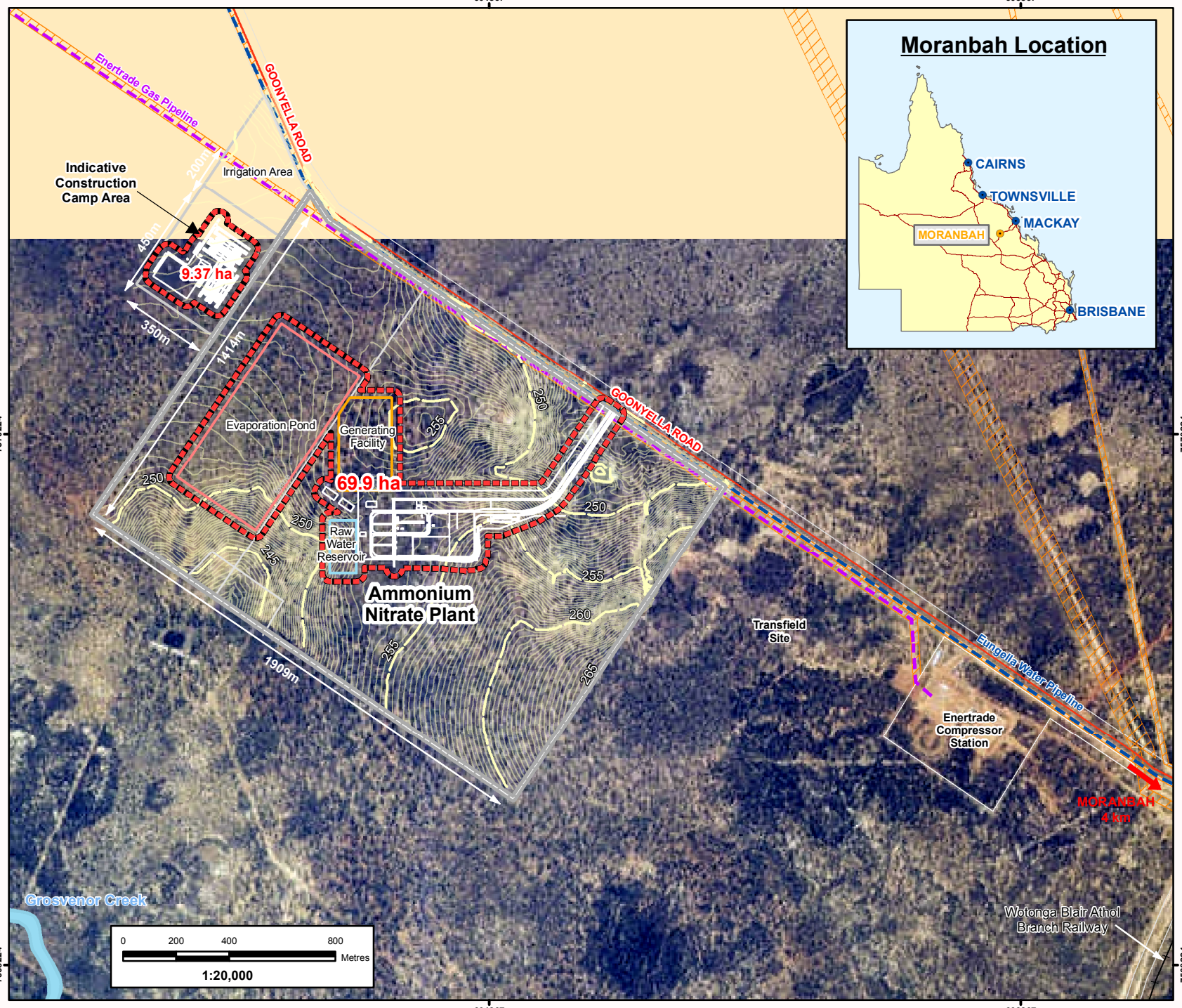
3.2.2 Construction Schedule

The construction period is scheduled for approximately 22 months in total. The peak workforce of 550 people is estimated with a normal range of 400 during most construction activities. Construction activities are likely to 6 days per week at 9 hours per day.

The main activities and estimated timeframes associated with construction (a number of which are concurrent) are shown in Table 7.

Table 7 Construction Schedule

Construction Type	Month																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Site Preparation, Earthworks & Foundations																						
Steel structure work																						
Equipment installation																						
Piping prefabrication & installation																						
Electrical installation & instrumentation																						
Painting																						
Insulation																						
Commissioning																						



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Date: 02-10-06 Rev A
Datum: GDA94 (MGA) Zone 55
Source: Base data sourced from the State of Queensland, Department of Natural Resources, Mines. All other infrastructure supplied by Dyno Nobel Asia Pacific Ltd.
File: G:\41\15824\GIS\Maps\Final\MXD fig9_Site_Clearing_RevA.mxd

Legend

- Ammonium Nitrate Plant Site
- Generating Facility
- Evaporation Pond
- Raw Water Reservior
- Major Road
- Easements
- Cadastre
- Watercourse
- Railway
- Water Pipeline
- Petroleum Pipeline
- Area — 30m Buffer of Facilities

*Generating Facility location is subject to detailed engineering.

Moranbah Ammonium Nitrate Plant

Environmental Impact Statement

Figure 9 Vegetation Clearing Plan

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3.2.3 Construction Wastes

Construction of the AN plant is anticipated to generate approximately 3 x 10m^3 bins per week of solid waste for the duration of the construction phase. Construction wastes will be divided into hazardous and non-hazardous wastes in accordance with applicable Queensland regulations. The majority of the waste has been identified as non-hazardous (refer Table 8 below) and therefore able to be disposed of at a licensed landfill facility or otherwise as required.

The monthly volume of waste generated will vary depending on the construction phase. It was confirmed with BSC that it has capacity to manage the volumes generated in the construction phase and should not place any additional strain on the waste management services of Belyando Shire or other Council facilities in the area.

Table 8 Estimated Construction Waste Types

Waste Type	Hazard Type
Empty paint and coating containers	Non-hazardous
General refuse (waste packaging, plastics, cardboard etc.)	Non-hazardous
Wood and scrap metal (incl. packing cases and electrical wire etc)	Non-hazardous
Vegetation	Non-hazardous
Spent oils	Non-hazardous
Excess fill	Non-hazardous
Domestic garbage and food waste	Non-hazardous
Concrete and other solid fill	Non-hazardous
Construction debris contaminated by oil or organic compounds	May be hazardous

3.2.4 Source of Plant and Equipment

Much of the plant and equipment will be sourced and fabricated locally or within Australia. Other plant and equipment may be sourced from other parts of Australia. Some components for the project such as the AN plant have been purchased from the United States.

The ammonia plant (part of the AN plant) will be sourced from the United States and shipped to Australia utilising a dedicated chartered vessel, suitable for handling and unloading of large equipment and vessels. The AN plant will be landed at the port of Mackay and transported (approximately 200 loads) to Moranbah on specialised heavy transport over a four (4) week period. Escorts will be provided for the larger oversized equipment. The estimated number of oversize vehicles for the AN Plant is between 15 and 20.

The nitric acid compressor will be sourced from the United States, with the NA absorber tower manufactured in Australia. Generally the majority of the storage vessels will also be manufactured in Australia. The pre-assembly and shop fabrication of the alloy and carbon pipe work and ducting will be undertaken within general workshops in the Mackay and Gladstone areas. Similarly, all steelwork will be sourced and prefabricated within Queensland.

A 40m^3/h concrete batch plant will operate on-site during the civil works. A piling machine may be required for a short duration following the earthworks. The large heavy lift cranes will operate on-site over a period of three months. Generally, welding machines will be diesel driven units. Selected equipment and pipe systems will be chemically cleaned prior to operation.

Other equipment will comprise boom lifts, scaffolding systems and safety gear. The site will operate a fenced laydown area and store to receive all deliveries to the site.

3.2.5 Traffic and Access

Access will be provided via the adjacent Goonyella Road. The development of the access road onto the site will need to be undertaken early in the site works to ensure that there is adequate infrastructure for the vehicle volume and size of vehicles accessing the site and to ensure that sufficient measures are adopted to mitigate impacts on the pipeline infrastructure that moves across the front of the site.

The size and frequency of the transport loads associated with the construction of the plant depends on the extent of prefabrication and modularisation of the plant. This will be determined more fully during the design stages of the project. Some items will require oversize transport (estimated 15 to 20 vehicles during construction). Specific routes, times and escorts will be arranged with the appropriate agencies.

3.2.6 Accommodation

Within Moranbah there is a limited availability for the construction workforce for the project. To address this issue the construction workforce will be accommodated in a construction camp on a site northwest of the plant (see Figure 10). Dyno Nobel Asia Pacific Limited has in place several agreements for a construction workforce in relation to the development and construction of the facility. The construction camp facility will be located approximately 1 km west of the proposed AN Plant as shown in Figure 2. The site comprises an area of 15.75 Ha and will require a driveway access fronting on Goonyella Road. An additional area of 10.5 hectare is located at the front of the accommodation camp and is available as an irrigation area for effluent from the sewage treatment plant.

The construction camp is intended to be self-contained, with full meal catering available for all residents and a recreation area.

Figure 10 shows the proposed layout of the construction camp. The construction camp is on the western side of the AN Plant site and will include:

» 400 (with a maximum of 550) rooms, comprising fit out with own entry;

- 50 site staff beds;
- Separate ablution and laundry blocks;
- Covered walkways;
- Canteen comprising dining room and kitchen;
- First aid/administration room;
- Recreation room;
- Roads, fencing and general security features;
- Water Supply and holding tank;
- Laundry; and
- On-site effluent treatment and disposal.

A separate access track from Goonyella Road will be constructed to reduce traffic demand on the external transport network. There will also be an access track between the construction camp and the AN plant site. Workforce requirements for plant construction are discussed in further detail in Section 3.5.

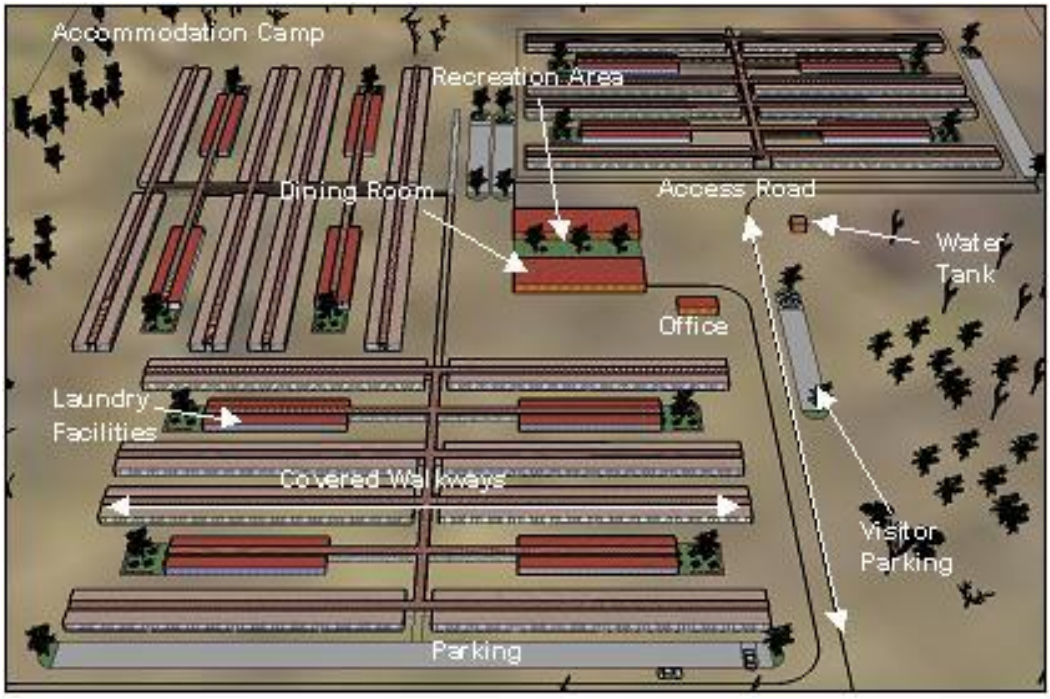

Figure 10 Construction Camp Layout – Plan View

3.3 Operations

The AN plant will produce 350,000 tonnes of AN per annum (Prill and Emulsion). Figure 11 shows the existing QNP Moura AN plant as an example of a similar plant. The plant will normally operate continuously for 350 days per year and use the remaining 15 days for maintenance and inspection purposes. The AN Plant is anticipated to have a lifespan of approximately 35 years.

The major components of the AN Plant are the same as the existing QNP Moura plant with the layout re-configured for the specific site.

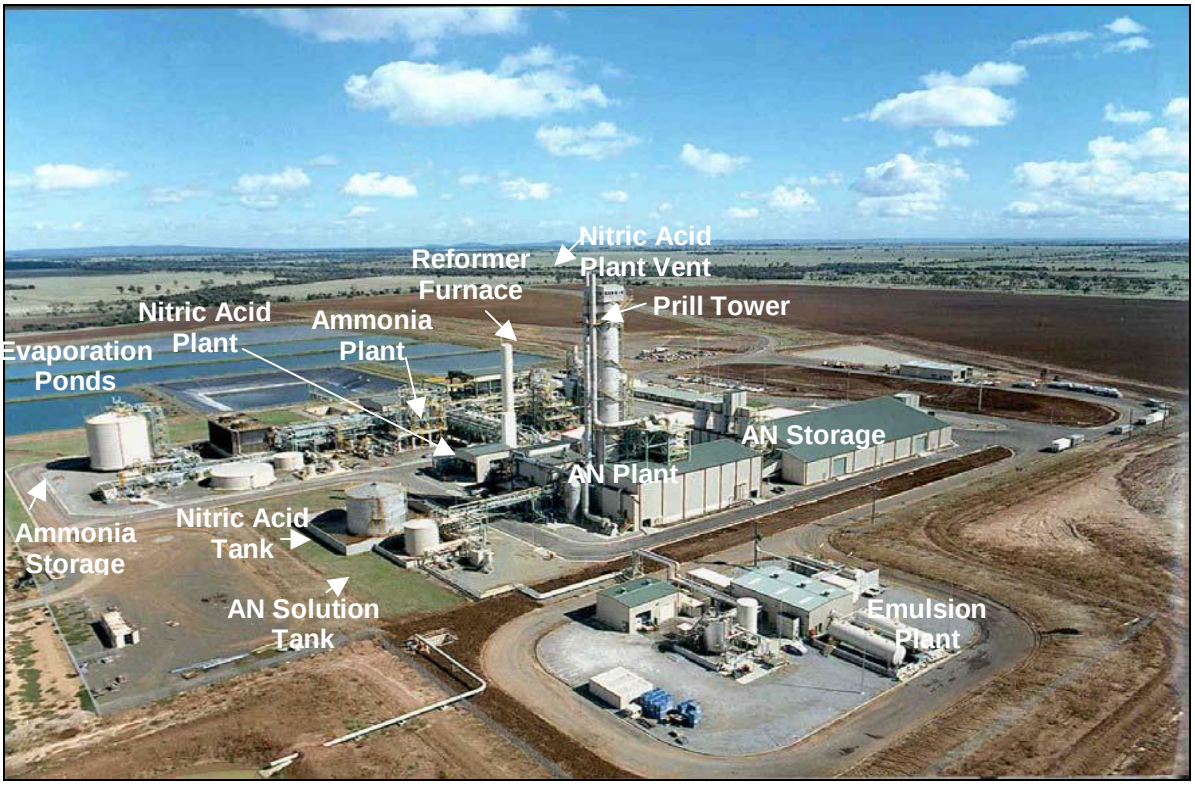

Figure 11 Existing QNP Moura Ammonium Nitrate Plant

The layout of the AN Plant is provided in Figure 12 this includes the ammonia plant, nitric acid plant, ammonium nitrate plant, emulsion plant, raw water and storm water surge pond.

The following section provides a summary of the key components and processes involved with the manufacture of AN. The manufacturing process is summarised in Figure 13.

Ammonia is produced from the methane in coal seam gas. The methane gas (CH_4) is processed in a steam reformer to produce hydrogen gas (H_2), which is then combined with nitrogen gas(N_2) extracted from the atmosphere to produce ammonia gas (NH_3).

POWER GENERATING FACILITY

RAW WATER &
FIRE WATER POND

FIRE WATER
PUMP STATION

66kv
SWITCHYARD

ALTERNATIVE 66KV POWER LINE RESERVE

WATER &
GAS METERING

GAS AND WATER LINES RESERVE
(UNDERGROUND)

WATER
TREATMENT
PLANT

ACCESS ROAD TO CONSTRUCTION
CAMP, EVAPORATION PONDS

GATE HOUSE
& WEIGHBRIDGE

AMMONIA
STORAGE
TANK

YARD RACK

WAREHOUSE

CAR PARK

FLARE

AMMONIA PLANT

COOLING
TOWER

AUXILIARY
BOILER

CONTROL
ROOM

LABORATORY

ADMINISTRATION

EQUALISATION
POND

INTERCEPTOR
PIT

AIR
SEPARATION
UNIT

SWITCHROOM 2

INSTRUMENT AIR
COMPRESSORS

NITRIC ACID
PLANT

LOADOUT SILO'S

FULL CONTAINERS

2000 TONNE CONTAINER
STORAGE AREA

EMPTY CONTAINERS
2 LEVELS

TRUCK PARKING

STORMWATER
SURGE POND

AMMONIUM NITRATE
PLANT

BULK PRILL STORAGE

AMMONIA
NITRATE
SOLUTION
STORAGE

NITRIC ACID
STORAGE

YARD RACK

CHEMICAL
STORAGE

EMULSION
PLANT

90000

204000

92000

0 10 20 30 40 50 100m
GRAPHIC SCALE 1:1000

No	Revision	Note: * Indicates signatures on original issue of drawing or last revision of drawing	Drawn	Checked	Approved	Date

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Drafting Check		Design Check	
Approved			
Date	27/09/06		
Scale	AS SHOWN	This Drawing must not be used for Construction unless signed as Approved	

Client

Project DYNO NOBEL AMMONIUM NITRATE COMPLEX

Title MORANBAH PLANT SITE
PLANT ARRANGEMENT PLAN

Figure 12

Original Size A3 Drawing No: Rev: A

Plot Date: 28 September, 2006 - 11:30 AM Cad File No: G:\41\15824\CADD\Drawings\ 600001-272-3G71-0002_C_Blocks.dwg

3.3.1 Ammonia Manufacture

The key components of the proposed ammonia plant include:

» Gas Heated Reformer;

» Pressure Swing Adsorbers (PSA); and

» Ammonia synthesis plant.

The primary inputs to the ammonia plant are:

» Methane gas – to produce ammonia;

» Air – to produce nitrogen for purging;

» Steam.

This process uses the ICI Leading Concept Ammonia (LCA), which combines the use of excess air (up to 25%) in the secondary reformer with a very active synthesis catalyst. In the LCA process, the heat generated in the secondary reformer is used in the primary reformer by direct heat exchange in a tubular Gas Heated Reformer (GHR). The CO shift is performed in a single stage shift reactor at 250^0C using special copper basic catalyst. CO_2, inerts and excess nitrogen are removed from raw synthesis gas by pressure swing absorption. Ammonia synthesis takes place at low pressure of below 10,000 kPa using ICI's highly active cobalt promoted catalyst. Net energy consumption of around 7.2 Gcal/ T ammonia has been demonstrated for 450 T pd.

The ammonia plant will be capable of producing 450 T per day (Tpd) of ammonia, which will be stored in a 2,000 T refrigerated tank, prior to supply to the Nitric Acid Plant. Key emission points associated with the Ammonia Plant are the reformer furnace stack (NO_x) and ammonia tank pressure safety valve (under upset conditions only). Refer to Appendices 7.8 and 7.9 for additional information on air emissions from the proposed facility.

3.3.2 Nitric Acid Manufacture

The proposed new nitric acid plant will comprise the following:

» Ammonia evaporator/superheater;

» Air filter;

» Heat exchanger;

» Cooler/condenser; and

» Ammonia/air mixer.

The primary inputs to the nitric acid plant are:

» Ammonia – from the ammonia plant; and

» Air.

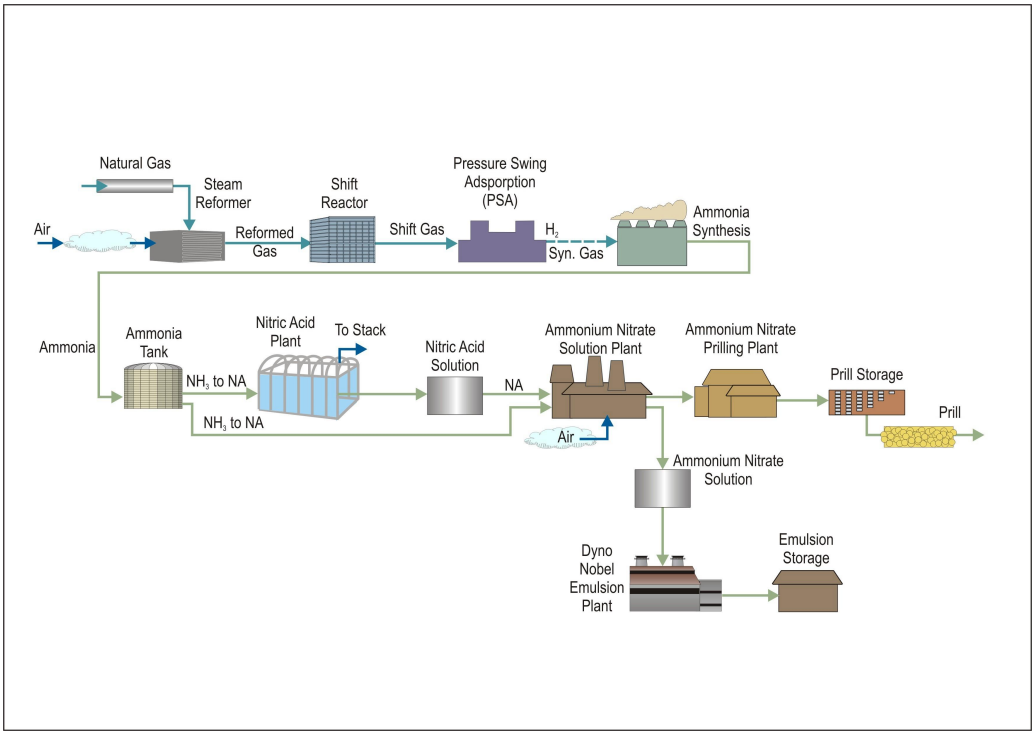


Figure 13 Summary of Manufacturing Process

Nitric acid is produced by reacting ammonia and atmospheric air at high temperature and pressure. The ammonia is oxidised to produce nitric oxide. Once cooled, the gas is oxidised further (this favours conversion of nitric oxide to nitrogen dioxide). Nitric oxide, nitrogen dioxide, water and oxygen are then combined to form nitric acid.

Anhydrous liquefied ammonia is supplied at medium pressure from the ammonia storage tank. The ammonia is vaporised in the ammonia evaporator and superheater to a pressure of approximately 1,300 kPa (g) and 100°C. Ammonia is then fed at a lower pressure into a mixer where it is combined with filtered clean air. The ammonia/air mixture is then fed into a burner where the mixture is reacted over catalytic platinum gauze. The reaction produces a mixture of nitrogen oxides and steam. Leaving the burner, the hot reaction products are passed through a series of heat recovery processes including a tail gas heater, an economiser and a gas cooler condenser.

The gas mixture is cooled to less than 60°C resulting in the production of weak nitric acid solution, which is then separated out and fed as weak nitric acid into the absorption tower. The non-dissolved nitrogen oxide gases are subsequently fed into and absorbed in the tower to form liquid nitric acid at a concentration of approximately 60% w/w. The acid is pumped from the bottom of the tower to storage tanks.

The nitric acid plant will be capable of producing 570 Tpd of nitric acid, with a process storage volume of 2,800 T of 60% nitric acid solution, prior to supply to the AN plant. In addition, a working volume of up to 200 m^3 (approximately 320 T) of weak nitric acid solution may be required, depending on the final design of the plant.

The nitric acid plant vent stack is the key source of emissions (NOx) from this section of the plant. Refer to Appendices 7.8 and 7.9 for additional information on air emissions from the proposed facility.

3.3.3 Ammonium Nitrate Solution Manufacture

The key components of the AN plant include:

» Ammonia evaporator/superheater;

» Ammonia neutraliser;

» Heat Exchangers;

» Flash Tank;

» Evaporator; and

» Remelt tank.

The primary inputs to the ammonia nitric solution plant are:

» Ammonia – from the ammonia plant; and

» Nitric Acid – from the nitric acid plant.

Ammonium nitrate (AN) is produced through the combination of nitric acid and ammonia (gas).

Anhydrous liquefied ammonia at approximately 1,600 kPa (g) is fed to the AN plant where it is vaporised in the ammonia evaporator and superheater to a pressure of approximately 530 kPa (g) and 70°C before being fed to the pipe reactor. The plant uses liquid nitric acid and gaseous ammonia as raw materials to produce aqueous AN and water in a tubular pipe reactor. The AN solution flows under gravity to a flash tank where the solution is concentrated. The solution is then pumped to an evaporator and then collected in the remelt tank before being fed to the prilling processes.

The new AN plant will be capable of producing 1,000 Tpd of AN solution, with a process storage volume of 1,000 T for supply of solution to the DN Emulsion Plant. The source of air emissions from the AN plant is described below (Prill Manufacture).

3.3.4 Prill Manufacture

The key components of the prilling plant include:

» Prilling tower;

» Scrubber;

» Drier drum;

» Screening;

» Fluidised bed cooler; and

» Coating drum.

The primary inputs to the prilling plant are:

» AN solution.

Prilling is the process of forming solid particles from a liquid solution. AN solution is passed through spray nozzles. The countercurrent flow of air cools and solidifies the droplets during their fall. The solidified droplets, called prills, are then dried, cooled, screened, coated, weighed and sized for product quality. The final prill is conveyed to storage for bagging and/or dispatch, whilst prills that are off-specification are returned to the recycle system.

The primary emission from the prill manufacture plant is in the form of very fine AN particles suspended in process air. All process air from the prill manufacturing process is scrubbed, cooled, dried and filtered in order to minimise the quantity of AN dust vented. Refer to Section 4.4 for additional information on air emissions from the proposed facility.

3.3.5 Prill Storage

The proposed expansion includes the construction of a storage facility capable of holding 9,000 tonne (t) of AN prill. A number of layout options are being investigated for the prill storage facility including 2 x 6,000 T and 6 x 1,500 T and will include a small area for off-specification product, which will be returned to the manufacturing process. The plant will also include four 100 T AN storage silos, each with drive through arrangement load out facilities.

3.3.6 Emulsion Manufacture & Storage

AN solution is blended with process oils (emulsifiers and mineral oils), then cooled and stored as an emulsion. The emulsion plant will produce up to 200 Tpd of AN emulsion suitable for sensitisation via special bulk explosive vehicles located in the surrounding mining operations. There is 200 tonne storage for the emulsion agents on site and a storage capacity of 360 tonne for AN emulsion.

3.3.7 Heat Recovery

There are a number of heat recovery stages within the above processes. These include:

» Using flue gas from the reformer to preheat the reformer feeds;

» Recovery of heat from the steam reformer for use in the plant;

» Recycling purge gas from the Pressure Swing Analysis (PSA) to the reformer;

» Using hot gases from the ammonia converter to generate high-pressure steam for use in the process; and

» Recovered heat in the AN plant to assist in powering air compressors and production of steam.

The energy efficiency of the AN plant has been estimated at approximately 16GJ/tonne of AN product. This is the energy consumption for the manufacture of 1 tonne of AN (gas and electricity). This will be further assessed and benchmarked against other

comparable projects as part of future technical studies, with the objective of achieving best practicable measures to optimise energy and GHG efficiency. In regard to GHG efficiency, there is no carbon absorbed in the manufacture. The carbon of the coal seam gas is discharged to the atmosphere. However, it is discharged as CO_2 and not as methane, which has a thirty times the CO_2 GHG effect.

3.3.8 Operational Wastes (Typical Operations Solid and Liquid Wastes)

A list of indicative solid and liquid wastes anticipated to arise during operation of the plants is presented in Table 9.

Table 9 Indicative Quantity/Month of Typical Solid and Liquid Wastes

	Production Stage			
Waste**	**AN**	**NH_3**	**NA**	**Emulsion**
Waste Oil	<1000 L	< 200 L	< 200 L	No more than 200 L
Empty Drums	40 x 205 L drums 20 x 20 L drums	10 x 205 L drums		4 x 205 L drums & 6 x 20 L drums
Rags and absorbents	1 x 240 L	Nil	1 x 240 L	1 x 240 L
Sewage Waste	Biolytix or equivalent treatment process proposed	Quantity of waste generated will be dependent on selected waste management technology.		
Catalysts			*Will be leased from specialist company	

Note: This represents a list of indicative wastes requiring management and off-site disposal, based on DN's experience at the Queensland Nitrates Plant. Final details of operational wastes and best practicable management will be further characterised during the detailed design.

Note: *: The catalyst is in the manufacture of NA. It is leased from a specialist company, which performs this worldwide. As the catalyst can be re-used the leasing arrangement is the most convenient.

**Note: ** ** Water has not been included as it is not a process waste. Most of the water intake to the plant ends up as the evaporation from the cooling tower (80%). Some (less than 10%) is sent to the evaporation ponds, depending on the wastewater treatment process. Some is also lost in the product. Water vapour has been included as an emission.

Key air emissions from the operational plant are anticipated to include:

» Oxides of Nitrogen (NO_X);

» H_2O as water vapour; and

» AN as particulates.

Modelled emission rates for the proposed AN Plant are included in Appendices 7.8 and 7.9. The proposed technologies for the plant incorporate selective catalytic NO_x reduction system, 100% air recycling in the prilling tower and venting of ammonia storage tanks. These measures ensure ambient air quality is maintained and emissions to atmosphere are minimised.

Odour emissions from the AN Plant and effluent treatment facility will be at levels below those that will cause impacts to nearby residents. Treatment and detection systems are designed to reduce the risk of odours being produced as levels that maybe considered offensive.

3.3.9 Safety and Emergency Systems

Whilst the risk of explosion is low, fire-fighting facilities such as monitors and hydrants with hoses will be provided consistent with normal practice. Fire fighting equipment will be fitted out in such a manner that the plant operators are able to fight fires and rapidly provide cooling water to at risk equipment. The raw water reservoir is the water source for the fire fighting system.

Safety equipment including firewater monitors with fogging nozzles, hydrants, mobile and portable fire extinguishers, protective clothing and self-contained breathing apparatus will be provided. Fixed water spray systems will be installed for key facility components.

The vent system will collect and transport relief gases and liquids as well as waste gases, such as ammonia and steam, to a remote location where they will be safely discharged. This location will be an elevated position on-site to ensure discharge is remote from site personnel. Combustion products will consist almost entirely of CO_2, water vapour, and elemental nitrogen, with trace quantities of NO_X from ammonia streams.

The flare system is an emergency device and under normal operation will only burn pilot (coal seam methane) gas. They are used for control/disposal of emergency process gas emissions. Combustion products will consist almost entirely of carbon dioxide, water vapour, and elemental nitrogen, with trace quantities of NO_X from ammonia streams.

An interlocking system is the safest method of controlling a complex chemical plant. One control system interlocks with another to ensure the plant (and processes) are controlled as an integrated system and not independently. The interlocks of the plant are divided into safety relevant trip functions and process related interlocks. Safety related trips are provided in a separate emergency shutdown system (safe instrument systems (SIS)) that consists of a certified, failsafe programmable logic controller (PLC). The process related trips are connected to a distributed control system (DCS). The SIS will be connected to the DCS via a signal link (data bus).

Alarm management (display and data logging) will be executed at the DCS operator stations. The station will allow operators to recognise the alarms in the order in which they appear. Shutdown actions will be announced by an audible signal from the DCS together with a flashing display of the pertaining tag number.

Gas detectors will monitor the atmosphere surrounding potential leak points of combustible or toxic gases (pumps, compressors, pressure relieving devices, valve stations) to prevent injury to personnel. Gas detectors will be installed if necessary at strategic locations such as classified indoor locations; air intakes and outlets for buildings; permanent ignition sources such as furnaces, the gas let-down station, coal seam gas, ammonia plant, ammonia storage and possibly the reformer (CO).

Personnel Protection Equipment (PPE) includes canister-type gas masks and Self Contained Breathing Apparatus (SCBA) and will be provided at appropriate points throughout the plant. Safety goggles, rubber gloves, boots, and aprons will be worn for dangerous work as indicated by procedures established for plant operators.

An emergency team will be established from members of permanent staff who will integrate, if required, with the local emergency services to deal with any hazardous situations. The efficiency and effectiveness of the team will be maintained through a system of training that uses a range of scenarios of increasing difficulty and related to major plant hazards. The approved emergency procedures will be used as the basis for training.

Additional Facilities

An administration and security block will be established outside the security fence adjacent to the main gate. This is in line with the SSAN (Security Sensitive Ammonium Nitrate) requirements for stricter control over access to AN. Various Ammonium Nitrate products produced at the plant are declared authorised explosives under the Queensland *Explosives Act 1999*. Therefore anyone in Queensland planning to import, export, manufacture, transport, sell, store or use SSAN must be licensed under the Act.

It is proposed that approximately 60 car park spaces and a truck stopping area will be constructed. This car park will be accessible for visitors, administration office deliveries and administration personnel.

Other facilities on site will include:

» Gate house and weighbridge;

» Control room;

» Workshop and warehouse; and

» Laboratory.

3.4 Product handling

The AN plant site will comprise the following key project characteristics as shown in Table 10.

Table 10 Key Project Characteristics

Characteristic	Total
AN Production Capacity	350,000 Tpa
Plant Facilities	
Ammonia Plant	450 Tpd
Nitric Acid Plant	750 Tpd
AN Plant (Wet Section)	1,000 Tpd
AN Prilling Plant	800 Tpd
AN solution export	200 Tpd
Prill Storage Facility	9,000 T
AN Emulsion	140 T per batch
Air Emission Points	
AN Prilling Plant	2
Nitric Acid Plant	1
Ammonia Plant	1
Ammonia Plant Vent System (emergency release only)	2 (2 vent systems)
Plant Operations	
Operating Hours	24 hours per day, 7 days per week (up to 350 days per year)
Operational Workforce	70 max
Routine Shutdown	Approx. 3 weeks, every 2-3 years
Project lifespan	35 years
Water Requirements	
Water requirements for plant operations	2,456 ML/annum (max)
Area of Evaporation Ponds	25 ha max
Construction	
Construction Period	22 months
Construction Workforce	Nominal 400, Peak 550

3.4.1 Plant Inputs and Outputs

A summary of the key plant inputs and outputs is provided in Table 11. In addition to the outputs during the commissioning phase, there may be up to 20,000 T of ammonia transported from Moranbah to Gladstone over a period of up to 6 months. Once the plant is fully operational, all ammonia produced will be fully consumed in the process.

Table 11 Plant Inputs and Outputs

Material	Classification and UN Number	Purpose	Quantity
Process Inputs			
Methane Gas	Class 2.1 UN 1971	Input to ammonia plant	7.7 PJ/a
Sulphuric Acid	Class 8, UN 1830	Water Treatment	215 Tpa
Sodium Hydroxide	Class 8, UN 1823	Water Treatment	170 Tpa
Corrosion Inhibitor		Water Treatment	24 Tpa
Dispersion Agent		Water Treatment	12 Tpa
Biocide		Water Treatment	48 Tpa
Oxygen Scavenger	Class 5.1	Water Treatment	0.48 Tpa
Process Outputs			
AN Prill	Class 5.1, UN 1942	Final Product	285,000 Tpa
AN Emulsion	Class 5.1, UN 3375	Final Product	140 T per batch
AN solution (for emulsion manufacture)	Class 5.1, UN 2426	Export for emulsion manufacture	70,000 Tpa (100% basis)

Table 12 includes a summary of the major chemicals and fuels by a volume basis that will be stored on site. All chemical storages on site will comply with the relevant Dangerous Goods and Australian Standards for storage. The classification of each chemical is related to the Australian Dangerous Goods Codes.

Table 12 Chemical Storage

Chemical	Classification and UN Number	Storage Quantity
Ammonia	Class 8, UN 1005	2,000 T (1 tank 60% concentrate)
Nitric Acid (60%)	Class 8, UN 2031	2,800 T (1 tank 60% concentrate)
Ammonium Nitrate solution	Class 5.1, UN 1942	1,000 T
Ammonium Nitrate prill	Class 5.1, UN 1942	14,000 T**
Sulphuric Acid	Class 8, UN 1830	60,000 L
Caustic Soda	Class 8, UN 1823	60,000 L
AN Emulsion	Class 5.1, UN 3375	360 T (3 tanks)
Mineral oils and/or emulsifiers	Class 3, UN 1202	40 m^3 (2 tanks)

Chemical	Classification and UN Number	Storage Quantity
Ammonia	Class 8, UN 1005	2,000 T (1 tank 60% concentrate)
Liquid Nitrogen	Class 2.2, UN 1977	24 m^3 (2 tanks)

**Distributed between bulk prill stockpile, containers and emulsion tanks

Emulsifiers and mineral oils will be stored in accordance with Australian Standard AS 1940 and provided with a full containment bund to hold both the entire contents of the tanks and a 24-hour rainfall event anticipated once per 25-year return period. The DN procedures for the reduction and control of spill are addressed in Section 4.12 Health and Safety.

The location of the ammonia, AN and nitric acid storage tanks are shown on the site layout drawing. The location of the prill storage building is also shown. Details of the storage of prill within the prill storage building and other chemical storage buildings will be developed during design.

The method of transportation of all materials is discussed in Appendix 7.6 Traffic Assessment Report. The maximum quantity of the material within the process at any one time is discussed in Appendix 7.7 Hazard and Risk Assessment.

Contingency planning for the project for the materials stored on site will be developed as part of an emergency response plan. Spill response procedures have been developed for the potential incidents on site and will be further developed following a detailed risk assessment as required under the DGSM Act and the WH&S Act (see Section 4.12 Health and Safety).

3.4.2 AN Dispatch

The AN product is dispatched to customers in bulk. Two systems for transportation will be utilised, the first system involves prill being loaded directly from a conveyor and hopper into truck transportation containers or tanks. 1.2 T bulk bags are also loaded using a conveyor and hopper system, with prill being fed onto the conveyor using a front-end loader. Bulk bags are loaded onto truck trays using a forklift.

AN prill and emulsion will be transported in accordance with the requirements of the National Code for Transport of Dangerous Goods – Edition 6. Transport of product will primarily occur during weekdays, however, deliveries of product to the mines will be required infrequently on weekends. Based on the existing transport requirements and predicted markets for the increased output, peak delivery times are anticipated to be early morning and late afternoon (return).

3.5 Infrastructure Requirements

3.5.1 Transport Infrastructure

The transport infrastructure required for the project involves:

» The construction phase, which is expected to be completed in 2008; and

» The operations phase, with analysis undertaken for 10 years after commencing operations.

As this is a new plant site, site access is required from Goonyella Road for the plant site and the construction camp, requiring two intersections to be constructed.

Figure 15 presents the magnitude of current peak hour traffic flows for a 1.5 week period along Goonyella Road (chainage is the distance from the start of the road). As can be seen in the graph, peak hour flows are relatively constant throughout the working week, but drops by approximately half during the weekend period.

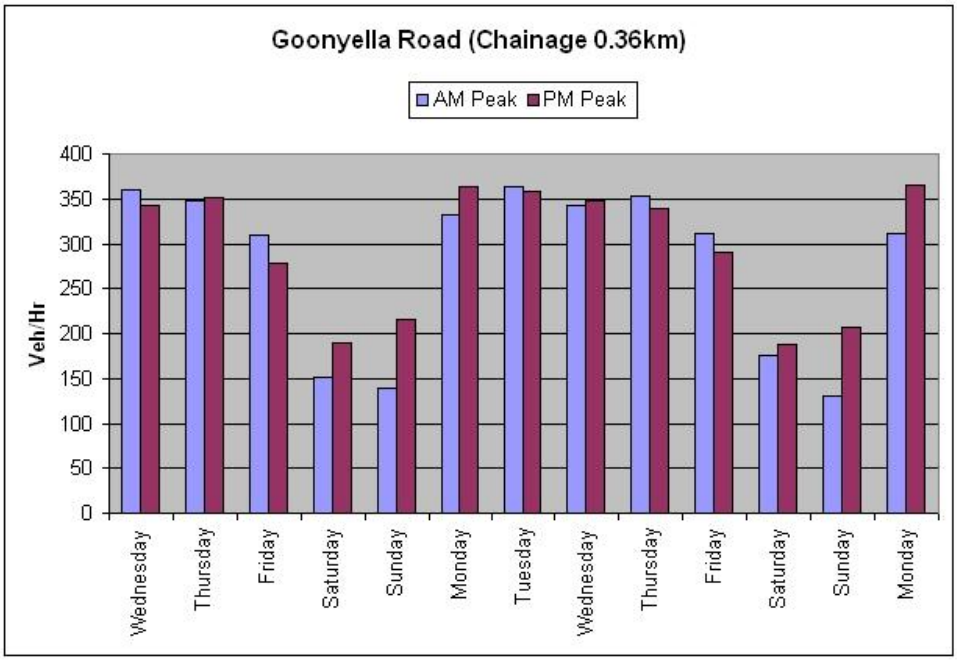


Figure 14 Goonyella Road Peak Hour Traffic Flows

Construction Phase

The construction phase would impact on the road network through increased traffic due to the following demands:

» Earthworks moving plant including scrapers, excavators or backhoes, graders, dozers, water trucks and rollers;

» Ready mix concrete trucks and concrete pumps;

» Mobile cranes;

» Deliveries of plant equipment and material:

» Construction materials; and

» Waste removal.

The estimated heavy vehicle traffic generated by the plant is 5 B-Doubles per day (average), originating from suppliers on the east coast (predominately Mackay).

The construction phase is expected to continue over 22 months with workforce requirements peaking at 561 personnel during the 14th month as indicated in Figure 15.

Buses will be used to transport workers to and from the construction site, with average vehicle occupancy of 15 persons per vehicle originating from the campsite. This will be by a proposed internal road between the construction camp and the AN Plant without the need to access Goonyella Road.

The project will house approximately 90% of the workforce in the construction camp with the remaining 10% being housed within the township. The number of vehicle trips generated by the construction workforce would average:

» 40 vehicles travelling to the plant during the morning peak; and

» 40 vehicles travelling from the plant during the afternoon peak.

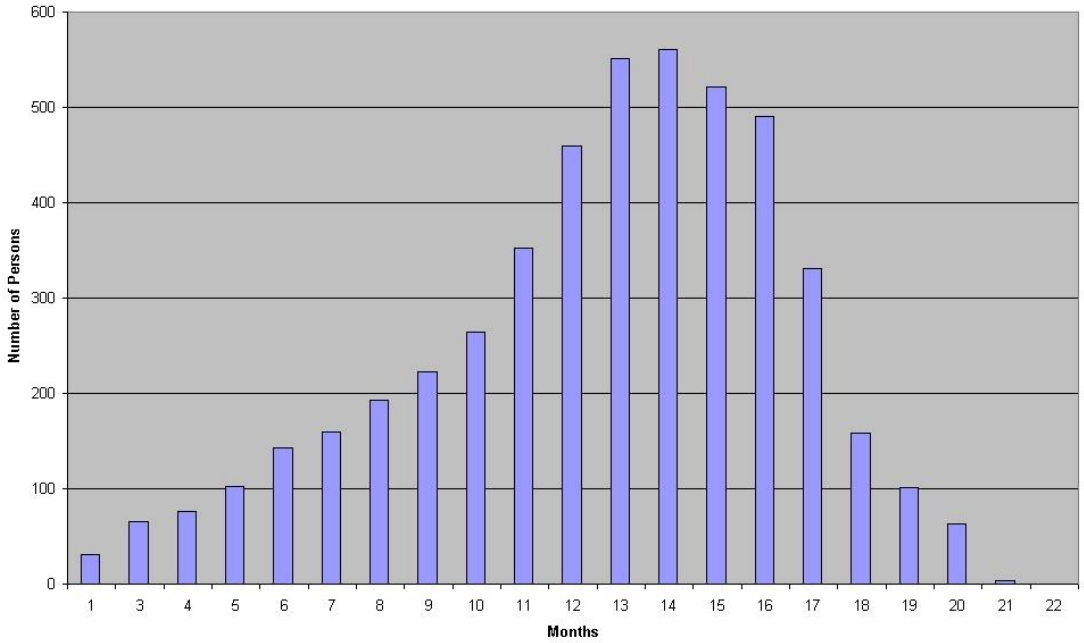


Figure 15 Estimated Workforce for Plant Construction

Operations Phase

The heavy vehicles generated during the operations phase are directly related to the production output of the plant and the destinations and volumes of prill and emulsion produced by the AN plant. Raw materials for the production of the prill and emulsion are likely to be sourced from Gladstone, a distance of approximately 520 km from Moranbah (i.e. Bruce Highway, Peak Downs Highway, Gregory Development Road)

During the operations phase, it is expected that all personnel will be accommodated within the township and outlying areas, making use of carpooling opportunities. Table 13 indicates the number of people that will be employed at the plant, travelling to and from the plant each workday. Assuming a vehicle occupancy rate of 1.7, the number of vehicle trips generated by the plant will be as follows:

» 31 vehicles travelling to the plant, 6 from the plant during the morning peak; and

» 6 vehicles travelling to the plant, 31 from the plant during the afternoon peak.

Table 13 Personnel Requirements during Operations

Number of Personnel	Description	Shift
22	Plant maintenance and operation staff	7.00 am – 4.00 pm
20	Administration Staff	7.30 am – 5.00 pm
10	Plant Operations	6.00 am – 6.00 pm
10	Plant Operations	6.00 pm – 6.00 am

Method of Movement

The AN plant product will be delivered via the road network to a variety of mine sites. The average number of heavy vehicle movements generated per day during operations is likely to be eighteen. The vehicles used in haulage would be B-Triple, Type 1 road trains to transport prill and B-Doubles to transport emulsion.

This includes an estimated 1 heavy vehicle (B-Double) per day will be required to remove waste, bringing the total number of heavy vehicles generated per day to:

» 13 B-Triples (65t load); and

» 4 B-Doubles (50t load).

Table 14 lists the number of heavy vehicles generated per day by the AN plant.

Table 14 Total Generated Heavy Vehicle Movements Per Day

	Production Trucks Per Day	Construction Trucks Per Day
Materials	17	2
Waste	1	3
Total	18	5

During construction, it is estimated that 2 heavy vehicles (B-Double) per day would be required for transport of construction materials and plant to the site, while 3 heavy vehicles (B-Double) per day would be required to remove waste.

Anticipated Times at which Movements May Occur

The heavy vehicle movements generated by the plant could occur at any time of day or night due to the 24 hour operation of the plant. During construction, heavy vehicles containing materials may be more likely to arrive during the morning peak and heavy vehicles carrying waste may be more likely to arrive during the afternoon peak.

Proposed Routes

The proposed roads used in transporting materials from the Moranbah plant to the destination mines are limited to those that have been designed to carry B-Triples and

B-Doubles. After discussion with the DMR, the general location of the roads to be used in transporting the materials to the various mine sites can be found in Table 15. The classification is listed by DMR district boundaries.

Table 15 Production Volumes and Destinations

General Location (DMR District Maps (No./Title)	Prill (tonnes/year)	Emulsion (tonnes/year)
8 Mackay (Eastern Basin)	109,668	25,572
9 Northern	31,320	6,500
10 North Western	18,270	3,792
15 Central Highlands	120,742	33,582
Bowen Basin (Moranbah) Total	**280,000**	**69,446**

Maintenance and upgrading of key transport infrastructure elements.

Traffic studies have been conducted to assess the construction and operational impacts on the existing transport infrastructure (See Section 4.11). A pavement impact study has also been undertaken to determine the impacts on the existing road infrastructure and the provision of contributions for maintenance to DMR.

Rail transportation

Rail infrastructure is located within 3 km (2 km from site boundary) of the AN Plant on the Blair Athol Railway line. In its current form however there are insufficient facilities to support transportation of the AN products to the market. This may be a future opportunity for the operation of the AN Plant. At this stage however there is no intention to transport product by rail.

3.5.2 Energy

The energy requirements from the project will be sourced by the development of an on-site gas fired power generation facility. This facility will provide power for the AN Plant only.

The gas fired annual electricity usage for the AN Plant is estimated to be 91,980 MWh, equating to 70% of the rated output of a 15 MW power generation facility. Coal seam methane will be used for the purpose of generating electricity (1.75 PJ/a) and for the manufacture of ammonia for emulsion and AN (5.5 PJ/a).

Enertrade Pty Ltd will construct the power generation facility. The Enertrade Pty Ltd will own and operate the facility, which will serve the only AN plant. The facility is intended to provide a fully embedded supply (not grid connected) designed to meet DN's plant requirements. However, at this time, options for the supply from an external infrastructure remain open, with a reserve for an external power line and switchyard. The power requirements will be relatively constant and there will be no large start-up power requirements

The generation facility will comprise nine x (nominally 2 MW) reciprocating gas engines (total of 18 MW capacity), located on a 200m x 150m parcel within the AN plant site (see Figure 2 for location of facility). Co-generation facilities have not been investigated at this stage. The facility will also include storage, workshop and control room facilities.

The power generation facility will operate for 24 hours a day, 7 days a week. The feedstock for the AN plant process and power plant will be sufficiently consistent to mitigate the risk of upset conditions. Consequently, peaks in emissions to air will be limited to periods of mechanical malfunction and associated shutdown and startup periods. Such events are likely to occur on a sporadic and infrequent basis.

The power generation facility will be air cooled, therefore no additional water will be required. The gas will be delivered to the generation facility at a pressure of approximately 700 kPa. The gas to fuel the generator is likely to be composed of:

» Methane: 96 - 98%.

» Carbon dioxide: 0 - 1%.

» Nitrogen: 1 - 3%.

The gas engines are of the reciprocating type where the gas is drawn into the combustion chamber compressed and ignited creating the combustion to provide the power to drive the electrical generator. The gas engines will utilise state of the art technology in ignition system and air/fuel ratio control to ensure low emissions and highest engine efficiency.

Figure 16 includes photos of typical power generation facilities at other sites. Note that these power generation packages have their own individual unit enclosures, which are skid mounted to the unit. Typically, unit enclosures are constructed of 3 mm steel sheet, 50 mm rockwool with a perforated metal lining. For example, a Caterpillar generation package (as shown in Figure 16), typically reduce the noise levels from 110 dBA to 85 dBA at a distance of 1m.

Figure 16 Example of Power Generation Facility

3.5.3 Water Supply and Management

Water Supply

Dyno Nobel Asia Pacific Limited is currently in negotiations with BMA for water to be supplied via a trade with its allocated quota for mining purposes. The project water will be supplied via the Burdekin Water Pipeline, which is currently being constructed by

SunWater. The BMA agreement will be structured with an undefined period of time for the water supply. Therefore, DN is also in negotiations with SunWater for a water agreement to be available when the BMA contract is completed. This will cover the operational phase of the project.

The water used during the construction period will be sourced from a third party and outside of the water supply provided to Moranbah. The supply of water for the project will therefore not reduce or impact on the supply to the Moranbah township and will provide for the workforce in both the construction and operational phases of the project. Table 16 summaries the quantities of water required for the project.

To prevent impacts on the Moranbah town water supply DN will provide a supply of water for the operational workforce and their dependents. This is be based on the Australian Burea of Statistics data (2001) on family types for the immediate study area (Moranbah and surrounds) and the estimated water requirements per person of 800 litres per day. This equates to approximately 150 people (including dependents) for the operational workforce of 70 people. In relation to the raw water supply required this equates to approximately 44 megalitres per year provided for the town water supply.

Table 16 Quantities of Water Required

	Water Demand Volume	
Water Required	**Construction**	**Operations**
Maximum hourly demand (raw water)		0.7 ML
Maximum daily demand (raw water)		8.25 ML
Mean daily demand (raw water)	100,000 L	5.4 ML
Maximum monthly demand (raw water)		28 ML
Total potable water demand (ML/day)	Varies Maximum over construction period 0.220 ML/ day for peak construction workforce	15 ML/day (max)
Total annual consumption (raw water)	Estimated 66.5 ML for the construction period.	2,456 ML / year (max)
Water Provision Moranbah township		44 ML/ year
Total quantity of water required	6.6 ML construction operations (excludes potable)	91,000 ML (plant life of 35 years)

Stormwater Management (operational phase)

Figure 17 summaries the basic water management system for the AN plant site. The project has been designed as a zero discharge site with respect to water. Rainfall from outside of the process hardstand will be directed to overland flow on the site.

The diversion of “clean” stormwater from surrounding areas on the site away from the AN plant facility is to minimise the amount of water directed toward the evaporation ponds. Where required, erosion control measures such as sedimentation barriers and revegetation will be used to reduce the risk of turbid runoff water. This diversion of “clean” stormwater will reduce the impact on the Grosvenor Creek catchment, and will also provide a natural buffer should the evaporation pond overtop as a result of any extreme rainfall events.

Rainfall onto the process hardstand areas that store or use hydrocarbons will be controlled within a ‘closed’ system draining into an oily water separator. Clean process water will be discharged to the equalisation pond(s). Waste oil will be stored and delivered offsite to a licensed waste contractor.

Stormwater from roofed areas will be reused after being processed by the water treatment system. This reduces the raw water demand and the size of the evaporation ponds.

Note that all rainfall and site run-off from the process hardstand areas (approximately 7 ha), will be discharged into the equalisation basin(s). The water from the equalisation basins (stormwater run-off, process waste, etc) will be blended with raw water and treated by an ultrafiltration and reverse osmosis (UFRO) plant. The product water services the AN plant and the reject is discharged into the evaporation ponds (approximately 25 ha).

All chemicals will be stored in compliance with the relevant Dangerous Goods and Australian Standards for storage. The chemical storage and handling areas will be bunded and emergency spill kits will be present on site and staff trained in their use. This measure will reduce the mobility of chemical contaminants. Should a major spill event occur, the spilled chemical will be tankered from site by a licensed contractor for disposal. Stormwater collected in each bunded area will be collected in a sump and pumped to the UFRO plant. The collection of the stormwater will not be automated (i.e. it will not drain by gravity) to the pond to ensure that major spills are contained within the bund.

The evaporation pond will contain some diverted stormwater and reject water from the reverse osmosis treatment plant. It is therefore expected to have a relatively high level of dissolved chemicals including traces of stored chemicals, and very high levels of nitrates from the reject Reverse Osmosis (RO) water. The evaporation pond will be impermeable to protect the integrity of groundwater. Stormwater from the access road will be directed toward natural site waterways.

In summary, all process water and stormwater captured on site is either reused or directed to the evaporation ponds. In order to minimise the quantity of stormwater collected in the evaporation ponds, stormwater from off-site will be diverted from flowing on to the site and entering the plant drainage system.

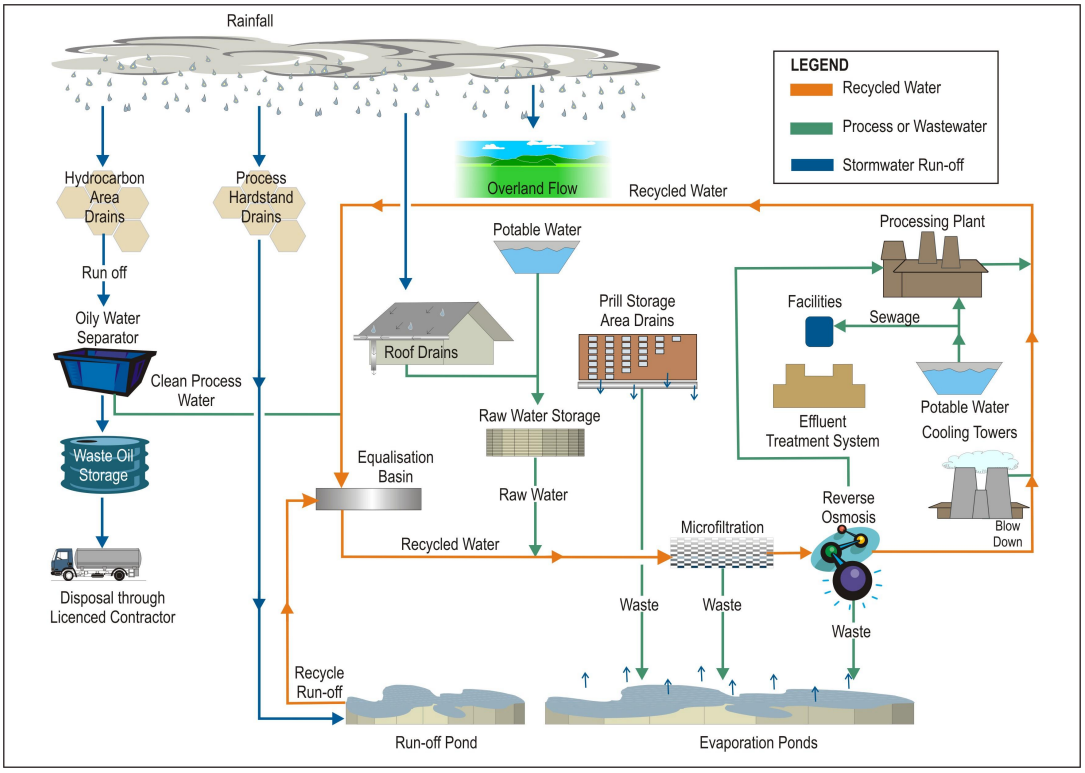


Figure 17 Water Management System

Stormwater Management (construction phase)

Stormwater run-off from in-plant construction areas will flow into the plant drainage system. Stormwater from construction lay-down areas will be directed to the evaporation lagoons after treatment to remove solids. Stormwater from surrounding areas will be diverted from entering the construction lay-down area.

Water for construction activities will be sourced from a third party. The quantity of water used for testing and system flushing is expected to be approximately 20 ML and will be reused, if suitable, or sent to the evaporation ponds.

Process Water

The key processes that consume water during the site operations include:

» Cooling water system evaporation;

» Cooling water system blowdown;

» Cooling tower spray losses;

» Boiler feed water;

» AN solution to the Emulsion Plant;

» Ultrafiltration waste;

» Reverse osmosis reject;

» Demineralised Water Unit Backwash;

» Raw water reservoir evaporation; and

» Potable/Utility/Safety shower water usage.

Water from a number of sources and recycle processes are treated in the UFRO plant for recycle, including:

» Stormwater run-off;

» Cooling tower blowdown;

» Cooling tower side-stream filter;

» Process waste including condensate;

» Demineralised water system backwash; and

» Boiler blowdown.

The consumption of raw water on site will be minimised by the recycling and treatment of plant effluent streams, which include cooling tower blowdown and process condensate.

The water collected for recycling will be blended with raw water and treated for use. There are no intentions to manage water or wastewater jointly with Transfield Pty Ltd (proposed Nebo and Moranbah Power Station Project).

Design of the Evaporation Pond

A water mass balance has been completed to size the evaporation pond. The water mass balance simulated the performance of a hypothetical evaporation pond from 1957 to 2005 using daily rainfall and evaporation data supplied by the DNRW. The water mass balance was completed on the basis that:

The design basis of the evaporation pond was that there should be no overtopping at all during the 49 years analysed. The preliminary mass balance confirmed that there are a number of permutations of evaporation pond areas and depths that can be located within the designated 25 ha area and would not be expected to overtop if the next 50 years are similar to the last 50 years.

Examples include a 20 ha area at 0.8m deep with a maximum total volume of 160 ML. The water balance and details of the stormwater system will be refined further when plant layout details have been finalised. Wastewater from operation of the AN Plant is estimated to be a relatively constant flow of 15 m^3/hr or 130 ML/annum (See Appendix 7.12 for a complete characterisation of the wastewater).

Water Storage

The water storage facilities will be designed to comply with best practice dam design for wastewater management. Table 17 includes the major storage facilities and quantities stored.

Table 17 Water Storage

Water Storage Area	Water Volume / Area
Evaporation ponds	20 to 25 hectares approx (15 m3 / hour design flow)
Raw water reservoir (including fire fighting)	50 ML
Potable water	50 m^3 (subject to detailed design)

Sewage and Greywater

The majority of the operational workforce for the project will be based in the town of Moranbah. The existing sewage system for Moranbah is licensed for a capacity of 4,000 to 10,000 equivalent persons. The increase in population for the operational workforce to the town of approximately 70 permanent operational staff (including dependents) will have a limited impact on the existing sewage infrastructure in Moranbah.

The likely treatment of sewage and greywater for the AN Plant site will be with a Biolytix system (refer to Appendix 7.12 Wastewater for a discussion of the options).

Construction Phase Water Management

A temporary sewage treatment system will be installed for the construction phase of the project. This will be managed (including all construction approvals) by the construction contractor for the project. The contract specification will include the requirement to design the system with regard to the relevant sections of:

» DNRW *On-site Sewerage Code (July 2002)* or any subsequent update of that Code;

» Queensland Recycled Water Guidelines; and

» AS/NZS 1547:2000 On-site Domestic Wastewater Management.

3.5.4 Waste Management

Construction Phase

Construction wastes generated from the site will be typical of the waste streams generated from any major industrial construction project and are likely to include:

» Scrap metal from plant assembly and construction activities;

» Scrap timber;

» Packaging materials including pallets, plastic wrapping, cardboard and wrapping ties;

» Normal domestic waste from construction personnel;

» Electrical wires and wastes; and

» Concrete and solid fill.

Construction is anticipated to generate approximately 3 x 10m^3 bins per week of solid waste for the duration of the construction phase.

The volume and type of waste generated on a monthly basis will vary depending on the construction phase. Waste receptacles will be located on site during construction to enable the segregation of wastes where practical. No solid wastes will be disposed of on site and all waste reuse, recycling and/or disposal will be managed by an external contractor.

A waste management section will be included in the Construction Environmental Management Plan (CEMP) and clearly identify waste streams, storage and final disposal point. Attempts will be made to recycle materials where services are available.

Operational Phase

The main solid waste from the AN plant is spent catalyst. Catalyst loss is negligible. The catalyst supplier ensures that disposal is carried out in line with regulatory requirements, arranges disposal of discharged catalysts. Spent catalyst is recycled after being reconditioned.

Any waste AN prill, such as out-of-specification product, is returned to the plant for reprocessing. Other inert solid waste will be disposed of off-site to local landfill. A summary of a typical year's regulated waste disposal is provided in Table 18, all of which is transported from site by a private contactor for disposal to a licensed disposal facility. This would be expected to increase in proportion with the increased plant size.

Table 18 Waste Disposal from Operations

Waste Stream	Approximate Volume Per annum
Rags and absorbent	36 x 240 L wheelie bin
Empty Drums (note: drum recycling is undertaken where possible)	648 x 205 L
	312 x 20/40 L
Waste Oil	19,200 L
Septic Waste	2 pump outs per year

3.5.5 Telecommunications

Good quality telecommunications is required. The site has minimal mobile phone coverage. Options for landlines, mobiles and internet connection systems will be discussed with Telstra. Communications around the site area is proposed to be via mobiles (where possible). A phone tower on site will provide the required coverage. External communications from the site office will be via both fixed lines and mobiles.

The adequacy of the existing telecommunication network will be reviewed during the design process when the detailed telecommunication requirements are identified.

3.5.6 Workforce, accommodation and other infrastructure

The majority of the workforce for the project is expected to be sourced from outside Moranbah. However, a small proportion of employees may be sourced locally from Moranbah. For the purposes of analyses conducted for the project, it is assumed that 90% of construction employees will reside within the construction camp and the remaining 10% will reside within the township. (See for example, Appendix 7.6 Traffic Assessment).

Workforce requirements for AN Plant construction are discussed below and shown in Figure 15 (Section 3.3.3) and workforce requirements for Plant operations are shown in Table 13 (Section 3.3.3).

The housing strategy for operations has been discussed in some detail on a number of occasions with the BSC, one of the parties of the Moranbah Growth Management Group (MGMG). In addition, DN is in the process of negotiations for an option to purchase a number of houses in Moranbah in order to provide accommodation for the operating personnel.

The operational workforce for the project will bring different family units into the town. One of the identified issues in relation to the population of Moranbah is the significantly higher proportion of men to women in the 25 to 40 year age bracket primarily due to the type of work in the area (mining) and the periodic transient work (e.g. construction).

Construction Camp

A construction camp is proposed to provide for the initial accommodation of up to 550 people. The camp will be located within close proximity to the plant (see Figure 2). The development area of the camp is proposed to be approximately 15.75 ha (with additional 10 hectare irrigation area for effluent disposal) and will comprise the following components:

- 400 (with a maximum of 550) rooms, comprising fit out with own entry;
- 50 site staff beds;
- Separate ablution and laundry blocks;
- Covered walkways;
- Canteen comprising dining room and kitchen;
- First aid/administration room;
- Recreation room;
- Roads, fencing and general security features;
- Water Supply and holding tank;
- Laundry; and
- On-site effluent treatment and disposal.

A direct access road between the AN Plant and the construction camp is proposed to largely negate the need for the construction workforce to access Goonyella Road. Pest management on site will be undertaken in Accordance with the *Land Protection (Pest and Sock Route) Management Act 2005* (class 2 weeds have been identified in the area and will need to be managed).

3.6 Rehabilitation and Decommissioning

Section 5 of the EIS contains an Environmental Management Plan – Operations, which includes mitigation strategies for the land use, rehabilitation and revegetation of the site following the decommissioning of the AN plant. Decommissioning of a plant or site is the process of removing, destroying, or rendering safe contaminated equipment and materials, thus restoring, as far as practical, the site to its original condition.

The DN Engineering Standards – Plant, (Document reference PLANT01, rev. 02) contains detailed procedures for decommissioning with the objective to achieve clean closure under applicable environmental laws. The procedures address the following areas:

1. Initial Planning
2. Site Reconnaissance
3. Regulatory Considerations
4. Project Work Plan
5. Financial / Accounting
6. Safety
7. Security
8. Record Keeping
9. Contracting
10. Disposal Plan
11. Burning
12. Blasting
13. Chemical Cleaning
14. Closure

It should be noted that the rehabilitation and decommissioning of the site would be dependent of the applicable legislation at that time and on the proposed land use post decommissioning.

The anticipated use period of the construction camp for this project is approximately 22 months. Once the AN facility has been constructed, the whole site may be decommissioned through the removal of the construction camp and other facilities. However, the site may be sold to a third party as an alternative construction camp for future use. Vehicle movements during decommissioning are not anticipated to have a significant impact on Goonyella Road.

4. Environmental Values and Management of Impacts

4.1 Land

This section of the EIS describes the existing environmental values of the land area, as defined by the EP Act and associated Environmental Protection Policies (EPPs) that may be affected by the project. It defines and describes the objectives and practical measures for protecting and enhancing environmental values, describes how nominated quantitative standards and indicators may be achieved, and how the achievement of objectives will be monitored, audited and managed. Further information to support each value is available in the relevant reports that accompany the EIS, which are identified in each of the Specialist Studies.

4.1.1 Description of Environmental Values

Land Use and Tenure

The site and surrounding land is currently used predominantly for grazing purposes with the majority of the immediate area under the GHPL held by Judith Flora Camm (part of Picardy cattle station). Refer to section 3.2.2 for further detail about the freehold acquisition process being pursued for the AN plant site.

The nearest industrial development to the site is an Enertrade Compression Station, which is adjacent to the eastern boundary of the site. An Ergon Power Station is approximately three kilometres east from the site. Marley accommodation camp is located near Ergon's Power Station and is the nearest residential development to the site.

Arrow Energy Pty Ltd is currently using land north and east of the site for gas extraction. Consequently, an extensive network of subterranean gas piping exists, including pods and surface holding ponds. Moranbah North coal mine is approximately 30 kilometres north of the site and Coppabella coal mine is approximately the same distance southeast of the site.

An investigation of the significance of the flora and fauna contained within and surrounding the subject site was undertaken and identified the following.

1 The proposed development site contains the Brigalow Belt Bioregion and the Northern Bowen Basin Sub Bioregion. Although this remnant vegetation is classified as 'Not of Concern' under the Queensland VMA, pockets of this vegetation form part of a bioregional corridor.

2 Remnant vegetation classified as 'Endangered' and 'Of Concern' under the VMA is located within two (2) kilometres southwest and northeast of the site.

Section 4.7 of the EIS discusses the flora assessment for the proposed AN Plant in detail. Searches were also conducted of the Environmental Management Register and the Contaminated Land Register for Lot 10 on SP175258. Results of the searches showed that the site is not included on either of the registers (refer Appendix 7.14).

Tenure

The real property description of the project area (the site) is part of Lot 10 on Plan SP175258. The land was previously held by Judith Flora Camm (Camm) as leasehold land, held as Grazing Homestead Perpetual Lease *30/4123* (GHPL). A GHPL is continued as a perpetual lease for grazing and/or agricultural purposes. A corporation may not acquire or hold an interest in this tenure and a GHPL also extinguishes Native Title over the subject land.

Easements

A search has been conducted of all easements affecting Lot 10 on SP175258. The State Tenure Search for the lot indicates eight easement agreements between different parties. A description of the easements in place over the area is detailed in Section 3.1.2.

Inspection of the survey plan confirmed only Easement AA burdens the site for the proposed plant. Easement AA is described as, Easement No 708797454 (Easement AA) granted on 5th July 2005 between the lessee and Enertrade (NQ) Pipeline No 1 Pty Ltd and Enertrade (NQ) Pipeline No 2 Pty Ltd for the purposes of a pipeline. This easement lies across the road frontage of the proposed AN Plant on Goonyella Road. A plan of the easements is provided in Figure 18.

The extract for Easement AA provides the following terms and conditions:

Pursuant to the agreement between the lessee and Enertrade (NQ) Pipeline No 1 Pty Ltd and Enertrade (NQ) Pipeline No 2 Pty Ltd (Pipeline Owner), the lessee may use the Easement Area for agricultural and maintenance purposes including cultivation, grazing, noxious weed control and normal burning practice. However, the lessee must obtain the Pipeline Owner's consent to:

1 *excavate, drill, install or erect any structures or installation in the Easement Area;*

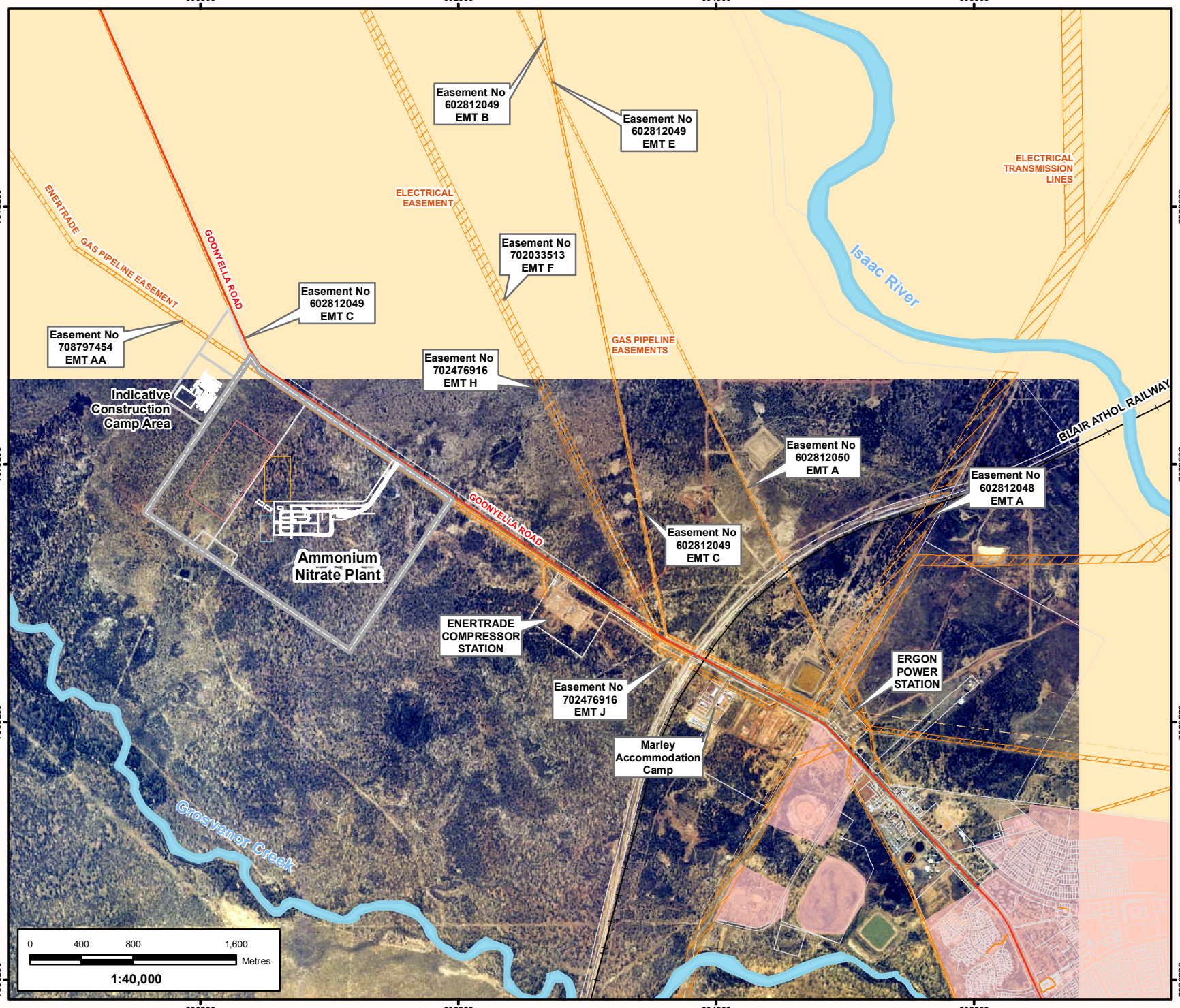
2 *alter or disturb the present grades or contours of the Easement Area;*

3 *plant any tree or install any fence posts within 3 metres of the Pipeline;*

4 *undertake any ground penetrating activity associated with regrowth control, water diversion or pipeline installation; or*

5 *do anything which would jeopardise the safety or operation of, or interfere with, the Pipeline.*

With regard to access to and through the easement, clause 5.1 of the agreement requires that the lessee shall have access to the Easement Area at all times provided that when accessing the Easement Area the lessee complies with any reasonable safety directions of the Pipeline Owner. In addition, Annexure A (of the agreement) requires to the extent reasonably possible, all vehicles are to be driven at a moderate to slow speed and on established tracks and roads and keep and maintain all such tracks or roads in good and trafficable condition.



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Date: 02-10-06 Rev A
Datum: GDA94 (MGA) Zone 55
Source: Base data sourced from the State of Queensland, Department of Natural Resources, Mines. All other infrastructure supplied by Dyno Nobel Asia Pacific Ltd.
File: G:\41\15824\GIS\Maps\Final\MXD\fig18_Moranbah_Easements_mod.mxd

Legend

- Ammonium Nitrate Plant Site
- Evaporation Pond
- Generating Facility*
- Raw Water Reservior
- Cadastre
- Easements
- Developed Area
- Watercourse
- Major Road
- Railway
- Powerlines

*Generating Facility location is subject to detailed engineering.

Proposed Ammonium Nitrate Plant

Environmental Impact Statement

Figure 18
Moranbah Easements

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Mining and Petroleum tenure

There are a number of different petroleum and mining interests in the immediate vicinity of the project. Figure 7 of Section 3 provides a map of the mining and petroleum tenure over the project site. There is a Mineral Development Lease (MDL) held by the Shell Company of Australia Limited that covers the site over which the project is to be developed. Coal reserves in this area are located under the proposed site and to the west. Anglo Coal Pty Ltd (Anglo Coal) is the operator of these leases and has been in consultation with DN regarding the operation of the AN Plant over this MDL. Anglo Coal does not intend to further develop the reserves located under the proposed AN Plant (refer to Section 4.1.1.2).

In addition, a Petroleum Lease is held by Arrow Energy Pty Ltd over a portion of Lot 10 (GHPL 30/4123). The Petroleum Lease is granted pursuant to the *Petroleum and Gas (Productions and Safety) Act 2004* (PGPS Act), which deals with the specifics of coal seam methane. The PGPS Act allows for incidental activities to be carried out on land subject to the lease.

Native Title Claims

There are two Native Title claims current for the site. These are the BBKY#4 Native Title Claim and the Wiri#2 Native Title claim. Further detail in relation to Native Title and cultural heritage are provided in Section 3.1.2.

Level of Statutory Planning Compliance

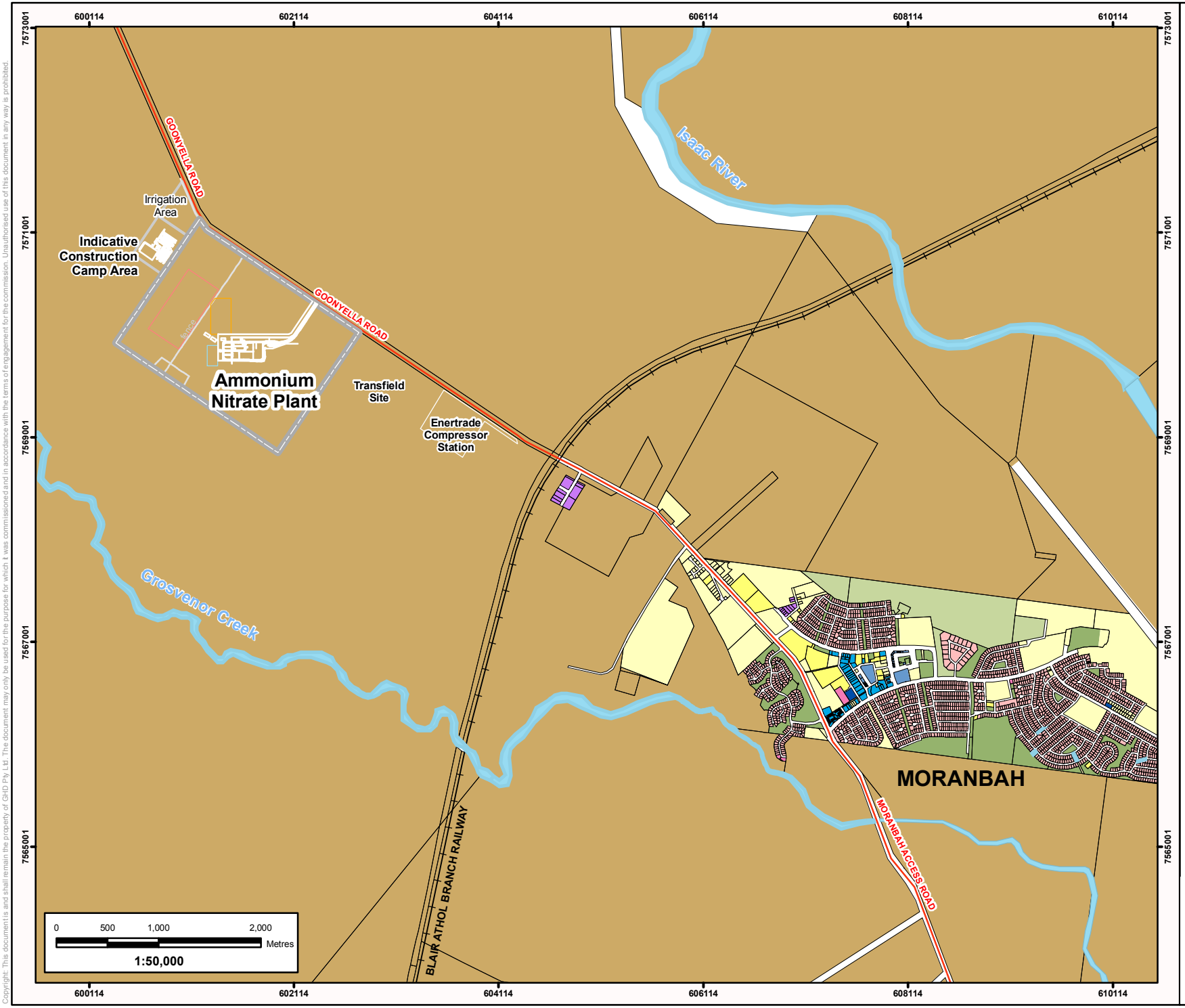
Belyando Transitional Planning Scheme

The site is located within Belyando Local Government Area and is subject to the provisions of the *Belyando Shire Transitional Planning Scheme* (TPS). The lot is designated as Rural A Zone, intended to protect those agricultural or grazing areas surrounding the town of Moranbah from undesirable urban development and to ensure their retention for rural purposes. This zone is also intended to cover those rural areas which do not have any value for agriculture or grazing but which nevertheless, need to be preserved and retained in their natural state. Figure 19 provides the land use zoning of the proposed site and the surrounding area.

Although an AN Plant is not specifically listed in either Appendix 4, 6 or 7 of the TPS, pursuant to Part 2 of the TPS, the proposed use of an AN Plant falls under the definition for both a ‘Heavy Industry’ and a ‘Noxious or Hazardous Industry’. It is similar to the uses listed in each of the appendices 4 and 7. It is noted however, irrespective of which definition is utilised, the level of assessment applicable to the proposed development is not altered.

Level of Assessment

For both use definitions (*Heavy Industry* and *Noxious and Hazardous Industry*), the relevant columns of assessment for the Rural A Zone under the planning scheme indicate that the proposed project (material change of use) would be identified as Impact Assessable development and therefore assessed against the provisions of the entire TPS.



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Date: 02-10-06 Rev B
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Source: Base data sourced from the State of Queensland, Department of Natural Resources, Mines. All other infrastructure supplied by Dyno Nobel Asia Pacific Ltd.
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Legend

- Ammonium Nitrate Plant Site

Zoning

- Central Business
- Local Shopping
- Commercial
- Industrial
- Private Open Space
- Public Open Space
- Residential A
- Residential B
- Rural
- Rural A
- Special Facilities
- Special Purposes
- Unzoned

Generating Facility location is subject to detailed engineering.

Moranbah Ammonium Nitrate Plant

Environmental Impact Statement

Figure 19
Zoning - Study Area

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The proposed development of a construction camp is not directly identified under the TPS Table of Zones. As the site is within the Rural A Zone, development of construction camp is identified as Code Assessable development, (Refer to Column 4, Section 3.3 – Table of Zones). The proposed development would therefore be assessed accordingly against the TPS.

Compliance with the Belyando Shire Transitional Planning Scheme

Appendix 7.14 of this EIS provides the relevant codes of compliance detailed under the TPS. Table 2 of the TPS provides the requirements in relation to development, relevant to the AN facility. These requirements include provisions for:

1 parking;

2 industrial uses; and

3 landscaping.

A comment on compliance has been provided for each requirement (provided in tables within Appendix 7.14). Table 3 of the TPS provides requirements in relation to development of the proposed construction camp. Provisions for residential uses, parking and landscaping have been addressed through an accompanying comment on compliance. Table 4 provides requirements in relation to the proposed development of a sewage treatment plant for the construction camp. A comment on compliance has been provided for each requirement for Water Supply and Sewerage Services as required under the planning scheme. Table 5 provides requirements in relation to the proposed development of the Power Plant. A comment on compliance has been provided for each requirement of Electricity within the TPS.

Belyando Shire Council Strategic Plan (Strategic Plan)

The Strategic Plan designates preferred dominant land uses and identifies BSC's aims and objectives for the future, including where and how development should occur. It is noted that the preferred dominant land uses are not zones and do not confer any rights to use land. Under the Strategic Plan, the subject site is designated as a Rural Preferred Dominant Land Use. Areas within this land use are intended for the mainstream land uses including cropping, mixed farming and grazing. It includes intensive agriculture where this is carried out in conjunction with the above uses. Table 19 provides the aims, objectives and the implementation of these objectives for the Rural Preferred Dominant Land Use. A comment on compliance has been provided for each objective.

State Planning Policies

State Planning Policies (SPP) identify the State Government's interest in development related matters and must be considered when assessing 'assessable development'. A list of the SPP and their applicability to the proposed development are included in Table 19 below.

Table 19 Applicability of Planning Policies to the Proposal

Policies	Response
State and Regional Coastal Management Plans	State coastal plans describes how the coastal zone is to be managed as required by the *Coastal Protection and Management Act 1995.* State coastal plans provide coastal management policy direction and define how government, industry and the community should implement these directions. **These Plans are not applicable to the proposed development as the site is not within a coastal management district or erosion prone area.**
SPP 1/03 Mitigating the Adverse Impacts of Flood, Bushfire and Landslide	This SPP aims to minimise the potential adverse impacts of flood, bushfire and landslide on people, property, economic activity and the environment. Where a transitional planning scheme is in force, the assessment manager must have regard to the SPP. **The subject site is identified as having "Low Bushfire Hazard" with pockets of "Medium Bushfire Hazard". The area is not considered as prone to flooding (refer to section 4.2 Climate) or landslide.**
SPP 1/02 Development in the Vicinity of Certain Airports and Aviation Facilities	This SPP sets out broad principles for protecting airports and aviation facilities considered essential for the State's transport infrastructure or the national defence system. **SPP 1/02 is not applicable to the proposed development as the site is not located within the vicinity of an aviation facility. The Moranbah airport is not listed under this SPP.**
SPP 2/02 Planning and Managing Development Involving Acid Sulfate Soils	SPP 2/02 applies to all land, soil or sediment at or below 5 metres Australian Height Datum (AHD) where the natural ground level is below 20 metres AHD in the local governments listed in Annex 1 of SPP 2/02. The SPP applies to development that would result in: » the excavation of, or otherwise removing, 100m³ or more of soil or sediment from areas below 5m AHD; or » filling of land involving 500m³ or more of material with an average depth of 0.5 of a metre or greater. **The proposed site is not located in an area subject to acid sulfate soils and therefore SPP 2/02 is not applicable to the development.**
SPP 1/92 Development and the Conservation of Agricultural Land	This policy seeks to protect good quality agricultural land from subdivision into uneconomic units and to minimise the potential for land use conflicts between agricultural and non-agricultural land uses. **The subject site is not classed as Good Quality Agricultural Land as indicated on mapping contained in Shields (1984) 'Land Suitability Study of the Collinsville-Nebo-Moranbah Region'. Consequently, SPP 1/92 is not applicable to the development**

SPP 1/03: Mitigating the Adverse Impacts of Flood, Bushfire and Landslide

State Planning Policy 1/03: Mitigating the Adverse Impacts of Flood, Bushfire and Landslide (SPP 1/03), is a statutory instrument expressing the State's interest in ensuring that the natural hazards of flood, bushfire, and landslide are adequately considered when making decisions about development. Table 20 identifies the proposed plant's compliance with SPP1/03.

Table 20 Outcomes of SPP 1/03: Mitigating the Adverse Impacts of Flood, Bushfire and Landslide

Outcome	Compliance
Outcome 1: within natural hazard management areas, development to which this SPP applies is compatible with the nature of the natural hazard, except where: » the development proposal is a development commitment; or » there is an overriding need for the development in the public interest and no other site is suitable and reasonably available for the proposal.	The site is not subject to flooding or landslide, but is subject to areas of low and medium level bushfire risk. The proposed AN Plant will be designed appropriately to maintain the safety of people and property by mitigating bushfire risk through: » allotment design and the sitting of buildings; » including firebreaks providing adequate setbacks between buildings/structures and hazardous vegetation; » providing adequate road access for fire-fighting/other emergency vehicles and safe evacuation; and » providing an adequate and accessible water supply for fire fighting purposes.
Outcome 2: Development that is not compatible with the nature of the natural hazard but is otherwise consistent with Outcome 1: » minimises as far as practicable the adverse impacts from natural hazards; and » does not result in an unacceptable risk to people or property.	The proposed AN plant will minimise, as far as practicable, the adverse impacts from natural hazards. Management practices will be employed during operation of the plant, to ensure risks to people or property are minimised.
Outcome 3: Wherever practicable, community infrastructure to which this SPP applies is located and designed to function effectively during and immediately after natural hazard events commensurate with a specified level of risk.	Not applicable, the proposed use is not defined as community infrastructure in either the SPP 1/03 or Schedule 5 of the *Integrated Planning Act 1997*.

Whitsunday Hinterland and Mackay Regional Plan

The Whitsunday, Hinterland and Mackay (WHAM) Regional Plan is a regional strategic planning project that encompasses the City of Mackay and the Shires of Bowen, Whitsunday, Mirani, Sarina, Nebo, Broadsound and Belyando. The Regional Plan is a non-statutory document, which provides the strategic framework for guiding growth and development in the region over the next 20 years and primarily focuses on future policy directions for the region.

Part D (WHAM) Integrated Regional Goals and Strategies

The Plan incorporates an integrated set of goals and strategies to address the key issues of the WHAM region. These integrated goals and strategies provide an overarching policy and planning framework through which the Regional Vision can be achieved. Of particular relevance to this project are the regional goals and strategies for Economic Development within the region. Within the plan, mining has been identified as one of the region's three major industries, contributing to a solid economic base. In order to maintain, strengthen and diversify the industry, key strategic directions have been developed for mining and manufacturing as follows:

1 Supporting opportunities in new mining ventures;

2 Protecting the integrity of mining operations and mineral deposits;

3 Investigating opportunities for additional compatible co-use of mining infrastructure; and

4 Supporting opportunities to expand and diversify manufacturing/engineering industries.

To address these strategic directions, the Plan identifies a goal and a set of strategies for the development of mining and manufacturing. Those relevant to the project include:

» Economic Climate

Goal:

To establish a stable, cost-competitive and sustainable climate for business and investment that facilitates economic growth and employment in the region.

Strategies:

Encourage investment and reinvestment of capital into the region to ensure economic sustainability for the longer term.

» Partnership and Coordination

Goal:

To enhance the cooperative and pro-active partnership between stakeholders to facilitate development of sustainable business and industry initiatives in the region.

Strategies:

Continue to support and foster improved relationships and partnerships between regional and sub-regional organisations, industry groups and government.

» Mining and Manufacturing

Goal:

To support and enhance the region's mining and manufacturing industry by maximising economic benefits while managing social and environmental impacts.

Strategies:

Establish strong links between regional representatives of mining industries, local and state government agencies, business and industry and other stakeholders to ensure future industry needs are met in a timely manner, and to foster cooperative relationships and alliances to undertake initiatives to maximise the associated benefits for the region.

Encourage the mining industry to collaborate and assist government and local communities to develop sustainable opportunities for employment and training and address accommodation, transport and business generation issues.

Part E (WHAM) Regional Structure Plan

Regional Structure Plan Elements, Economic Development

The Bowen Basin is one of Australia's largest coal producing regions with over 20 operational mines and significant reserves to support future activities. Mining will remain a leading component of the region's economy in the next 20 years. There is a need to maintain accessibility to the region's mineral resources and to provide and maintain future infrastructure and support services to the mining industry.

Future development activity over the next five to ten years is likely to be concentrated in the Bowen Basin area with coal exports continuing to be handled through regional port terminal facilities at Abbot Point, Hay Point and Dalrymple Bay. The Region's known reserves of other extractable minerals including shale oil, coal seam methane, gold, nickel, magnesium and cobalt provide further opportunities for growth in this sector.

Hinterland Sub-Regional Structure Development Plan

In recent years the hinterland has experienced a declining population, primarily due to changes in coal mining operational and workforce practices and the general coastal drift evident throughout rural Queensland. Notwithstanding population decline, the hinterland makes a significant contribution to the region's economy, with potential for future growth in mining, grazing, agriculture and tourism.

With respect to mining, coal seam methane has recently emerged as a significant economic development opportunity in the Moranbah area.

As is evident, the proposed development for an AN Plant will assist in addressing the development of the mining and manufacturing industry and its contribution to the region's economy. The plant will provide mines in the region with a reliable source of AN. The project will also support employment and economic development within Moranbah. The goals and strategies of the WHAM Regional Plan will be addressed in further detail in the development application for the plant and associated construction camp.

Potential impacts on surrounding land uses

The project and its location are both logical extensions of other industrial developments in the area and can support industrial land planning around Moranbah. The area surrounding the project already has in place significant industrial uses. With the constraints on development surrounding the town of Moranbah this area is the logical area for any future development of industrial infrastructure.

The location of the AN Plant and the presence of these existing industrial facilities will prevent any urban development in the immediate vicinity of the project. The AN Plant site features an extensive buffer area to limit the offsite impacts from the facility. There will be an impact on both the social infrastructure in Moranbah and an increase in the number of people accessing the town as a result of the project. This is further discussed in the SIA undertaken as part of the EIS (see Section 4.9).

There will be some visual impact on the town from the stacks located at the plant site, which will be visible in a number of locations around the township (refer to Section 4.1.1.4).

Topography

The project site has an elevation of approximately 260 m above sea level (mASL). Within a 10 km radius of the site, the terrain is predominantly flat. There are a number of low-lying ranges of hills approximately 15 km to the north east and south west of the site. However, such hills are an exception to the site's surrounding topographical character.

Figure 20 provides five metre contours over the site and the surrounding environment. The topography of the area slopes away from the AN Plant site in both north and south directions, with the plant site located approximately 255 m above sea level sloping away to the two watercourses of Grosvenor Creek and the Isaac River at approximately 225 m above sea level. A map detailing site contours (0.25 m) is provided in Figure 18 of Section 3.1. This map identifies some areas of elevation over the site with a gentle slope running towards the south west of the site.

A slope analysis of the site was also undertaken and provides details of the drainage around the site (see Figure 21). The site has a gentle slope with the majority of the site with less than 5% slope.

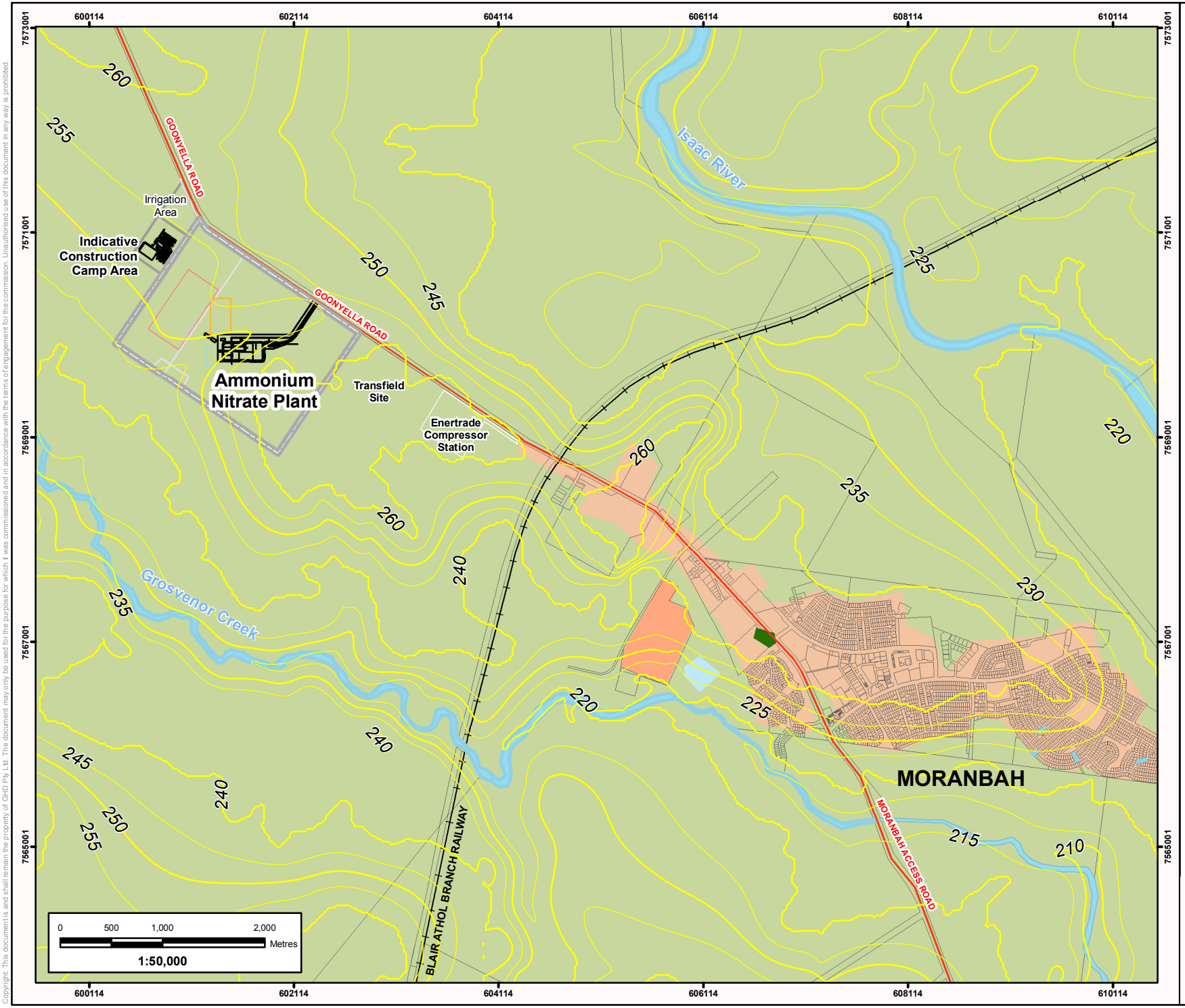
Geology and Soils

Geology

An assessment of the geology and coal resources of the project was made using publicly available information. An assessment of the site's soils was undertaken, and this specialist study is provided in Appendix 7.13.

The Moranbah area is located within the Bowen Basin of central Queensland, a coal resource area of international significance. The Bowen Basin is about 600 km long and up to 250 km wide, and contains vast resources of Permian black coals. Of these black coals, the late Permian coals of the Moranbah Coal Measures are favoured, as they provide uniformly high grade coking coals. The project is situated over a section of these Moranbah Coal Measures, which range in thickness from 250 m to 300 m, and variably consist of sandstone, shale, mudstone and coal. The aggregate thickness of coal in the Moranbah Coal Measures ranges from 12 m to 24 m, and may consist of up of up to eight seams. The seams of economic significance within the Moranbah Area are the P, Harrow Creek and Dysart Seams.

The study area is underlain by Oligocene to Miocene (36.5 – 5.3 Ma) aged sediments. Late Cainozoic aged floodout and residual sands, soils and gravel extend regionally to the north, south and west of the study site. Tertiary aged (66.4 – 1.6 Ma) volcanics, consisting mainly of basalt outcrop, are located 500 m southeast and 1.5 km north east of the site. Extensive exposures of sedimentary rocks of the Permian aged (286 – 245 Ma) Back Creek Group are located approximately 1.5 km south west of the study site. Sedimentary facies of the Back Creek Group include quartz, sandstone, siltstone, carbonaceous shale and minor coal deposits.



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Date: 02-10-06 Rev B
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Source: Base data sourced from the State of Queensland, Department of Natural Resources, Mines. All other infrastructure supplied by Dyno Nobel Asia Pacific Ltd.
File: G:\41\15824\GIS\Maps\Final\MXD fig20_Elevation_and_Land_Use.mxd

Legend

- Ammonium Nitrate Plant Site
- Evaporation Pond
- Generating Facility*
- Raw Water Reservior
- Cadastre
- River
- Contours

Land Use

- Conservation and natural environments
- Intensive uses - Residential
- Intensive uses - Services - Recreation and culture
- Production from relatively natural environments - Grazing natural vegetation
- Water - Reservoir/dam

*Generating Facility location is subject to detailed engineering.

Moranbah Ammonium Nitrate Plant

Environmental Impact Statement

Figure 20
Elevation & Land Use

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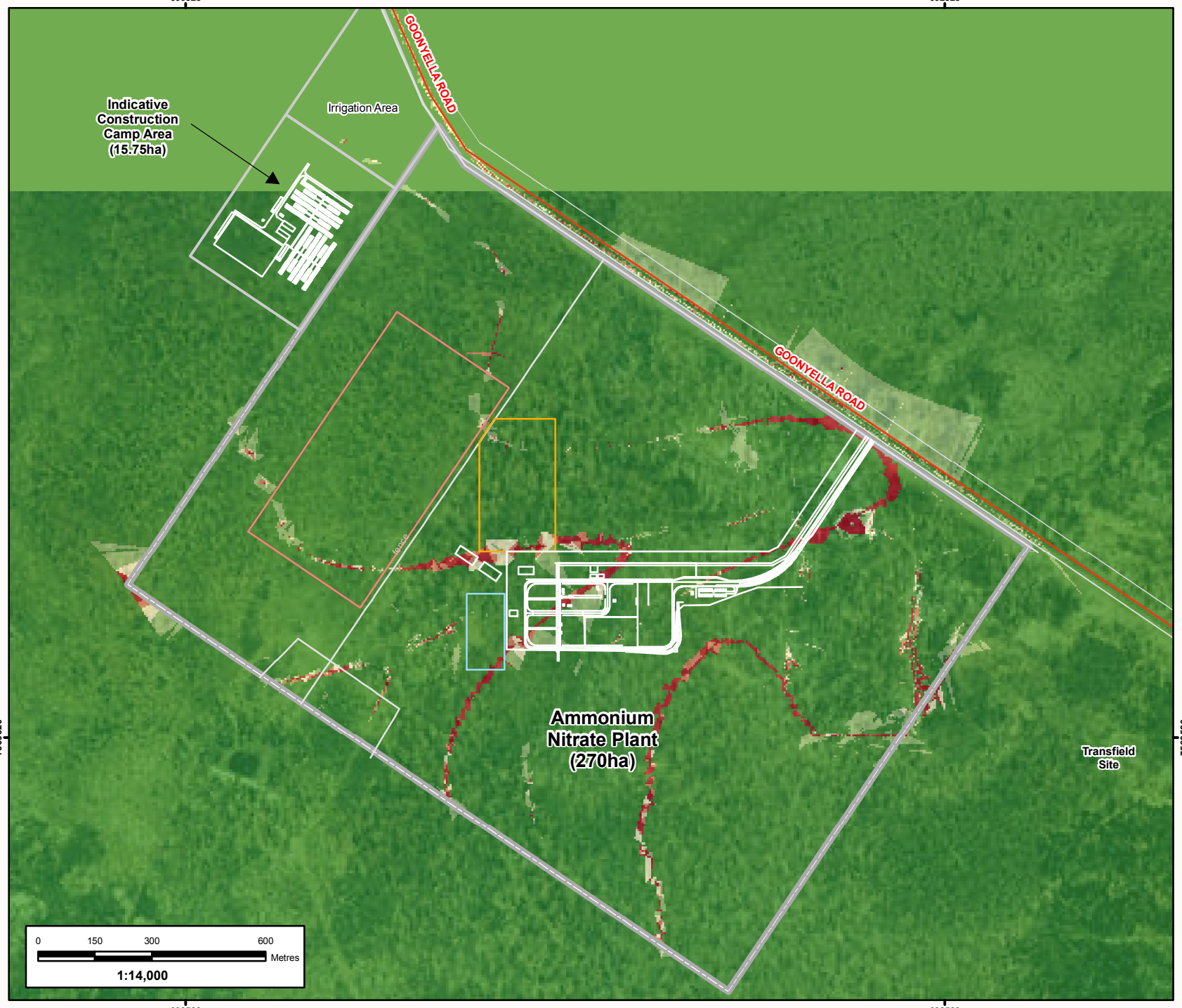

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Legend

- Ammonium Nitrate Plant Site
- Evaporation Pond
- Generating Facility*
- Raw Water Reservior
- Cadastre
- Watercourse
- Major Road
- Railway

Slope Analysis % (Indicative Only)

- 0 - 5%
- 5 - 10%
- 10 - 15%
- 15 - 20%
- >20%

*Generating Facility location is subject to detailed engineering.

Moranbah Ammonium Nitrate Plant

Environmental Impact Statement

Figure 21
Slope Analysis

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Coal Resources

In the Moranbah area, the Moranbah Coal Measures are covered by an irregular veneer of up to 150 m of basalt and poorly consolidated sediments. This Cainozoic cover frequently precludes the use of open-cut mining. The AN plant site lies between and along strike of several major coal mines including BMA's Peak Downs and Goonyella open cut operations and Anglo Coal's Moranbah North underground longwall operation. The coal seams exploited by these operations are those of the Moranbah Coal Measures, and are known for producing low-ash hard coking coals.

The project site and inferred 1.5 km buffer could potentially affect three Mining Tenements (refer to Table 21). The 1.5 km buffer was based on Australian Standard AS2187.1-1998 "Explosives – Storage, transport and use" Table 3.2.3.2, using a storage capacity of 15,000 T AN stored at the centre of the site. This Standard suggests a 1.1 km separation distance between a precursor facility and a magazine of explosive material. Exclusions under this standard includes storage for AN, other than minimum clearance distances to magazines for the storage of explosives (under AS2187.1-1998).

Table 21 Mining Tenements Affected by Project

Tenement	Holder	Beneficial Owner	Name	Comment
MDL274	Shell Company of Australia Ltd	Anglo Coal Pty Ltd	Grosvenor	Covers 70% of the AN Plant and Buffer
EPC552	Anglo Coal (Grosvenor) Pty Ltd	Anglo Coal Pty Ltd	Grosvenor Exploration Lease	Covers 90% of the AN Plant and Buffer
MDL166	Moranbah North Coal Pty Ltd	Anglo Coal Pty Ltd	Moranbah North	<1 km north of the AN Plant Buffer

Consultation with geological representatives of Anglo Coal has indicated that the company does not envisage undertaking any mining operations in the area of the project for the following reasons:

1 The depth to the top of the Harrow Creek and Dysart is considered likely to be too deep to allow an open cut mining operation;

2 The Cainozoic cover of semi-consolidated sands, gravels and basalt is an unsuitable material to act as a roof for an underground mining operation; and

3 In the vicinity of the project site there is insufficient unweathered Permian strata above the Harrow Creek and P Seams to provide a suitably strong roof to an underground operation.

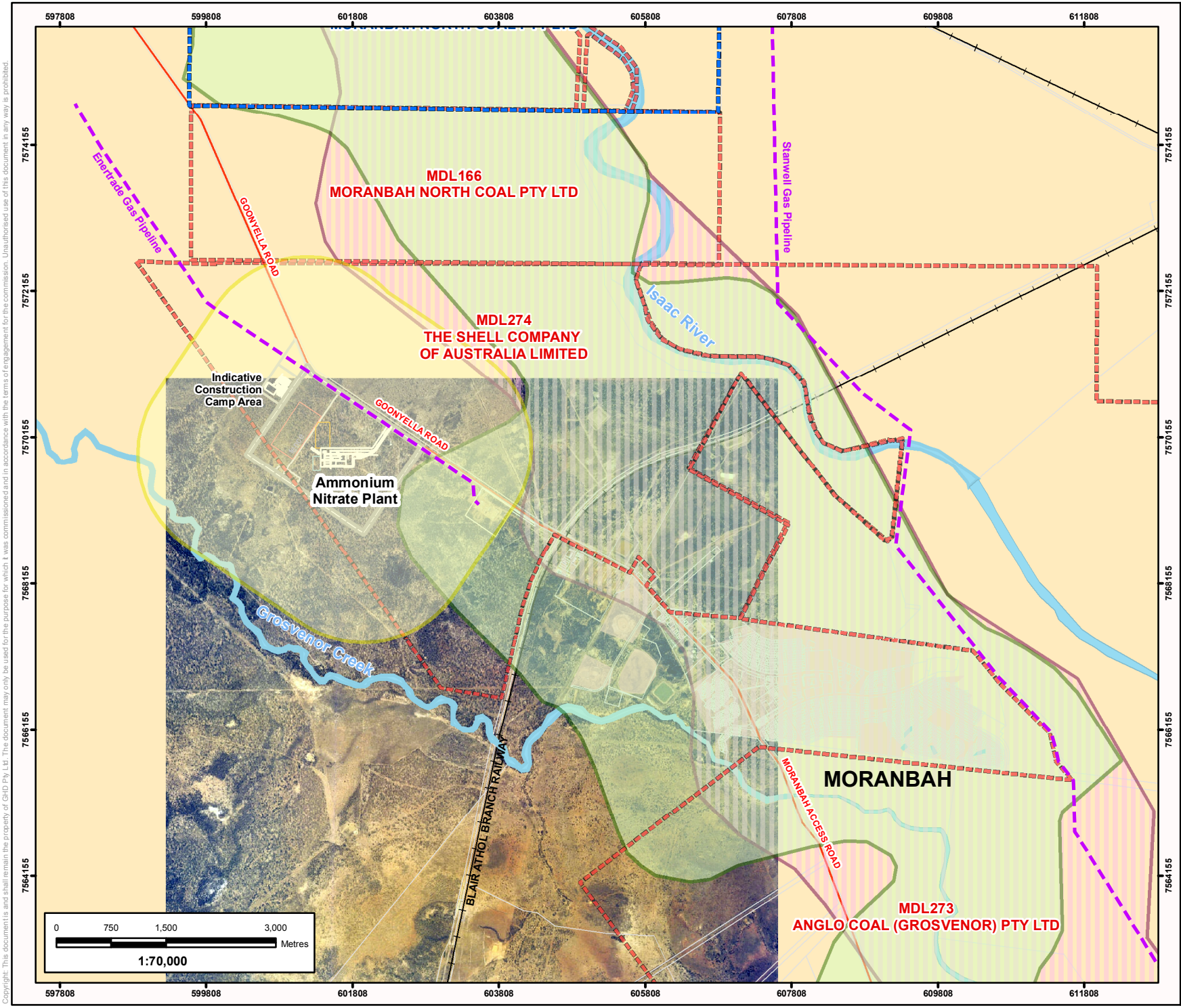
The resource plans for the Dysart, Harrow Creek and P Seams were digitised from the Wallin and Koppe (1978) report and overlain with the project location and other infrastructure. A 1.5 km buffer surrounding the proposed site was created, and

resources within this buffer calculated from each seam. This estimate shows that there is potentially less than three million tonnes of coal directly underlying the proposed site or its buffer.

It can be concluded that there are coal seams of significance that could potentially be directly affected by the project in the Moranbah area (Refer to Table 22). However, these seams are not economically viable using current mining methods due to their depth (for an open cut operation) and unsuitability of roof materials (for an underground operation). Figure 22 provides a map of the coal reserves in the area with a 1.5 km buffer distance for the development of the AN Plant used as the basis for calculating the volume of coal affected provided in Table 4.

Table 22 Coal Resources Affected by Proposed AN Plant

Seam	Area (k. sq. m)	Avg. Thick. (m)	Assumed Density	Top Depth (m)	Resource (Mt)
Dysart	610.6	3.00	1.5	140	2.75
Harrow Creek	0	3.75	1.5	140	0
P Seam	0	3.50	1.5	130	0
Total					2.75



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File: G:\41\15824\GIS\Maps\Final\MXD fig22_Moranbah_Coal_Resources.mxd

Legend

- Petroleum Pipeline
- Ammonium Nitrate Plant Site
- Evaporation Pond
- Generating Facility*
- Raw Water Reservior
- Cadastre
- Developed Area
- Watercourse
- Major Road
- Railway
- 1.5km Buffer of Ammonium Nitrate Plant Site
- Mineral Development Licence
- Mining Lease
- Dysart Lower Seam Coking Coal Resource Extent
- Harrow Seam Coking Coal Resource Extent

*Generating Facility location is subject to detailed engineering.

Moranbah Ammonium Nitrate Plant

Environmental Impact Statement

Figure 22
Mineral Development Leases and Coal Resources

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Soils

A detailed survey was undertaken of the soils on the site. Refer to Appendix 7.13 for details of the findings. In summary, there were two different land units identified in the project area. The distinguishing factor between these units is soil type - Sodosols (Land Unit 1) and Kandosols (Land Unit 2). The area to be impacted by the proposed foot-print (210 ha of the site (270 hectares in size)) was investigated. Land unit 1 encompassed the largest area being 160 ha, whilst the size of Land Unit 2 is 50 ha. Vegetation communities across both land units were similar, being predomiantly *Eucalyptus populnea* woodland and grasses.

The project area was assessed to be suitable for Pastoral Land, and is not good agricultural land. This land is suitable for native pastures and marginal for improved pastures. Limitations preclude continuous cultivation for crop production, but some areas may tolerate a short period of ground disturbance for pasture establishment, although vegetation clearing would first be required.

The Sodosols on site are charcterised by a high exchangeable sodium percentage (ESP), which is commonly used as an analytical indicator of soil sodicity. ESPs of 6% to 15% are considered to be sodic to strongly sodic, respectively. All samples, except those from the surface, contained ESPs between 9.1%-23.7%, indicating that the A2 horizon is sodic to strongly sodic, and that the B horizon is strongly sodic.

In the A horizon the soil pH (pH 5.7-6.1) and electrical conductivity (EC1:5, <0.2 dS/m) are favourable to plant growth; however fertility of this soil is poor. Fertility analysis of the surface samples indicates that the concentrations of extractable phosphorus were low (2 ppm), and total nitrogen was below detection limit. In the B horizon soil pH (pH 7.9-8.6) is approaching alkalinities that may cause nutritional deficiencies, and the EC1:5 (0.14-0.20 dS/m) ranges from low to moderate salinity. Tests on the Sodosols covering the site indicate the potential to be a dispersive soil.

The Sodosols cover the area toward the front of the site and are characterised as a heavy dispersible clay material. This material is a suitable material for dam construction and can provide a base for the dam with a permeability of $1x10^{-9}$m/s. This material may be used in the construction of the evaporation pond for the operation of the AN Plant.

Kandosols are characterised as lacking strong texture contrast between A and B horizons, have massive or weakly structured B horizons, and are not calcareous throughout. The soil profiles of the Kandosols were similar across the study area with the main difference being colour, such that two different suborders of Kandosols were identified being Red Kandosols and Brown Kandosols.

The soil pH (pH 6.2-7.0) and electrical conductivity EC1:5 (<0.3 dS/m) throughout the profile are favourable to plant growth. However, fertility of this soil is low. Fertility analysis of the surface samples indicates that the concentration of extractable phosphorus was low (4 ppm), and total nitrogen was below detection limit. Throughout the profile ESPs were approaching 6% indicating that the soil is mildly sodic.

The Ca:Mg ratios through the profile tended to decrease with depth, ranging between 2.2-0.7. These low Ca:Mg ratios provide further indications that the Red Kandosol has the potential to be dispersive.

The Kandosol soils on site are a much better soil type for plant growth although the nutrients within the soils are limited. These soils would not be used in dam construction as they are likely to be dispersive with poor structure. None of the soils identified during the assessment of the site are considered good quality agricultural land.

Sensitive Environmental Areas

The project site is mapped as having a significant coverage of remnant vegetation, under the VMA with the exception of the grazing land to the westerly section of the site which has been extensively used for cattle grazing and shows evidence of chemical clearing. Information on the mapping was obtained and was confirmed in a field investigation by a GHD ecologist on 21 April 2006.

The site proposed for the project is mapped as the heterogenous Regional Ecosystems (RE) 11.5.9 (80%)/11.5.3(20%) and 11.7.2 (80%)/11.5.3 (20%). Both REs are classified under the VMA as 'Not of Concern', with a biodiversity status (set under the EPA Biodiversity Planning Assessment process) of 'no concern at present'. Neither RE listed below is a threshold RE, meaning that neither is on the threshold of being listed as 'Of Concern' (Refer to Section 4.7 - Nature Conservation for more information).

The Belyando Shire contains a number of protected areas: Willandspey National Park, Epping Forest National Park, Peak Range National Park, Narrien Range National Park and Mazeppa National Park. All of the REs mapped for the site are represented in these protected areas, in particular RE 11.5.3, which was the most common RE on the site.

Clearing of any type of vegetation (remnant or non-remnant) has the potential to damage Aboriginal Cultural Heritage. The duty of care established under the *Aboriginal Cultural Heritage Act 2003* requires that a person or corporation exercise all reasonable and practical measures to avoid harming cultural heritage. The Traditional Owners of the area have played a key role in surveying the site, and have identified a number of sites of cultural significance over the site (Refer to Section 4.8 of the EIS for the Cultural Heritage Assessment).

It is likely that the project will meet all requirements of *Water Act.* Infrastructure will be located in the western section of the lot, opposite a minor drainage line on the land. Both Grosvenor Creek and the Isaac River are a significant distance from the project site and no works in or near these watercourses are required for the project.

Grosvenor Creek is an ephemeral creek that runs during periods of wet weather but has the potential during these periods to support a number of different fish species. Grosvenor Creek is part of the catchment that flows into the Isaac River, which has a number of waterway diversions along its length from mining operations.

An Environmental Management Plan (EMP) has been prepared for the project to address the environmental impacts associated with the development of the project.

This is provided in Section 5 of the EIS. A draft EMP has also been prepared for the mitigation of operational impacts from the project. This is also provided in Section 5. Both of these EMPs address the potential impacts to the sensitive areas identified on the site (both with regards to the clearing of the REs on site and the areas of cultural significance on the site) as well as the general protection of the surrounding environment from impacts.

Visual Amenity

The proposed AN Plant is located approximately 4.5 km northwest of the township of Moranbah. The visual and landscape characteristics of the proposed site and surrounding areas have the following features (Refer to Figure 23):

1 Goonyella Road, located along the northern boundary of the site;

2 The closest residential dwellings are located within the Moranbah township, 4km from the proposed site;

3 An Enertrade Compression Station is located along Goonyella Road, approximately 800 m south-east towards Moranbah which provides no immediate visual or landscape impact;

4 Existing infrastructure includes the Wotonga Blair Athol Mine Railway located approximately three km east of the site. The Ergon Power Station is located immediate east of the Railway line;

5 The Isaac River is located 4 km north east of the site and forms part of the Fitzroy River Catchment;

6 Grosvenor Creek is located approximately 2 km south of the AN Plant;

7 The site and adjacent properties are currently designated and used for rural grazing land and primarily contain woodland vegetation and scattered scrubby thickets, except for the northwest section of the site, which has been previously cleared of vegetation;

8 The site and surrounds generally consist of flat topography of < 5% slope except an elevated mound located at the north eastern end of the site, in close proximity to Goonyella Road (Refer to Figure 20 and Figure 21);

9 A minor sandy drainage channel is located within the site, sloping to the southeast on the eastern corner of the site.

A detailed assessment of the visual amenity of the project is provided in section 4.1.2.4. The change to the visual amenity of the town of Moranbah will be significant as the site can be seen from a number of areas within the township.

Night Views

Night views traditionally differ significantly from daytime views in that all scenic elements are removed from view through the lack of illumination. The area immediately surrounding the proposed site is predominately influenced by natural lighting.

The AN Plant main buildings will be lit for operations at night, although this will have a limited impact on the visual amenity of the project. However, several stacks will be lit at night. Although the lighting of these stacks has not yet been finalised, the highest of the stacks will rise 65 m above ground level and is likely to be visible from the township of Moranbah.

Infrastructure

There is a wide range of infrastructure surrounding the site. The location of major roads, railways, water and petroleum pipelines located in the study area is illustrated in Figure 24**.**

Contaminated Land

Searches were conducted of the Environmental Management Register and the Contaminated Land Register for Lot 10 on SP175258. Results of the searches showed that the site is not included on either of the registers (refer Appendix 7.14).

The site has been under a lease from Judith Flora Camm since 1/1/1989, which was previously held by Violet Martha Angel for the operation of cattle grazing activities. There was no available information regarding the subject site of activities other than grazing that may have been undertaken on the subject lease and no infrastructure from any other operations that may have been undertaken at the site. There is no available evidence that a notifiable activity as defined under the EPA has been undertaken at the site.

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GOONYELLA ROAD

Indicative Construction Camp Area (15.75ha)

Irrigation Area (7ha)

Site Photo 1 Site Photo 2 Site Photo 3 Site Photo 4 Site Photo 5 Site Photo 6 Site Photo 7 Site Photo 8

Ammonium Nitrate Plant (270ha)

Transfield Site

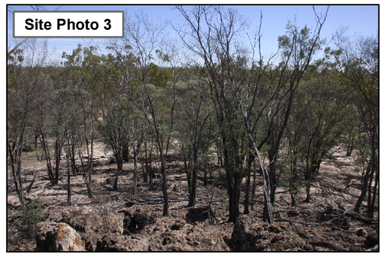
Enertrade Compressor Station

Grosvenor Creek

Wotonga Blair Athol Branch Railway

0 400 800 1,600 Metres

1:25,000



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Legend

- Ammonium Nitrate Plant Site
- Evaporation Pond
- Generating Facility*
- Raw Water Reservior
- Cadastre
- Easements
- Watercourse
- Major Road
- Railway

*Generating Facility location is subject to detailed engineering.

Moranbah Ammonium Nitrate Plant

Environmental Impact Statement

Figure 23
Existing Landscape Characteristics

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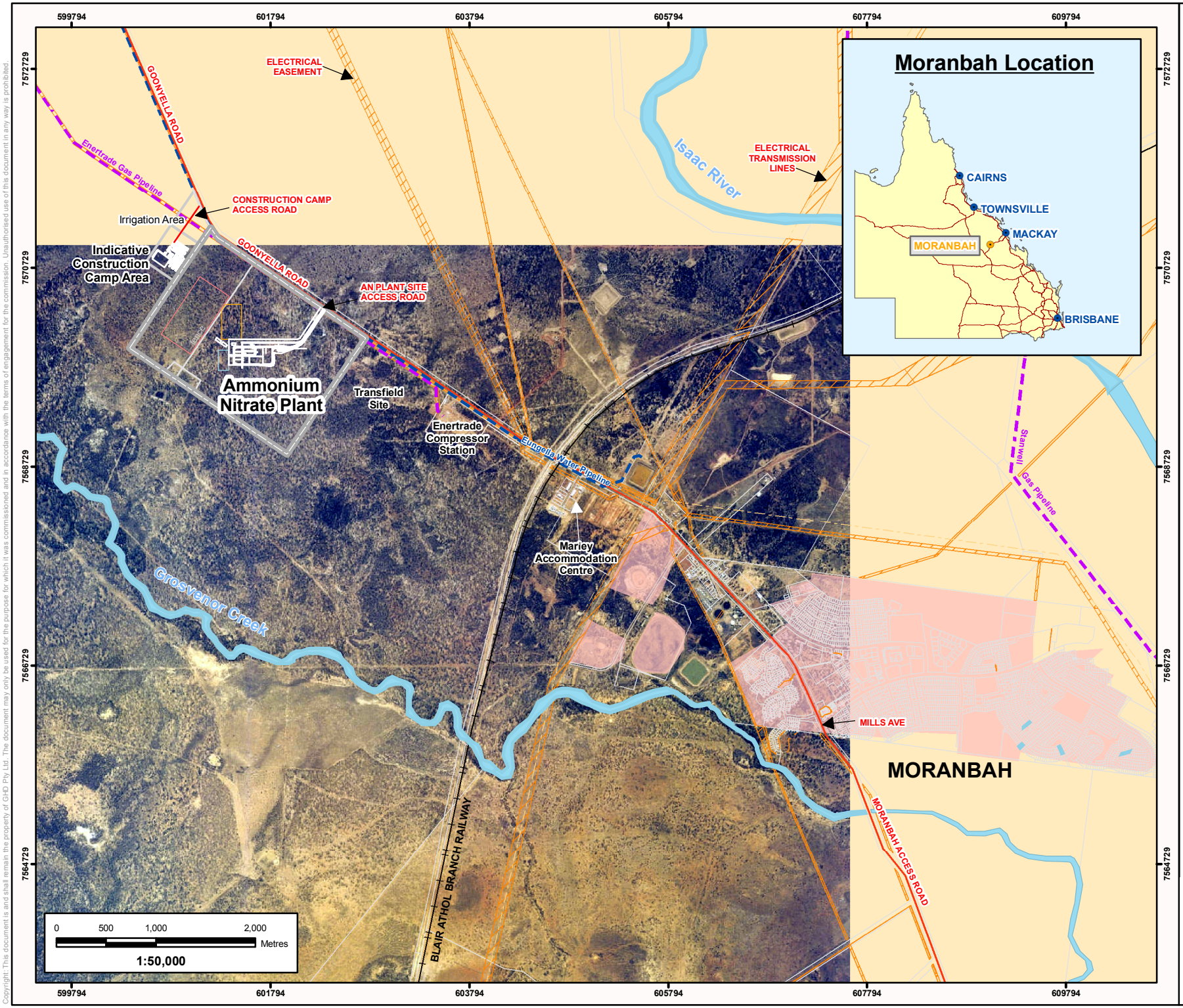

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File: G:\41\15824\GIS\Maps\Final\MXD\fig24_Surrounding_Infrastructure.mxd

Legend

- Ammonium Nitrate Plant Site
- Evaporation Pond
- Generating Facility*
- Raw Water Reservior
- Cadastre
- Easements
- Developed Area
- Watercourse
- Major Road
- Railway
- Water Pipeline
- Petroleum Pipeline
- Powerlines

*Generating Facility location is subject to detailed engineering.

Moranbah Ammonium Nitrate Plant

Environmental Impact Statement

Figure 24 Surrounding Infrastructure

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4.1.2 Potential Impacts and Mitigation Measures

4.1.2.1 Land Use Suitability

The area of the site is approximately 270 ha, an additional area of approximately 25 hectares is provided for the construction camp adjacent to the AN Plant site. The footprint of the proposed plant and evaporation ponds is approximately 53 ha (69.9 hectares to be cleared) and will be positioned just off centre of the site. The size of the site has been selected to contain within the site boundary significant risks from the operation of the facility and to provide an adequate separation distance between surrounding land uses and the AN Plant. The development of the AN Plant in this area is considered compatible with the surrounding land uses including grazing, a power station (east), gas extraction (north and east) and coal mining (north and south).

The subject site is not considered Good Quality Agricultural Land (GQAL) as indicated on mapping contained in Shields (1984) 'Land Suitability Study of the Collinsville-Nebo-Moranbah Region' and from the soils assessment undertaken as part of the EIS (refer Appendix 7.13). Therefore SPP 1/92 is not applicable to the development.

The operation of the grazing of cattle on the surrounding property is unlikely to be negatively impacted by the operation of the AN Plant. Dyno Nobel Asia Pacific Limited and the landholder are in negotiations for providing access to the surrounding buffer for the grazing of cattle.

The nearby proposed mining activities of Anglo Coal Pty Ltd have been assessed with regard to Australian Standard AS2187.1-1998 "Explosives – Storage, transport and use" Table 3.2.3.2, using a storage capacity of 15,000 T AN stored at the centre of the site. This standard suggests a 1.1 km (a 1.5 km separation distance was adopted for the calculation of impacted coal resources) separation distance between a precursor storage facility of this size and a magazine for the storage of explosives (e.g. of the type that may be found on a mine site).

The activities proposed by Anglo Coal Pty Ltd will not impact on the buffer area around the site used for calculation of the coal reserves impacted by the development (see Table 4). Therefore, the operation of underground activities within the buffer should not have any impact on the operation of the AN Plant.

The operation of the AN Plant relies on the provision of adequate gas reserves for the production of the AN used in the production of Prill and Emulsion for operations at mining facilities within the Bowen Basin. An agreement is being negotiated for the supply of coal seam gas for the operation of the AN Plant. The pipeline infrastructure that runs along Goonyella Road will be protected to prevent any damage to both the water and gas pipelines during construction and operation. The volume of gas consumed within the process is provided in the GHG assessment in Section 4.13.

4.1.2.2 Land Contamination

There are a number of notifiable activities that will be undertaken at the site for the production of Emulsion and Prill. These notifiable activities are provided in Table 23.

Table 23 Notifiable Activities

Activity	Notifiable under *Environmental Protection Act 1994*
Manufacturing AN for production of Prill and Emulsion. Volumes produced are in excess of the trigger for notification.	6 Chemical manufacture or formulation—manufacturing, blending, mixing or formulating chemicals if— (a) the chemicals are designated dangerous goods under the dangerous goods code; and (b) the facility used to manufacture, blend, mix or formulate the chemicals has a design production capacity of more than 1 t per week.
Storage of Emulsion and AN. The volume stored of this type of material exceeds the trigger for notification.	7 Chemical storage (other than petroleum products or oil under item 29)—storing more than 10 t of chemicals (other than compressed or liquefied gases) that are dangerous goods under the dangerous goods code.
Production of AN for use in explosives manufacturing. Specifically defined under the Explosives Regulation 2003.	15 Explosives production or storage—operating an explosives factory under the *Explosives Act 1999*.
Storage of mineral oils for the manufacturing of emulsion. The volume of mineral oils stored exceeds the trigger for notification.	29 Petroleum product or oil storage—storing petroleum products or oil— (a) in underground tanks with more than 200 L capacity; or (b) in above ground tanks with— (i) for petroleum products or oil in class 3 in packaging groups 1 and 2 of the dangerous goods code—more than 2500 L capacity; or (ii) for petroleum products or oil in class 3 in packaging groups 3 of the dangerous goods code—more than 5000 L capacity; or (iii) for petroleum products that are combustible liquids in class C1 or C2 in Australian Standard AS 1940, 'The storage and handling of flammable and combustible liquids' published by Standards Australia—more than 25000 L capacity.

Best practice environmental management will be put into place to prevent and mitigate land contamination. The AN Plant hardstand area, which will be designed to capture any spillage and direct this spilled material through a treatment system prior to running back into the process if possible. If the material is not suitable for reuse it will be discharged to the evaporation ponds through an oil water seperator.

Management measures will be implemented to ensure that product-handling areas are effectively maintained and managed for the transportation of the Prill and Emulsion to the different clients at the various mine sites in the Bowen Basin. Any waste product produced as part of the manufacturing process will be reincorporated back into the process if possible. If this is not possible the material will be designated for waste disposal.

One of the significant sources of potential land contamination will be from the management of oils and fuels on site. Table 24 illustrates actions to be undertaken during the construction phase to ensure chemicals and fuels are adequately handled to prevent contamination.

This includes standardising the operational procedures for the construction of the project. A detailed EMP is provided in Section 5 of the EIS to address the potential impacts resulting from the construction of the project and some of the impacts during the operation of the facility.

Table 24 Chemicals and fuels

Chemicals and Fuels Management Plan		
Objective	To undertake all reasonable and practicable measures to minimise contamination of land or waters.	
Issues and Impacts	Potential for spillage or leakage of chemical and petroleum products and regulated wastes to waters.	
Relevant Legislation and other guidelines	*Environmental Protection Act 1999* *Dangerous Goods Safety Management Act 2001* AS 1940-1993 The Storage and Handling of Flammable and Combustible Liquids	
Construction		
Control Measures		**Responsibility**
Only the minimal required quantities of chemicals, fuels, oils etc. should be retained at construction sites or contractor laydown areas at any particular time. Purchase the products on an 'as required' basis in accordance with the provisions of the *Workplace Health & Safety Act, 1995*.		Construction Contractor
Chemicals, fuels and oils etc should be stored at a minimum separation distance of 100 m from the nearest waterway (Grosvenor Creek is located approximately 1.3 km from the site).		Construction Contractor

Construction	
Control Measures	**Responsibility**
Chemicals and fuels should be stored in accordance with AS1940 – The storage and handling of flammable and combustible liquids.	Construction Contractor
Maintenance and servicing of vehicles will be undertaken away from the project site at appropriate facilities. Daily servicing only may be undertaken on site. Such activity will be undertaken at a minimum separation distance of 100 m from drainage lines.	Construction Contractor
Temporary chemical storage will be in accordance with Material Safety Data Sheets (MSDS) while non-compatible chemicals will be stored separately.	Construction Contractor
Safe handling techniques during refuelling such as via use of pumps, funnels or syphons to prevent spillage.	Construction Contractor
Petroleum product spillages will be immediately cleaned up by dry absorbent materials or sand or the area tined up and remediated with a series of liquid fertilisers over a period of at least 7 to 14 days or until remediation is achieved.	Construction Contractor
Absorbent materials used in the clean up of hydrocarbons or other chemicals will be placed and sealed in an appropriate container marked 'regulated waste' and consigned to a waste contractor licensed to receive such waste.	Construction Contractor
Monitoring	In the case of a spill or other accident, monitoring of the receiving environment willbe undertaken by an experienced professional. The Construction Contractor Site Supervisor or Contractor Workplace Health & Safety Officer will regularly inspect all temporary chemical and petroleum product storage areas for leakages and release any clean stormwater accumulated in temporary bunded areas, after each rainfall event. An environmental officer representing DN will conduct a monthly audit of the contractor's procedures and performance to check for compliance.
Reporting	In the case of environmental nuisance or harm, the Environmental officer will report the incident to EPA and local council. If a spill occurs, a report detailing corrective actions and monitoring requirements will be prepared.
Corrective Action	Immediately clean up any spilt chemicals and fuels and replace any spills kits In the event of contaminant release to land or water that has the potential to cause environmental harm, the Construction Manager will immediately arrange for any necessary works to contain the contaminant and control/stop the source of the release. The Construction Manager will notify DN's Environmental officer and Project Manager. The Environmental officer will advise the EPA if notification triggers are exceeded.

Construction	
Control Measures	**Responsibility**
The containment, including absorbent materials, should be recovered and placed into a sealed container suitable to hold such materials. The wastes will be consigned to a contractor licensed to receive such wastes. Spills will be cleaned up in accordance with relevant Material Safety Data Sheets and Australian Standard AS1940. A copy of the MSDS for all chemicals will be maintained at all contractors lay down areas and contractor's project office on construction sites.	

Land Disturbance & Soil Erosion

Soils on the project site vary from loam to sand on a relatively flat plain. Investigation revealed that the loamy grey top-soil degraded rapidly on being disturbed to a fine but thick blanket of 'bull-dust'. At transect 1 and 3 of the site investigation area (refer Figure 25), the loam is hard packed and very difficult to penetrate, at least down to 45 cm. Rain tends to pool in depressions across the surface and the soil in these areas becomes thick and slippery. Cattle tracks are up to 20 cm deep in places where this has occurred. Small clay pans of up to 70 m diameter are apparent in places with little or no vegetative growth – in these clay pans the soils are extremely difficult to penetrate. Loamy soils appear to be dominant in the northern and central section of the lot.

The sand soils are soft and easily penetrated, and appear to be highly permeable. The sand is a light red colour, and supported a higher diversity of grasses than the loamy soils. These soils, although coarsely textured, still contain a percentage of loam, but are sandier than elsewhere on the site. Sandy soils are dominant in the southern and western sections of the lot.

Little rock is apparent across the site. However, the site has occasional very low ridges of laterite 'gibber' pebbles. These pebbles do not appear as part of the underlying soil profile, but are found sitting on the surface in places on the site in elongated ridges up to five centimetres high.

The EMP provided in Section 5 of the EIS details the management strategies in the land clearing for the project. The methodology for soil and preparation and land clearing will involve:

1 A clear delineation of the areas to be protected and implementing measures to protect these locations from impacts during operations on the site. This will include appropriately fencing off sites of cultural significance to prevent any impacts on these locations.

2 The extent of the land clearing will be minimised during the construction of the project.

3 Identifying the vegetation to be cleared and marking this vegetation. When this vegetation is being cleared, ensuring that fauna spotters are in place to manage any fauna that may require relocation.

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File: G:\41\15824\GIS\Maps\Final\MXD\Fig25_Land_Resource_Survey.mxd

Legend

- Ammonium Nitrate Plant Site
- Cadastre
- × Ground Observation Points

Soil Order

- Land Unit 1 (Sodosol)
- Land Unit 2 (Kandosol)

*Generating Facility location is subject to detailed engineering.

Moranbah Ammonium Nitrate Plant

Environmental Impact Statement

Figure 25 Land Resource Survey

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4 Putting in place stormwater management measures during the clearing activities on site. Including diversion drainage, silt fencing for overland flow and other stormwater management measures for areas of steeper slope including rock armouring and rock-check dams. See Section 5 – EMP for details of the stormwater management plan.

5 Effectively manage the vegetation that is cleared including providing for hollow logs on the site for reptiles and other fauna while removing other vegetation from the site where required.

6 Ensuring clearing is effectively staged for the project and stormwater management systems established during construction are adequately maintained.

7 Topsoil will be stockpiled as close as possible to the site where the material is required.

8 Erosion control around these stockpiles will be implemented to prevent erosion and loss of topsoil.

9 During rehabilitation of the lay-down area for the project, endemic vegetation species will be used where possible.

A draft erosion and sediment control Management Plan has been prepared and is provided in the EMP as part of Section 5. The soils on the site are described in Appendix 7.13.

For the ongoing management of infrastructure on site, the EMP provided in Section 5 sets out the proposed monitoring schedule for the project including measures to manage the potential erosion and sedimentation from the project. Initially the erosion and sediment control measures at the site will be developed to manage a higher volume of sediment. However, once the site is constructed, the erosion and sediment control measures will be focussed on diversion of clean overland flow and stormwater in a way that minimises the potential erosion generated. The buffer area around the AN Plant will assist in the prevention of further erosion on site. Section 4.3 discusses water management on the site and some of the management measures that will be implemented to prevent land and water contamination, including measures to minimise erosion on site.

4.1.2.3 Visual Amenity and Scenic Values

Where possible, the visual assessment has attempted to be objective and to incorporate multiple sources of visual characteristics and values. However, it is recognised that visual assessment is highly subjective and individuals will associate different visual experiences to the study area. Such factors can include:

1 The relationship of the viewer to the visibility (i.e. whether the person is a permanent resident, traveller, worker);

2 Exposure to the view (i.e. whether it is a brief glimpse or an outlook from a house);

3 Distance from a particular vantage point;

4 The sensitivity of the view;

5 The degree of human modification – naturalness;

6 Consistency with surrounding landscape;

7 The number of viewers;

8 Vegetation cover;

9 Topography;

10 Orientation of views (i.e. from houses or open space); and

11 Extent of modification.

A Geographical Information System (GIS) was used to undertake a visibility assessment to determine where the proposed AN Plant stack will be most visible from any selected observer point within the study area. The visual impact methodology involves the input surface of a Digital Elevation Model (DEM – 5 metre accuracy) and identifies areas within the DEM that can be viewed from a specified point. Each cell within the DEM is assigned a value that specifies a visibility scenario of 'Low to Moderate' or 'Moderate to High'.

A significant number of potential views are shielded by local topography and will also be removed or minimised by screening vegetation. The first visual scenario involved conservatively modelling vegetation screening by assigning an average tree height of 15 m to RE classifications of remnant vegetation. All non-remnant vegetation was excluded from this scenario. The second scenario excluded all vegetation and was based on topography only.

The following parametres were incorporated into the visibility functionality within ArcView:

1 Observer offset = 65 m stack (top of structure);

2 Target offset = 1.5 m above ground (approximate standing height of a person);

3 Field of Vision = 360 degrees;

4 Near Distance = 1 metre;

5 Far Distance = 10 kilometres.

The results of this assessment are shown in Figure 26 and Figure 27**.** Figure 26 identifies those areas from where the proposed 65 m stack will be visible with vegetation screening. The red sites represent areas that are likely to have an unobstructed view of the structure (stack), with the orange sites representing locations likely to have obstructed views as they occur within vegetated areas.

There are numerous vantage points from which the proposed stack can be viewed within this scenario, notable areas include:

1 Immediate land surrounding the proposed site;

2 Along Goonyella Road, heading north-west from Moranbah township;

3 Along Grosvenor Creek, adjacent to the proposed site;

4 Scattered locations along Blair Athol Railway line; and

5 Moranbah township, predominately along and adjacent to Mills Avenue.

Figure 27 identifies those areas from where the proposed 65 m stack will be visible without vegetation screening. As it can be seen from the analysis, the proposed 65 m stack is visible from most locations up to 10 kms away. Low visibility areas for this scenario include:

1 Areas scattered along Grosvenor Creek and Isaac River;

2 Areas adjacent to the existing Ergon Power station; and

3 Residential areas located on the southern fringe of Moranbah township.

Both scenarios will depend highly on an individual's Field of View (FOV), orientation, period of view and whether the viewer is indoors or outdoors.

In summary, the project will introduce a major facility structure into the landscape and will create a long-term change to the visual features of the site and immediate surrounding rural grazing environment once the project has been developed. There will not be an impact on the visual amenity of the area until the stacks are put in place for the project as there is significant vegetation shielding the sites development.

Mitigation measures aim to reduce the immediate and future landscape and visual impact of the proposed plant. There are a number of strategies that can be implemented to minimise impacts to immediate and distant viewers:

1 Use of a colour scheme, particularly for the 65 m stack, to blend as much as practical with the background of the rural landscape;

2 Paint selected as a matt finish to help minimise reflective glare;

3 Construction of fencing along Goonyella Road;

4 Conservation of existing vegetation where possible;

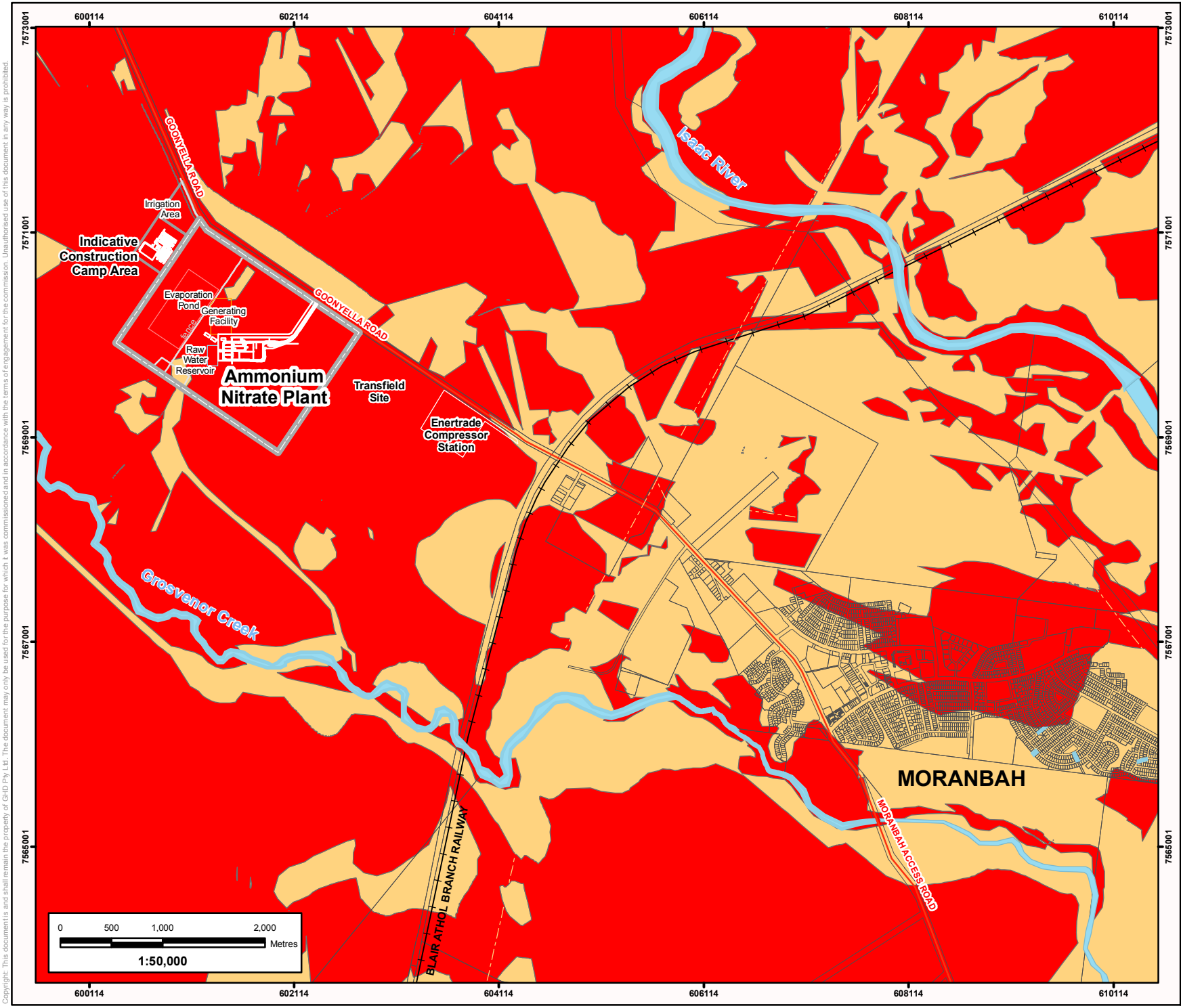
5 Preparation of a vegetation management plan that addresses construction phase vegetation management and post construction rehabilitation and restoration, for example, roadside tree planting can screen potential views from particular sections along Goonyella Road overtime;

6 Designing lighting to minimise light spill to closest sensitive receptors. Lighting design to be compliant with Australian Standard AS4282 – 1997: Control of the Obtrusive Effects of Outdoor Lighting.

Lighting

The detailed design of the project and the lighting requirements have not as yet been finalised. The AN Plant will be operational 24 hours a day and therefore will require night lighting to a degree. Stack lighting will consist of aircraft hazard lighting to ensure night-time visibility to aircraft.

The construction of the project will occur during daylight hours and it is not anticipated that night time lighting of the project will impact on Moranbah during the construction period due to the shielding of the vegetation between the AN Plant site and the Moranbah township.



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Date: 02-10-06 Rev A
Datum: GDA94 (MGA) Zone 55
Source: Base data sourced from the State of Queensland, Department of Natural Resources, Mines. All other infrastructure supplied by Dyno Nobel Asia Pacific Ltd.
File: G:\41\15824\GIS\Maps\FinalMXD\fig26_Moranbah_Visibility_Assessment_w_Veg.mxd

Legend

- Ammonium Nitrate Plant Site
- Evaporation Pond
- Generating Facility*
- Raw Water Reservior
- Cadastre
- River

Visibility with Vegetation

Visibility

- Low - Moderate
- Moderate - High

Visibility is based on a 65m Stack, 1.5m observer point and 15m remnant vegetation heights. Indicative Only.

*Generating Facility location is subject to detailed engineering.

Moranbah Ammonium Nitrate Plant

Environmental Impact Statement

Figure 26
Visibility Assessment With Vegetation

GHD
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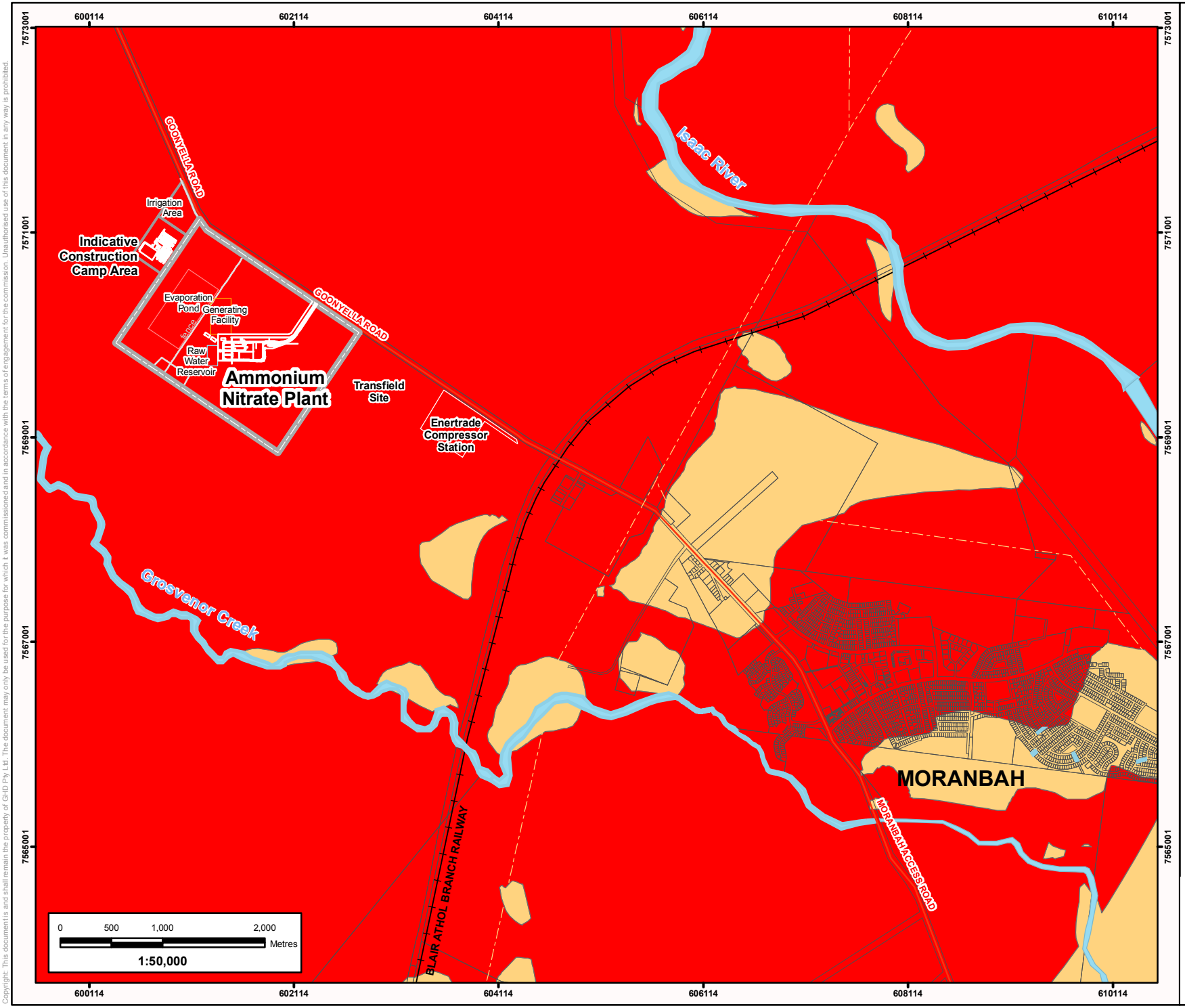

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DYNO
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Date: 02-10-06 Rev A
Datum: GDA94 (MGA) Zone 55
Source: Base data sourced from the State of Queensland, Department of Natural Resources, Mines. All other infrastructure supplied by Dyno Nobel Asia Pacific Ltd.
File: G:\41\15824\GIS\Maps\FinalMXD\fig27_Moranbah_Visibility_Assessment_wo_Veg.mxd

Legend

- Ammonium Nitrate Plant Site
- Evaporation Pond
- Generating Facility*
- Raw Water Reservior
- River
- Cadastre

Visibility without Vegetation

Visibility

- Low - Moderate
- Moderate - High

Visibility is based on a 65m Stack and 1.5m observer point. Indicative Only.

***Generating Facility location is subject to detailed engineering.**

Moranbah Ammonium Nitrate Plant

Environmental Impact Statement

Figure 27
Visibility Assessment Without Vegetation

GHD
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The site for the AN Plant has had significant disturbance from cattle grazing and will be further disturbed during the construction of the facility. The lighting impacts will primarily affect the nocturnal fauna at the site. The fauna in the area will already be disturbed from the construction operations undertaken at the site. However, as the site has a significant buffer, where fauna are impacted by the lighting from the facility there is adequate cover and vegetation for the fauna to move away from the site if required.

The AN Plant is set up during the construction period to have a self contained construction camp with both a wet (serves alcohol) and dry canteen (serves food). There will also be in place an area for recreation. At night it is anticipated that there will be a limited impact of traffic on Moranbah due to the provision of these services at the construction camp. The operational workforce (70 plant operation staff and 20 transport staff) will be based in the township of Moranbah and the surrounding areas.

Decommissioning

Decommissioning of the facility will be undertaken in accordance with all relevant State based legislative requirements. For additional details on DN policy and guidelines for decommissioning see Section 3.5 of this EIS.

4.2 Climate

The Australian Bureau of Meteorology operates a synoptic station at the Moranbah waste water treatment plant (WWTP),-27.9947S 148.0308E. The data from this weather station was used in the generation of the climate data for the specialist Air Quality Assessment Report (Appendix 7.8).

The project area experiences a semi-arid climate characterised by higher minimum and maximum temperatures in summer and moderately high temperatures in winter. The rainfall exhibits a distinct seasonal pattern with most rainfall experiences in the summer months.

The site has an average annual rainfall of only 603 mm. Pan evaporation consistently exceeds rainfall on an average monthly basis. Table 25 illustrates the average monthly rainfall events and average minimum and maximum temperatures for the area between 1957 and 2005 (data sourced from the DNRW, 2006).

Table 25 Climate and rainfall data DNRW

Monthly	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Rainfall (mm)	92	90	58	36	33	20	18	23	8	33	63	99	603
Pan Evap (mm)	233	188	197	153	120	97	108	136	181	226	234	246	2119
Ave Max Temp (^{O}C)	33	33	32	29	26	24	24	25	29	32	33	34	29
Ave Min Temp (^{O}C)	22	22	20	17	14	10	9	10	13	17	20	21	16

Rainfall

The rainfall exhibits a distinct seasonal pattern with most rainfall experiences in the summer months (Table 25). On average, Moranbah experiences only three days per year when the rainfall total is above 50 mm (BoM, 2006). December and January are the wettest months of the year.

The risk of a flood in the area is insignificant. It should also be noted that the plant lies on high ground and would therefore not be susceptible to flooding (see Climate Extremes).

Relative Humidity

While the mean daily relative humidity of the area does not vary significantly between months, it does exhibit a significant difference with time of day. Average annual humidity is 68% at 9 am and only 38% at 3 pm (Bureau of Meteorology, 2006).

Temperature

The project area experiences a semi-arid climate characterised by higher minimum and maximum temperatures in summer and moderately high temperatures in winter. Monthly averages of daily minimum temperatures range from 22°C in January to 9°C in July.

The observations from the Moranbah WWTP were used for model calibration and validation purposes in relation to air temperature. The Air Pollution Model (TAPM) was used to produce representative hourly surface meteorological data at the proposed site. The Air Quality Assessment Report (refer to Appendix 7.8 of this EIS) discusses calibration of TAPM in greater detail.

Figure 28 shows the mean temperature at 3:00 pm for each month, as predicted by The Air Pollution Model and recorded by the BoM at the Moranbah WWTP. The comparison between the predicted and recorded data is favourable and demonstrates only marginal (less than 5%) under-prediction across all months.

The strong correlation between predicted and recorded temperature indicates that the model is accurately calculating the surface energy balance, which in turn adds confidence to the predictions made for atmospheric stability.

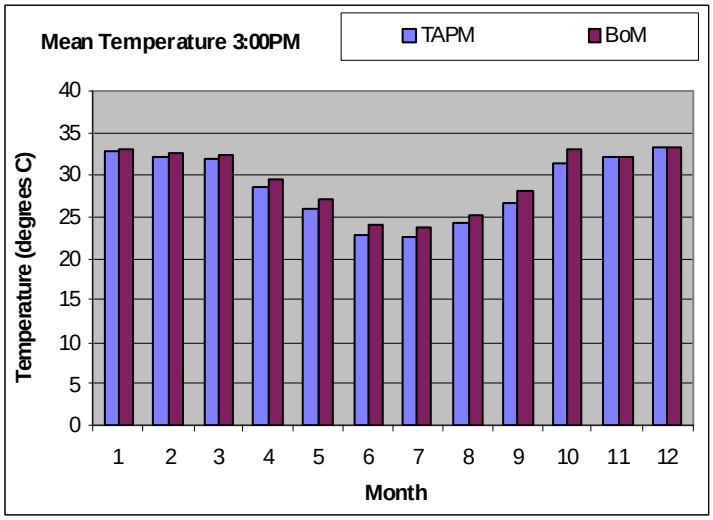


Figure 28 Monthly Average 3:00 pm Temperature at Moranbah, as predicted using TAPM and recorded by the BoM

Wind Direction and Wind Speed

The wind direction and speed range of the area suggest that for the current yearly data wind direction is in an easterly or south-easterly direction ranging from 2 km/h to 37 km/h. The wind direction was recorded at 9 am daily and the direction with the highest frequency is listed in Table 26.

Table 26 Wind Direction

Month	Wind Direction	Frequency (%)	Speed Range (km/h)
Aug 05	SE	40	4 -37
Sep 05	SE	34	2 -4
Oct 05	NW	25	2 -19
Nov 05	E	33	4 -28
Dec 05	NE	28	2 -19
Jan 06	E	27	4 -11
Feb 06	E	54	4 -20
Mar 06	E	40	4-22
Apr 06	SE	44	4-15
May 06	SE	40	4-9
Jun 06	ESE SE	50 50	9 13
Jul 06	SE	41	2-6

The Air Pollution Model predicted annual average wind speed for Moranbah is 3.08 m/s. The predicted annual wind rose for Moranbah, and is indicative of the influence of synoptic scale flow, which has an easterly prevalence at the latitude of the site. Local to regional scale wind channelling, between the Denham and Kerlong ranges, acts to enhance this predominance. The predicted wind distribution at Moranbah reveals a north easterly predominance during summer and spring and a south easterly predominance during winter and autumn. This shift in predominance is caused by the differences in synoptic scale trends between the seasons, a result of the annual north-south oscillation of global circulation patterns caused by the tilt of the earth's axis.

The directional distribution of winds predicted by TAPM shows a strong concordance with the recorded observations. However, a consistent, although marginal, under prediction in the frequency of light winds can be noted. This marginal under prediction is, for this application, beneficial, as it adds a degree of conservatism to the predictions made by the AUSPLUME dispersion model. As explained in the Air Quality Assessment Report (Appendix 7.8 of the EIS), the high impacts associated with emissions to air from a non-wake effected stack sources (such as those proposed for the project) can occur during neutral atmospheric conditions, which, in turn, are often associated with moderate to high wind speeds.

Climate Extremes

Tropical cyclones are low-pressure systems in the tropics that have well defined wind circulations of at least gale force strength (sustained winds of 63 km/h or greater with gusts in excess of 90 km/h). The applicable code for wind loading (AS1170.2) indicates that Moranbah is not in a cyclonic zone. Moranbah is located in Region A4 - non cyclonic.

The project area lies within the Fitzroy River catchment, 30 km east of the Burdekin River Catchment. The Fitzroy River is one of Queensland's largest river systems with a catchment area of 143,000 km² and a mean annual discharge of 5,370,000 ML. The Fitzroy River system is interconnected upstream with several major rivers such as Isaac, Connors and Mackenzie Rivers.

The site of the AN plant is located 260 m above sea level with the waterways of Grosvenor Creek and the Isaac River at approximately 225 m elevation respectively with Grosvenor Creek the closest to the project site at approximately 2 km to the southwest of the site.

Recent available flood history information for the Fitzroy catchment does not identify any flooding in the Moranbah area and with the limited catchment of Grosvenor Creek it is unlikely that any flooding would impact on the site from this catchment taking into account the relative elevation of the site.

Bushfires

There is a low to medium risk of a bush fire near Moranbah (see Appendix 7.7 – Hazard and Risk Assessment for the bushfire risk analysis for the project). The bush will be cleared to a specified distance (approximately 30 m) around the facilities of the main plant and evaporation lagoons but most of the vegetation will remain intact on

site. Therefore, a bush fire causing impact onsite is unlikely in this area. Nonetheless, measures have been incorporated for fire mitigation should fires occur see Section 4.12.2.

4.3 Water Resources

4.3.1 Existing Conditions

4.3.1.1 Surface Water

No wetlands or permanent waterways exist on the site. However, a number of small eroded channels do cross the site, which could fill during periods of heavy rain. These areas have severely eroded banks, which could possibly be caused by domestic cattle trampling and over grazing of supporting vegetation. Due to the lack of standing water on the study site, no aquatic sampling was undertaken and therefore no fish species were observed. However, Grosvenor Creek could potentially provide habitat for a number of fish species at certain times of the year.

At approximately 2 km south of the study site, Grosvenor Creek traverses the land in a west-east direction. The creek is generally ephemeral in nature. It contained water during a recent assessment (8-12 May 2006) but was not flowing. It has been dry during all other site visits by project staff. The banks are lined by a tall suite of canopy trees, dominated by river red gums (*Eucalyptus camaldulensis*) with some *Eucalyptus orgadophila.*

Water quality of Grosvenor Creek was not measured during the May 2006 field investigation, as the creek was not running. However, from observation, the water was opaque, indicating a high level of suspended solids and a relatively high turbidity. This is not uncommon for watercourses in this part of Central Queensland as a significant amount of sediment is generated from the infrequent rainfall and the generally unprotected soils (heavily grazed). Additionally, the sediment entrained in the water column generally has a high amount of colloidal clay, which can remain in suspension for extensive periods.

With a very slow flow rate it can be assumed that the dissolved oxygen levels would reach low levels within weeks of any flood event. Grass may grow in the stream for a period after inundation.

This high turbidity level is expected for an ephemeral stream with a low flow rate that drains grazed open woodland. The waterway could possibly provide periodic habitat for various species of fish and macro-invertebrates, which in turn would provide foraging opportunities for birds, amphibians, mammals and reptiles.

It is noted that Grosvenor Creek is an ephemeral creek with sporadic flow. However, it is highly recommended that should the creek be flowing, a background water quality assessment be conducted prior to the commencement of any construction work. The objective is to obtain baseline data before construction begins. This assessment should sample and report on water quality both up- and down-stream of the point at which any run-off from the project could be expected to influence the creek.

Grosvenor Creek flows into the Isaac River. Flooding has occurred periodically in the lower reaches of the Isaac River during periods of intensive rainfall. The records from the BoM on flooding in Central Queensland indicate that flooding, when it occurs, is primarily in the lower reaches of the Isaac River. Additionally a large part of the Moranbah township is in close proximity to Grosvenor Creek and with development at 225 m above sea level (see Figure 20). A recent approval of a housing development was passed through council adjacent to Grosvenor Creek above the 1 in 100 year flood event at about 225 m above sea level and within 200 m of the creek.

The land uses downstream of the proposed site are primarily mining and grazing. The Isaac River does not flow all year round and is not a reliable water source. Additionally, the Isaac River has a number of diversions along the length. The area is also extensively grazed and the water from the River may be periodically used for providing water for cattle grazing along its length.

Groundwater

There are no registered bores within 5 km of the site (as at April 2006). Three registered water bores are within a 10 km radius of the site boundary (refer Figure 29) but only one has stratigraphy and water level records, which are summarised in Table 27. No data was available for aquifer hydraulic properties; bore yields or water quality for the surrounding registered bores.

Table 27 Stratigraphic Summaries of Registered Bores

Bore Number	Location from Study Site	Depth From (m)	Depth To (m)	Stratigraphy
RN81447	4.5 km North	0.0	48.0	Sandy Clay and Claystone
		48.0	108.0	Basalt (SWL-50 m Sep 1993)

The region surrounding the study site is likely to contain aquifers within the Isaac River alluvium, Cainozoic basalt and sediments and Permian coal seams (see Figure 29). Based on the local geology and topography of the site, the uppermost aquifer is likely to be in the Cainozoic sediments and basalt to the north and south of the site, with additional aquifers likely within basal sands of the Isaac River alluvium to the north.

Groundwater flow is likely to be towards Grosvenor Creek to the south of the site and the Isaac River to the north, providing base flow following periods of high stream levels. Recharge is likely to be from the streams during periods of high flow, with reversal of groundwater flow away from the streams. Given the presence of overlying clayey sediments, aquifers are likely to be confined to partially confined. Localised (small) perched aquifers are possible in those materials that underlie the proposed site.

The overlying clay minimises the vulnerability to pollution from surface sources, however desiccation cracks and fissures within the clay may provide preferential flow paths through the confining layers.

No data are available on groundwater quality within the local aquifer, or pumping rates of the nearest registered bores. Based on regional experience, however, groundwater yields are likely to be relatively low and slightly to moderately saline (more so in coal bearing strata), although localised higher yields may be available in basal sands within the alluvium and vesicular/columnar jointed horizons in the basalt, if present.

Coffey Geosciences Pty Ltd has conducted groundwater monitoring on site. The groundwater was monitored using four piezometres in boreholes BHA1, BHA5, BHD1 and BHD5 (Figure 30 details borehole locations) to depths varying from nominally 14.1m (242.2m AHD) to 27.3m (221.9m AHD). Each piezometer comprised 100mm diameter slotted PVC tube, fitted with steel end caps. The slotted sections were gravel/sand packed and sealed with bentonite plugs.

Groundwater was only found in the piezometer installed in borehole BHD5 at 19.3m depth (236.95m AHD). The remaining piezometres did not indicate any groundwater at the time of writing this report.

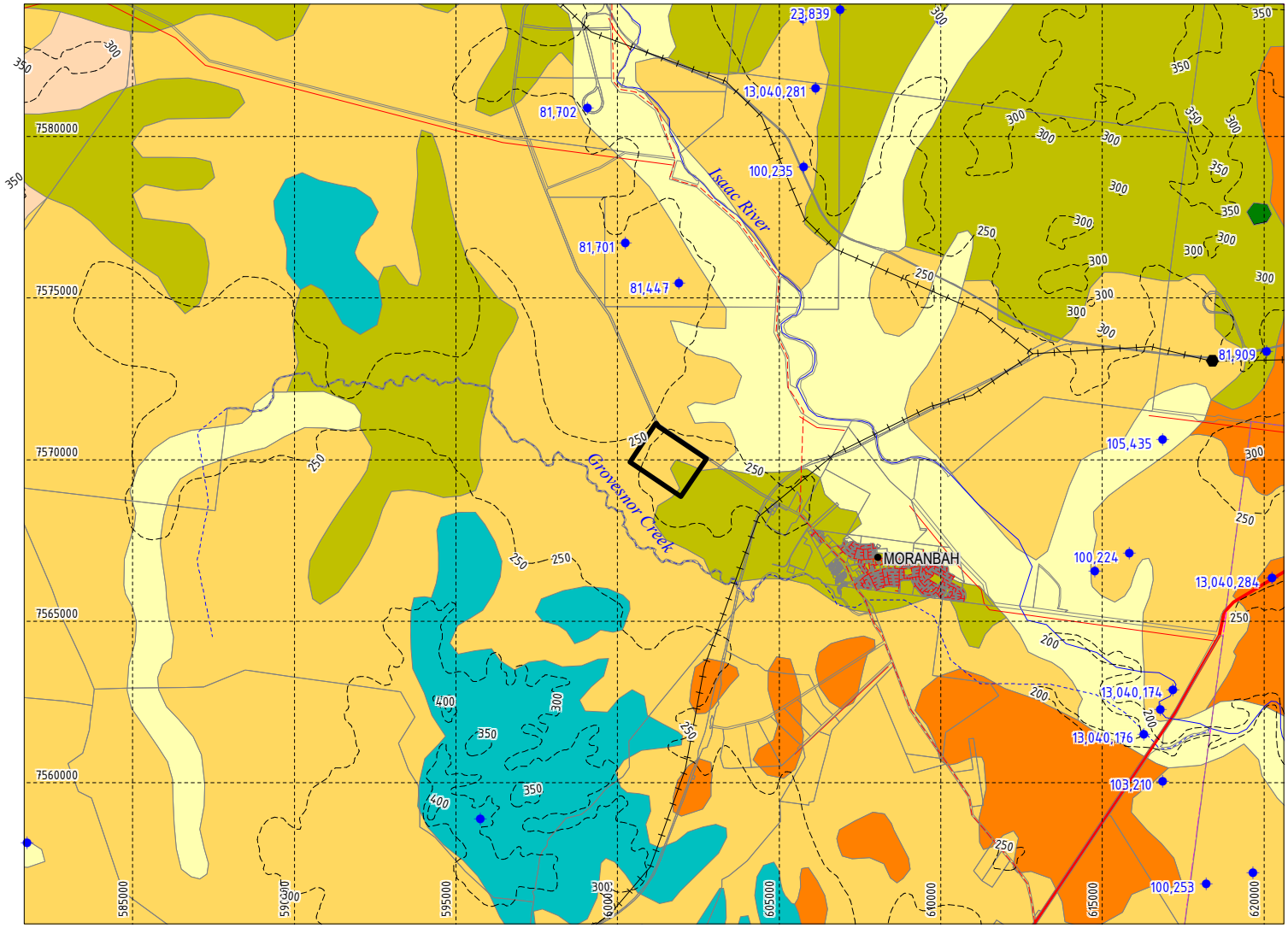
4.3.2 Potential Impacts and Mitigation Measures

4.3.2.1 Surface Water

Water usage on the site will come from both the use of raw water from the Burdekin pipeline onto the site and from the use of recycled process water from the operation of the AN Plant. There will be two dams on the site for water storage, one for raw water from the pipeline, and the other is the evaporation pond.

The raw water storage dam will be lined to prevent further loss of this valuable resource to the environment. The evaporation pond for the site will be constructed to prevent any of the waste water from the evaporation pond leaching towards the groundwater in the area. The EPA recommends a permeability of no greater than 1x10-9 m/s for landfills and high hazard dams and this level has been adopted for the construction of the evaporation ponds.

The assessment of the soils on site identified soil material that will be suitable for lining of the evaporation pond.



Reference

- Alluvium: Alluvium, mainly clay, silt, sand and gravel
- Unconsolidated Sediments: Soil, alluvium, gravel, scree, 'billy', sand, duricrust.
- Colluvium: Sandstone, claystone, siltstone, conglomerate, laterite, oil shale, brown coal, sandstone breccia.
- Basalt: Olivine basalt flows.
- Rewan Formation: Green lithic sandstone, green and red mudstone and sandstone
- Back Creek Group: Sandstone, siltstone, carbonaceous shale, minor coal and sandy coquinite
- Felsites: Rhyolite, dacite, rhyolitic ignimbrite, volcaniclastic sediments, sinter, minor sandstone and siltstone
- Approximate Fault Location
- 10 km Dyno Nobel Buffer
- Dyno Nobel Site
- Cadastral Boundary
- Road
- Highway
- River
- Railway
- DNRM Registered Bore
- 50 m Contour

Geological Data Source: Department of Natural Resources and Mines, Queensland.

Geology Of The Moranbah Area

41-15824 August 2006

Proposed Ammonium Nitrate Plant

Dyno Nobel Group

1:200 000

MGA94 Z55

Drawn By: DJF Checked By: RJV

Figure 29

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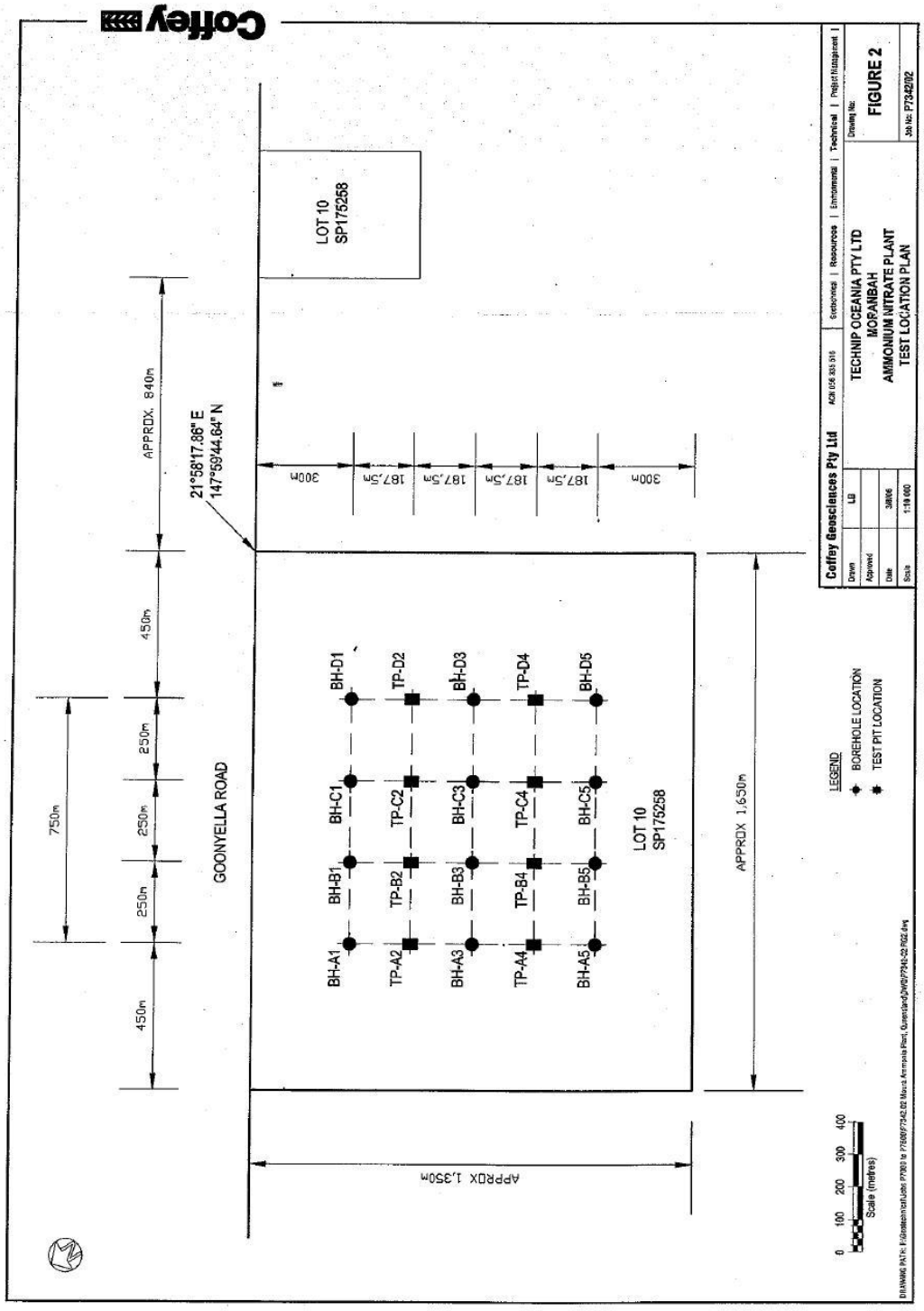
Figure 30 Borehole Locations



Coffey Geosciences Pty Ltd (Coffey) carried out a geotechnical assessment of the soils on the AN Plant site to determine the construction considerations pertinent to the proposed development of the AN Plant. As part of this assessment an investigation into the soils in the area where the evaporation pond is proposed was undertaken.

Coffey has produced a draft geotechnical report (Coffey, 6 Sept 2006) on the evaporation pond (Figure 30 details bore hole locations) and details the following information.

The evaporation pond is proposed to be nominally 1m deep and located in the western part of the site. The evaporation pond will require a clay liner, with fines content preferably greater than 50% and a Coefficient of Permeability ≤ 10^{-9}m/s. During this investigation, boreholes BH-A1, BH-A3 and BH-A5, and test pits TP-A2 and TP-A4, were carried out within or near the proposed pond area.

The laboratory test results summarised in Table B, indicate that the sub-soil materials encountered at borehole BH-A1, BH-A3 and BH-A5 locations, near about 1m depth, are anticipated to generally meet the fine content requirements.

It is expected that sub-soil materials, at the excavation level at the locations of boreholes BH-A1, BH-A3 and BH-A5, would indicate the Coefficient of Permeability in the same order as shown by the tested samples recovered from test pits TPB4 and TPC4, which had fines content (<0.075mm sieve size) of 63% and 42%, respectively, and indicated very poor drainage characteristics with the Coefficient of Permeability in the order of 10^{-9}m/s to 10^{-10}m/s. However, the sub-soil material at test pits TP-A2 and TP-A2 may have a relatively lower fine content, and relatively higher permeability.

The clay material required for construction of the evaporation ponds is readily available on site. In-situ permeability tests should be carried out to confirm the permeability of the sub-soil material for the proposed evaporation ponds during construction.

The evaporation pond will also need to have in place adequate stormwater diversion to prevent the evaporation pond from capturing overland flow from offsite.

The evaporation pond has been modelled for the inputs from the process waters into the dam with the water flows from the hardstand area (7 ha) directed into the evaporation pond and for no overtopping events. This was based on the rainfall and evaporation data for the area from the DNRW (formerly DNRMW) from 1957 to 2005.

Evaporation pond sizes modelled include a 20 ha area at 0.8 m deep with a maximum total volume of 160 ML. The evaporation pond has been modelled for zero discharge (further details are provided in Section 4.5 Waste).

A monitoring program of the walls of the evaporation pond will be developed to periodically assess the dam walls integrity. A further geotech assessment will be undertaken to determine suitability of soils for dam wall costruction and for the pond lining.

Best practice for dam construction will be implemented in the construction of the evaporation pond. Monitoring of the evaporation pond will be undertaken with the use of bores or other measures to determine if leakage is occurring.

The supply of water for the project will be provided from water allocation and pipeline capacity agreements with BMA and Sunwater for the Burdekin to Moranbah pipeline.

The evaporation pond in place for the project will contain liquid waste high in Ammonia (2,050 mg/l), Nitrate and Nitrite (1,923 mg/l). The EPA has responsibility for dams containing hazardous waste. The "*Code of Environmental Compliance for Environmental Authorities for High Hazard Dams Containing Hazardous Waste"* a hazardous waste is:

"Any substance, whether liquid, solid or gaseous, derived by, or resulting from, the processing of minerals that tends to destroy life or impair or endanger health".

This is further defined under the code as a substance that exceeds the Hazardous Waste Criteria as provided below in Table 28.

Table 28 Hazardous Waste Criteria

Acceptance criteria

Parameter[1]	**Liquor[2]**	**Total Solids[3,4]**
Arsenic	1.0 mg/L	500 mg/kg
Cadmium	10 µg/L	100 mg/kg
Cobalt	1.0 mg/L	500 mg/kg
Copper	1.0 mg/L	5 000 mg/kg
Lead	0.5 mg/L	1 500 mg/kg
Mercury	2 µg/L	75 mg/kg
Nickel	1.0 mg/L	3 000 mg/kg
Zinc	20 mg/L	35 000 mg/kg
Chloride	2 500 mg/L -	
Fluoride	2.0 mg/L -	
Sulphate	1 000 mg/L -	
Cyanide	10 mg/L	2 500 mg/kg
PH	Between 4 and 8	Net acid generation of pH<4

1) Metals should be analysed in accordance with recognised test methods by a NATA certified laboratory.

2) Applies to the liquid contents in a dam generally available to the environment (for example, water available to birds and animals).

3) Total solids include suspended and colloidal solids.

4) Applies to the solids in a dam.

(EPA, information sheet," Determining Dams containing Hazardous waste")

Under this definition, the effluent within the evaporation pond would not be classed as hazardous waste as Ammonia and Nitrate are not included and the criteria for the other compounds identified within Table 28 are not exceeded (based on the water quality from the existing evaporation pond at the Moura AN Plant). The water quality parametres from the existing evaporation pond at the Moura AN Plant are provided in Table 29. The evaporation pond therefore will not be triggered as a “Hazardous Dam”.

Table 29 Water Quality from the evaporation pond at the existing Moura facility

Analyses	Units	1st Evap pond (100%)
pH	pH	7.68
Conductivity	us/cm	15,230
Turbidity	NTU	24
Colour	Hazen	50
Suspended Solids	mg/L	54
Sulphate	mg/L SO_4	982
Chloride Cl	mg/L	332
Total Hardness	mg/L Ca CO_3	274
Total Alkalinity	mg/L Ca CO_3	159
Alkalinity- Carbonate	mg/L	0.71
Alkalinity- Bicarbonate	mg/L	158
Alkalinity- Hydroxide	mg/L	0.02
Fluoride	mg/L	0.726
Nitrate, Nitrite	mg/L as N	1,923
Ortho phosphorus	mg/L	1.38
Ammonia	mg/L	2,050
Total organic carbon	mg/L	58
Calcium	mg/L Ca	75
Magnesium	mg/L Mg	21
Sodium	mg/L Na	590
Potassium	mg/L K	37
Aluminium	mg/L Al	0.040
Boron	mg/L B	0.249
Barium	mg/L Ba	0.301
Copper	mg/L Cu	0.018
Iron	mg/L Fe	0.079
Manganese	mg/L Mn	0.263
Zinc	mg/L	0.186
Silica	mg/L SiO_2	54

A referable dam is defined under Section 481 of the *Water Act 2000* as;

(1) A dam is, or a proposed dam after its construction will be, a referable dam if—

(a a failure impact assessment of the dam, or for the proposed dam, is required to be carried out under this part; and

(b the assessment states the dam has, or the proposed dam after its construction will have, a category 1 or category 2 failure impact rating; and

(c the chief executive has, under section 487, accepted the assessment.

Under the *Water Act 2000* a failure impact study is required if the dam is more than 8 m in height and have a storage capacity of more than 500 ML, or more than 8 m in height and have a storage capacity of more than 250 ML and a catchment area that is more than three times its maximum surface area at full supply level.

As the evaporation pond will not meet these criteria it is not classed as a hazardous dam and therefore licensing of the dam under the *Water Act 2000* is not required.

Clearing of the woodland on the project site will increase the potential for soil erosion, particularly if soil disturbed during the clearing operations is not adequately protected. Increased soil deposition in Grosvenor Creek could be expected should the site experience heavy rainfall after clearing, but before the site has been hardened. Should turbidity increase in Grosvenor Creek, expected impacts would include a lowered ability for aquatic plants to function, with negative impacts for organisims that rely on such plants for food and shelter.

In order to minimise topsoil loss and lowered water quality in Grosvenor Creek, it is recommended that the period between clearing and site hardening be kept to the minimum possible, and be timed to avoid predicted wet weather or heavy wind events.

The soil surface should be kept damp if heavy winds are expected in order to 'bed' the surface soil down. Diversion drainage around the plant site should be installed before clearing commences this may include construction of bund walls down-slope of clearing activities using sediment fences for overland flow on shallow slopes (<5% slope) with rock check dams and rock armouring on areas of slightly steeper gradients. Stormwater management for the site is discussed in detail in Section 5 of the EIS.

It should be noted that the slopes on the site are very gradual. The slope in the south western corner being one of the steeper slopes on the site with a drop of five metres over 160 metres with the majority of slopes on a much lower gradient. Figure 31 provides an indication of likely water flow over the site moving down gradient from elevated areas. Control measures to manage sediment and erosion on site will be further defined in the final design of the plant.

Landscape planting of thick, shrubby native vegetation with a ground cover of grasses and sedges down-slope of the construction site should be considered as a more permanent measure to collect suspended soil particles after construction is finished.

The water from the hardstand area may potentially have some hydrocarbon contamination, nitrates and nitrites and an elevated salinity. Therefore water from the hardstand area will be captured on site and sent through an oil water separator unit

prior to discharge to the evaporation pond. The separated oil and other material will be collected for disposal through a waste contractor.

There is not anticipated to be any contaminants from the AN Plant released to the environment except for some minor sediment and hydrocarbon runoff from the constructed roadway on the site outside of the hardstand area.

Control measures in place, including the presence of the existing vegetated buffer around the AN Plant, will assist in minimising erosion from the site. Where there is a discharge point on the plant site from clean water diversions, these release points should be assessed with a view to protect them from scour erosion. Primarily the site will direct uncontaminated stormwater to overland flow. Some sediment may be expected in the stormwater from the site. However, the vegetated buffer and significant distance to Grosvenor Creek should minimise the impact on water quality in the downstream environment.

During construction, and if Grosvenor Creek is flowing or containing pools, water quality assessments both up and down-stream of the site will be conducted every three months until complete(during flow events). All assessments will consider the full suite of water quality parametres considered appropriate under the Australia and New Zealand Environment and Conservation Council (ANZECC)/Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) Guidelines for fresh water quality (ANZECC/ARMCANZ, 2000), and will be conducted in the manner prescribed in the Guidelines.

A report outlining all findings and identifying and discussing any trends detected from previous findings should be an outcome of each monitoring study. Prompt action will be taken to correct any significant negative trends in water quality detected by this monitoring program.

A PRA was conducted of the potential risks from the operation of the AN Plant including a catastrophic failure of the evaporation pond. The modelling undertaken for the evaporation pond did not indicate any overtopping events for the available data from 1957 to 2005. If there was a catastrophic failure of the evaporation pond a release of up to 160 ML would occur, a significant volume of this material would remain within the pond with the remainder moving down slope towards Grosvenor Creek. The Creek is ephemeral and may or may not have water in it.

The extremely high levels of nitrate and ammonia would significantly impact on any aquatic organisms within the creek if this material were to reach this location. The toxicity of these compounds is both pH and temperature dependent (US EPA, 1999). However the levels of ammonia and nitrate within the water entering the creek (well above the ANZECC/ARMCANZ 2000 trigger levels unadjusted) would cause immediate impacts on any aquatic organisms within the water column (it should be noted that this toxicant is non-cumulative and non-persistent). The release of ammonia and other nitrogen products may also cause eutrophication of the surface waters.

Ammonia is a natural product of biological decomposition of organic nitrogen products. Numerous tests have been undertaken on the impact of ammonia on aquatic

organisms primarily, due to the generation of ammonia in intensive aquaculture operations. Ammonia can be lethal to fish at very low levels, depending on species, concentration and exposure time. Fish can suffer a loss of equilibrium, increased respiratory activity and oxygen uptake, and increased heart rate. At extreme ammonia levels, fish may experience convulsions, coma, and death (US EPA, 1999).

The volume of the water reaching the creek would be dependent on a wide range of factors including whether the ground surface over the site has reached water saturation prior to the failure, the amount of vegetation between the creek and the evaporation ponds (the buffer will not be cleared for this project) and the level of failure of the evaporation pond.

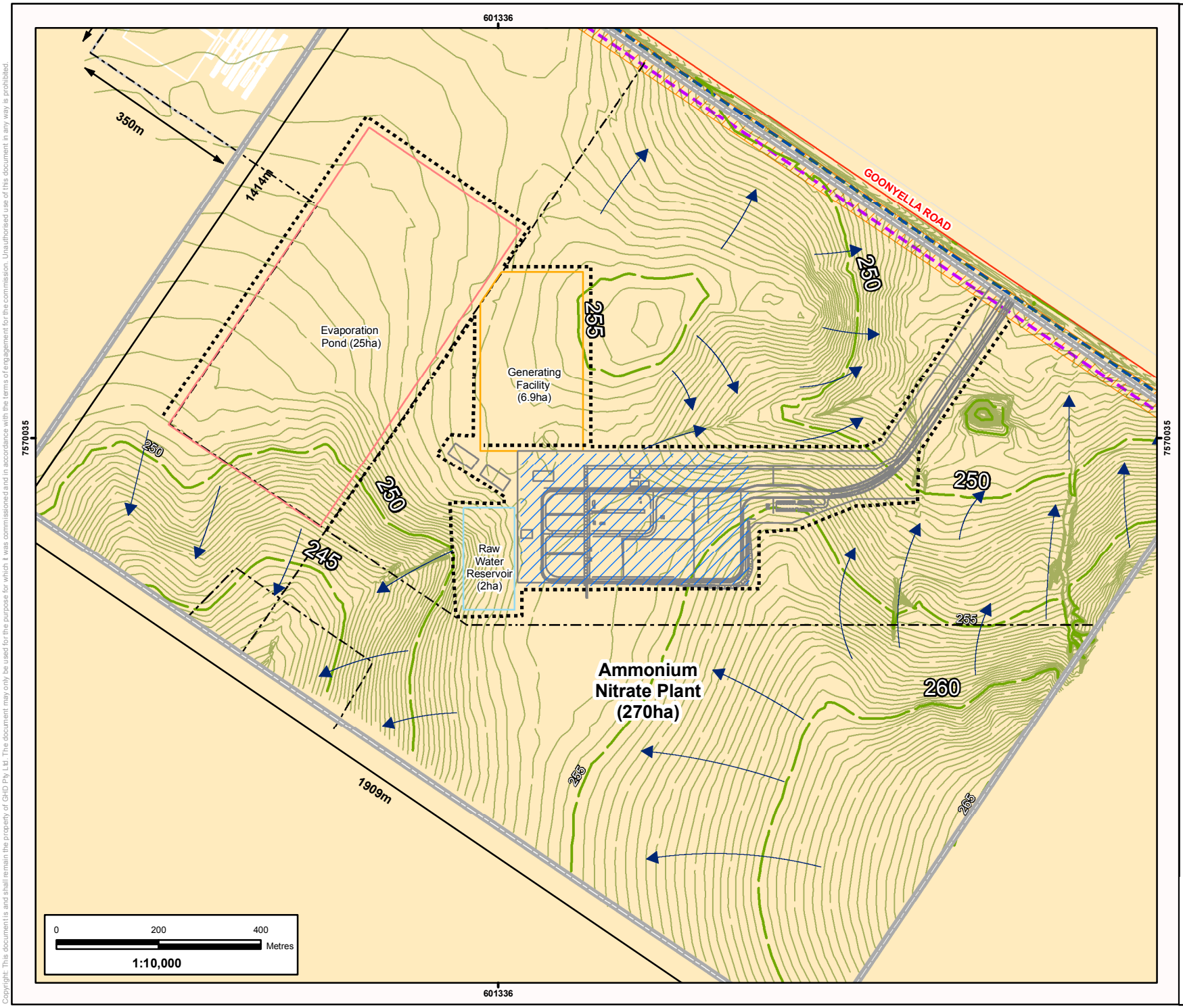
Some of the metal concentrations in the wastewater will also exceed the ANZECC/ARMCANZ 2000 water quality guidelines including Copper and Zinc. These may have a potential negative impact on organisms within the creek if they were to reach the watercourse. The salinity of the effluent will be 15,230 us/cm (1,523 ms/cm), slightly above the level expected from freshwater. The nutrient levels could cause an algal bloom, depending on the turbidity levels within the creek system. There is unlikely to be any impacts on human health due to the fact that the creek is not used for a water supply and is an ephemeral water body with no permanent standing water.

The surrounding land area outside of the project site would mitigate the impacts and spread the flow of the wastewater out over the site. Grosvenor Creek is a tributary of the Isaac River, which has both mining and grazing along its length. It is unlikely that the wastewater would reach the Isaac River even following catastrophic dam failure. The Ammonia and Nitrate would also dissipate, as these contaminants are not cumulative or persistent.

Ground Water

The most likely potential impact on groundwater in the area around the proposed plant is contamination by seepage from wastewater storage ponds and infiltration of contaminated run-off from stockpiles. The risk of impact appears to be minimised by the presence of a thick surface clay layer (i.e. the Tertiary surface). As leakage through fissures and desiccation cracks in the clays may be significant, any *in-situ* soils used as liners for storage ponds must be ripped, re-worked, moisture conditioned, and compacted to the appropriate density and moisture content, to minimise the risk of shrinkage and cracking.

At least one deep bore will be drilled, to a depth of approximately 20 m to determine if there are localised shallow permeable horizons beneath the site, which may act as preferential flow paths to leakage from the storage ponds or infiltration of surface contaminants. If such permeable horizons are intersected, consideration should be given to a more extensive site investigation, including installing monitoring bores and regular sampling. Falling/rising-head tests should be carried out in each monitoring bore to determine aquifer permeability.



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Date: 02-10-06 Rev G
Datum: GDA94 (MGA) Zone 55
Source: Base data sourced from the State of Queensland, Department of Natural Resources, Mines. All other infrastructure supplied by Dyno Nobel Asia Pacific Ltd.
File: G:\41\15824\GIS\Maps\FinalMXD\fig31_Water_Flow.mxd

Legend

- Diversion drainage
- Ammonium Nitrate Plant Site
- Cadastre
- Generating Facility*
- Evaporation Pond
- Raw Water Reservior
- Easements
- Fence
- Watercourse
- Major Road
- Railway
- Water Pipeline
- Petroleum Pipeline
- Hardstand diversion through to evaporation pond

*Generating Facility location is subject to detailed engineering.

Moranbah Ammonium Nitrate Plant

Environmental Impact Statement

Figure 31
Water Flow

GHD
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In addition, permeability testing, using either large ring –infiltrometres or soakaway tests in test pits will be carried out within the proposed storage pond areas to determine macro permeability of the soils. Dyno Nobel Asia Pacific Limited has instigated a further geotech investigation for the site of the evaporation pond. The final design of the evaporation pond and the materials on site available will be further assessed during the detailed design.

4.4 Air Quality

4.4.1 Existing Conditions

Existing local sources of air contaminants, particles with an effective diameter of less than 10 micrometres (PM_{10}) and NO_2 are primarily associated with combustion and include local vehicular traffic and the sporadic operation of the Ergon peaking power station. Further local emissions of PM_{10} dust (specifically, crustal dust) are likely to result from wind erosion and mechanical generation through agricultural activity. On a regional scale, coal mining activity is likely to be another source of PM_{10}. However, given the predominant south easterly winds at Moranbah, and given that the coal mines are located 20 km to the north west, such activities are not likely to significantly impact local air quality at Moranbah.

There are currently no known records of air quality data for the Moranbah area. However, in order to produce a conservative estimate of existing air quality, data from areas that are more urbanised and industrially intensive than Moranbah have been used. Specifically, records of existing NO_2 concentration have been taken from the previously referenced report by Katestone Environmental for the air assessment of the adjacent peaking power station, which cites data recorded by EPA Queensland at three locations in urban Brisbane. Records of existing PM_{10} concentration have been taken from a 2005 EPA Queensland publication, which contains a summary of data recorded at West Mackay. For both NO_2 and PM_{10}, the maximum recorded values are conservatively assumed to be representative of typical conditions at Moranbah. Table 30 summarises the adopted representative data.

Table 30 Ambient Air Quality, Adopted Concentrations

Air Quality Indicator	Concentration (µg/m^3)	Averaging Time	Location of Measurements
NO_2	49.3	1-hour	Brisbane
NO_2	46.2	4-hours	Brisbane
NO_2	19.6	1-year	Brisbane
PM_{10}	45.3	24-hours	West Mackay
PM_{10}	20.6	1-year	West Mackay

Sensitive receptors are generally defined as residential areas, hospitals, schools, caravan parks and other similar land uses where people are present for an extended period of time, except in the course of their employment or leisure. There are a

number of sensitive receptors in the vicinity of the project and many are located at the township of Moranbah. The majority of these receptors are urban residences, however the township also has three schools and a hospital. In addition, there are a number of temporary miner's accommodation residences near the Ergon peaking power station, which is located approximately mid way between the project and the centre of Moranbah.

Available Meteorological Data

The simulation of air quality impacts resulting from emissions to air from the project requires the use of a meteorological data set containing hourly data spanning a year. Ideally, much of these data would be obtained from on-site observations. Such observations are, however, not available for the proposed site. In such situations, recorded data from another, representative location may be used. Data are deemed to be representative if the meteorological trends, surrounding land uses and topographic features for the site of interest are similar to, or are expected to be similar to, those of the site at which the data were recorded. Where site-representative meteorological data are not available, or are not of suitable temporal resolution or extent for dispersion modelling, the alternative is to synthesise meteorological data for the site using prognostic 3D wind field modelling.

Consequently, GHD opted to utilise a regional-scale prognostic meteorological model, TAPM, to simulate the climate. The Air Pollution Model was used to produce representative hourly surface meteorological data at the proposed site. This information, in conjunction with the determined source characteristics and emissions inventory, was later used with the AUSPLUME dispersion model, to assess the impacts of emissions on the surrounding land uses. Section 5 of the Air Quality Assessment Report (refer to Appendix 7.8) discusses TAPM in greater detail.

4.4.2 Potential Impacts and Mitigation Measures

Construction Phase Emissions

During construction of the project, it is anticipated that emissions to air will consist predominantly of particulates, originating from internal combustion engines, mechanical earth moving and wind erosion. PM_{10} emissions will be most intense during the nine month period of earth works, associated with site preparation and foundation construction, and will occur sporadically from all areas of the 60 ha construction site.

Table 31 provides a summary of the construction emissions inventory derived for this assessment. Estimates were based on information obtained from DN's Initial Advice Statement for the project. Note that the PM_{10} emission rate for mechanical activities is inclusive of both vehicle exhaust and crustal dust, and that estimates of emissions control have been applied where appropriate.

Table 31 Construction Phase Emissions Inventory for PM_{10} Dust

Process	PM_{10} Emission Rate'	Basis and Assumptions
Excavator / Shovel / Front-End Loader	0.15 g/sec, 11 hr/day	Screening level of 0.012 kg PM_{10} per ton of material dumped. Assumed 500 T dumped per day.
Grader	0.69 g/sec, 11 hr/day	Screening level of 0.4 kg/Vkt, with average speed of 25 km/hr, 11 hours per day, active 25% of the time on-site.
Wind Erosion	0.14 g/sec, all time	Screening level of 0.2 kg/ha/day PM_{10}, 60 ha of disturbed soil.
Bulldozer	0.56 g/sec, 11 hr/day	Screening level of 4 kg/hour/dozer PM_{10}, two dozers, 11 hours per day.
Dump Trucks	0.34 g/sec, 11 hr/day	Screening level of 0.4 kg/Vkt, with average speed of 25 km/hr, two dump trucks, 11 hours per day, Level 2 watering (75% control), vehicle active 25% of the time on-site.

Further to compliance with EPP(Air) goals, it is noteworthy that the modelling of construction impacts is highly conservative and that there are no nearby sensitive receptors in the directions of maximum predicted off site impact (south and west of the site). The nearest sensitive receptors (temporary miner's accommodation) will receive minimal impact from the construction phase. In addition, emissions from bulldozing and grading constitute 65% of the total inventory.

Screening level emission factors have been applied to these activities. The application of emissions control measures described in Section 2.3.1 of the Air Quality Assessment Report *(*Appendix 7.8 of the EIS) will substantially abate these dust emissions and so reduce localised impact just beyond the site boundary.

The Air Quality Assessment Report for the project provides for the mitigation of impacts. On the basis of the assumption, (detailed in Section 2.2.1 of Appendix 7.8), that PM10 constitutes 50% of Total Suspended Particulates (TSP) emissions during the construction phase, a doubling of the calculated values gives an indication of the potential impact upon ambient TSP.

On this basis the offsite annual average PM_{10} concentration equates to approximately 40 µg/m3 of TSP. When the assumed (conservative) background of 41.2 µg/m3 is included, the total comes to 81.2 $\mu g/m^3$, which equates to 90% of the corresponding EPP(Air) air quality goal of 90 $\mu g/m^3$.

Construction Phase Emissions Abatement

It is anticipated that construction phase abatement of PM_{10} emissions will include such options as:

1 Tactical water spraying which takes into consideration approaching weather systems and targets areas of frequent traffic and/or unconsolidated soil;

2 Defined and controlled transport routes and areas; and

3 Revegetation.

Additional information will become available upon completion of the EMP for the project.

Operational Phase Emissions

Air quality assessments must take into consideration 'worst case' emissions to air that may arise during the operational phase of industrial facilities. Such emission scenarios typically occur during plant start up, shut down or upset conditions. There are three points of release of emissions to air from the project:

1 The AN plant;

2 The Nitric Acid Vent (NA Vent); and

3 The Reformer Furnace (RF).

Anticipated emission species of concern from these three release points fall into two categories: Particulate Matter and Oxides of Nitrogen (NO_x). Particulate matter emissions are expected to occur solely from the AN Plant and will consist of crystalline AN. The conservative assumption has been made that 100% of these particulate emissions will fall within the PM_{10} particle size category. Emissions of NO_x, on the other hand, are expected to occur only from the NA Vent and RF. In this instance, the conservative assumption has been made that NO_2 will constitute 30% of the NO_x emissions.

Emissions from the proposed peaking power station, to be located approximately 1.5 km ESE of the project, have been taken into consideration. According to a preliminary air assessment, conducted by Katestone Environmental, the main pollutants of concern from the generator units at the proposed power station will be Oxides of Nitrogen. Emissions of CO_2, CO, particulates, hydrocarbons and water vapour are expected to be insignificant to local air quality. NO_x emissions were again assumed to be 30% NO_2.

Visibility of Emissions

The occurrence of atmospheric haze or smog is highly improbable in Moranbah due to low local emissions of the pollutants that are typically responsible for these effects, namely particulates, NO_X and VOCs (Volatile Organic Compounds). It is unlikely that the small predicted increase over existing background levels in atmospheric PM_{10} and NO_2, associated with the project and peaking power station, will result in the formation of visible haze or smog. In addition, the prevailing wind direction at Moranbah is east south easterly. Winds from this direction will act to disperse emission to air from the project in a direction that is away from the township of Moranbah, thereby further reducing the risk of haze and/or smog.

Operational Phase Emissions Abatement

At the time of preparation of the Air Quality Assessment Report (Appendix 7.8 of the EIS), information pertaining to the proposed emissions abatement technologies had only been obtainable for the Nitric Acid Vent. The specific abatement technology to be utilised at the NA Vent is Selective Catalytic Reduction (SCR), which, utilises a small amount of ammonia as a reducing agent and is capable of removing up to 90% of NOx from the exhaust stream.

Figure 32 shows the predicted annual average ground level concentrations of NO_2. Maximum off site impacts (between 3 and 4 µg/m^3) are seen to occur near the western boundary of site. The predicted impact at the temporary miner's accommodation is shown to be substantially less than 1 µg/m^3. When the predicted maximum impact is added to the estimated annual background (19.6 µg/m^3), compliance with the EPP(Air) air quality goal (30 µg/m^3) is demonstrated. More specifically, the maximum predicted off site impact, when inclusive of conservative background is 79% of the EPP(Air) goal.

Note that the predicted ground level concentrations are dominated by the impact associated with the nine power generator units, despite their combined emissions being just 60% of the total for the project. The proportionately high impact is due to differences between the release geometries of the generators and the release geometries of other stacks (NA Vent and Reformer Furnace). The generators have 15 m stacks, which are significantly closer to ground level and have smaller exhaust velocities than either the NA Vent or Reformer Furnace. Both act to reduce the amount of time, and consequently, the dispersion of the plume, before the plume first creates an impact at ground level. The result is that the observed peak ground level concentrations are predominantly due to the shorter generator stacks.

Health Risks

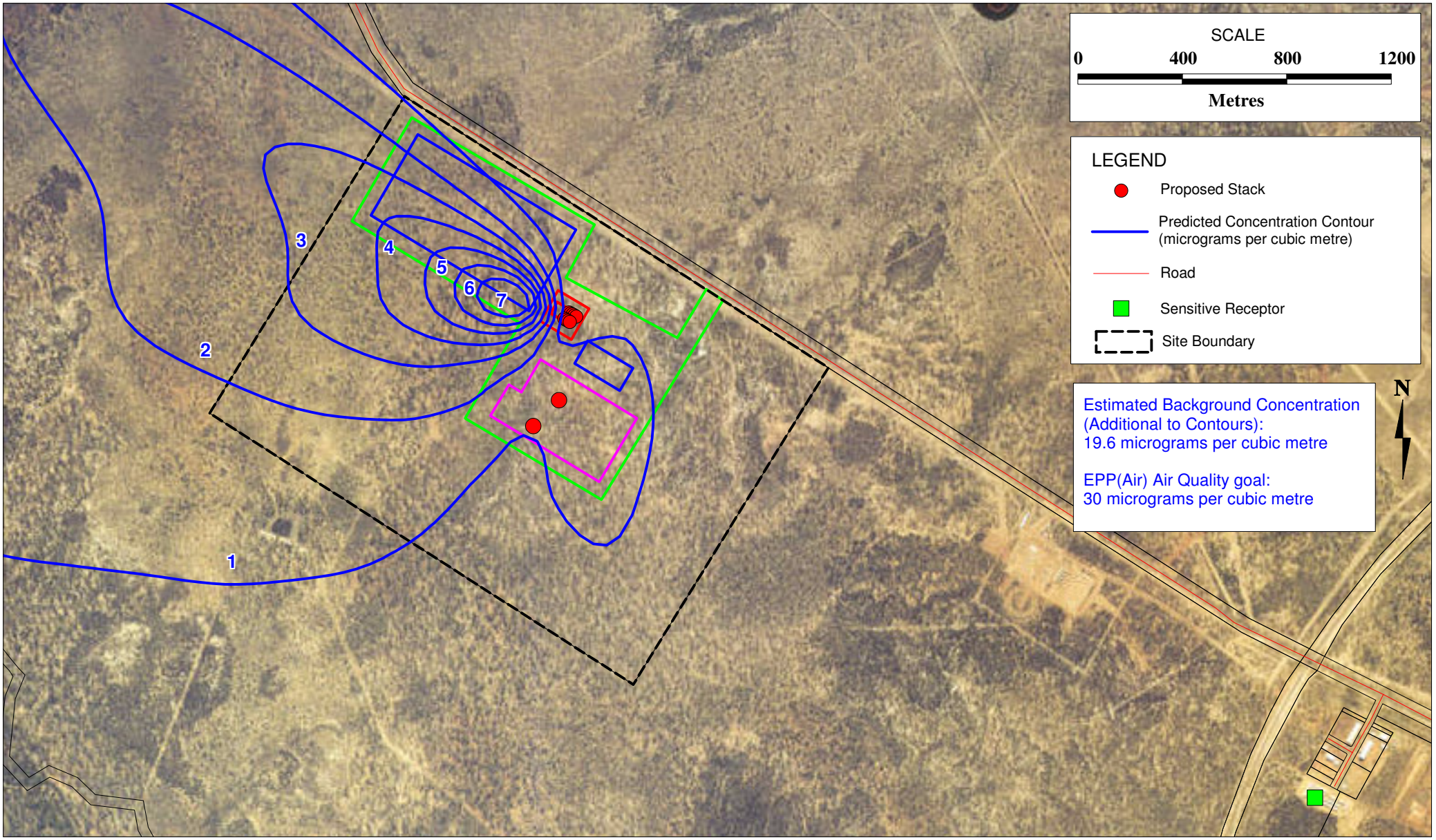
Based on the modelling undertaken the NO^2 emissions are less than the NEPM (Air) annual air goal for human health protection and the PM_{10} emissions are considered to have a very limited impact on any sensitive receptors in the area. The health risks associated with the air emissions are discussed in detail in Section 3.3.9 and Appendix 7.8.

Worst Case

Air quality assessments must take into consideration 'worst case' emissions to air that will arise during the operational phase of industrial facilities. Such emission scenarios typically occur during plant start up, shut down or recognised upset conditions. In the case of the project, correspondence between GHD and DN has indicated that: "Emissions will not be higher at start-up and shutdown than during operation. Indeed, at start-up, scrubbing will be started before prilling and, at shutdown, prilling will be stopped before scrubbing. Higher emissions could be due to non-regulated prilling with superheating of AN solution leading to fumes and submicron particles formation (in general, that is the result of process control loss by operators). For preventing this case, there is a margin in the scrubber recirculation flow (flooding) and the solution is maintained slightly acidic for neutralising ammonia emissions."

Dyno Nobel Asia Pacific Limited has also indicated that the risk of process upset due to inconsistent feedstock composition will be mitigated by a policy of plant shutdown should operating conditions deviate from those required. In addition, DN has indicated that the feedstock for the AN Plant process and the Power Plant are known to be of adequately consistent composition to further mitigate the risk of upset conditions.

With regards to 'worst case' emissions to air from the power generating facility, it is anticipated that, being a continuously operating facility (base load facility), the generators will be run for 24 hours a day, seven days a week. As such, peaks in emissions to air will be limited to periods of mechanical malfunction and associated shutdown and startup periods. Such events are likely to occur on a sporadic and infrequent basis. More detail is provided in the Air Quality Assessment Report (Appendix 7.8 of the EIS).



DATA SOURCE				
Prepared.	BPS	09/08/2006	Workspace	NO2_1yr.wor
Checked.	AML	09/08/2006	Location	G:\41\15824\GIS\Projects
Approved.	AML	09/08/2006	Map Grid	GDA 94 (Zone 55)

GHD
180 Lonsdale Steet
Melbourne Vic 3000
Tel: 61 3 8687 8000
Fax: 61 3 8687 8111

Project:	**Dyno Nobel Proposed Ammonium Nitrate Plant - Moranbah, Qld**					
Title:	**Figure 32: Predicted Annual Average NO2 Contours**					
Project No: **41 / 15824**	Date: **09/08/2006**	**A4**	Scale: **1:20,000**	Sh **1** of **1**	Rev. **0**	

4.5 Waste

4.5.1 Existing Conditions

Applicable Legislation

Dyno Nobel Asia Pacific Limited has adopted the definition of waste as outlined in the EPA which states:

Waste includes any thing, other than a resource approved under subsection (4) that is-

(a) Left over, or an unwanted by-product, from an industrial, commercial, domestic or other activity; or

b) Surplus to the industrial, commercial, domestic or other activity generating waste.

Waste management practices are based on the principles and requirements outlined in:

1 Environmental Protection Act 1994 (Qld);

2 Environmental Protection (Waste Management) Policy 2000 (Qld);

3 Environmental Protection (Waste Management) Regulation 2000 (Qld).

Environmental Protection Act 1994 (QLD)

Under the EP Act, the plant is characterised as a "chemical manufacturing, processing or mixing" and "chemical storage" facility. This requires the proponent to obtain a development approval and registration certificate to become a "registered operator" for specific ERAs.

Environmental Protection (Waste Management) Policy 2000

The project will comply with all regulatory requirements and aim to adopt best waste management practices and go beyond compliance where economically feasible options are identified. Dyno Nobel Asia Pacific Limited accepts the principles outlined in the Environmental Protection (Waste Management) Policy 2000, specifically the "polluter-pays principle". Consequently, the company will take responsibility for the management of wastes generated from the facility and/or as part of the manufacturing process. To best manage waste, DN will adopt the waste management hierarchy as outlined in the Environmental Protection (Waste Management) Policy 2000.

Environmental Protection (Waste Management) Regulation 2000

Dyno Nobel Asia Pacific Limited intends to comply with all regulations outlined in the Environmental Protection (Waste Management) Regulation 2000, and adopt the objectives of the legislation into the AN Plant waste management practices. Specifically, "minimising the impact of waste on the environment" and "…manage waste under principles of ecologically sustainable development".

Environmental Values

The environmental values that may be impacted from the waste stream relate to the generation of both solid and liquid waste from the operation of the facility. The waste management methodology adopted by DN is to follow the principles provided in the Environmental Protection (Waste Management) Policy 2000. This encourages waste to be managed in the following order of preference:

1. waste avoidance;
2. waste re-use;
3. waste recycling;
4. energy recovery from waste, and
5. waste disposal.

Dyno Nobel Asia Pacific Limited has adopted these principles for implementation at the site for management of both solid and liquid waste. The potential impact of waste generation at the site will affect existing landfill operations by increasing the current loads of waste materials that are received. The regulated waste generated at the site will require collection, potentially treatment and then disposal. The effluent from the evaporation ponds will include high concentrations of nitrates and ammonia that will need to be effectively managed.

According to *The state of waste and recycling in Queensland (2003),* the Belyando Shire reported a recycling rate of 3%, which can be attributed to the limited recycling capacity of the Shire. Since 2003, JJ Richards has developed a Materials Recycling Facility (MRF) at Clermont, making recycling more feasible and accessible to the project. The waste streams generated by the facility are discussed within this section of the EIS.

4.5.2 Potential Impacts and Mitigation Measures

Construction Phase

Dyno Nobel Asia Pacific Limited estimate that solid waste material generated during construction will be approximately thirty cubic metres per week (3x10m^3 bins). Construction wastes will be divided into hazardous or non-hazardous in accordance with applicable Queensland regulations. The majority of the waste have been identified as non-hazardous (refer section 3.2.3).

A waste management plan has been included as part of the environmental management plan (see Section 5) this will be further developed during the detailed design to clearly identify waste streams, storage and final disposal point for waste. All attempts will be made to recycle materials where services are available.

The construction wastes (approximately 30 m^3) will be removed from the proposed project site on a weekly basis with the regulated waste disposed of through an appropriately licensed contractor a number of which operate in the area.

Construction Camp

Wastewater management for the construction camp will be required for a peak of 550 construction staff from 18 months to two years. After this time, the construction camp may be removed; any wastewater management systems will be decommissioned prior to this. For this EIS, it is assumed that the construction camp is temporary in nature. Refer to section 3.6 of the EIS for information regarding decommissioning of the construction camp.

The wastewater treatment and management systems considered to a conceptual level in this EIS should be robust for this scheduling of variation in loads. Should the staff numbers oscillate substantially over short periods of time (e.g. from 550 down to 200 then back to 550 etc.) the use of biological treatment systems should be reconsidered. Biological systems which can cater for a progressive increase and reduction in loads are favoured as they allow a good level of nutrient reduction, which in turn reduces the area (and costs) required for sustainable irrigation.

The design characteristics of the sewage treatment systems are based on the wastewater proportions, which are included in Wastewater Effluent Assessment Report (Appendix 7.12 Appendix C of the EIS). Flow and nutrient quality of untreated wastewater are summarised in Table 32.

Table 32 Design Wastewater Characteristics

	Flow rate adopted (L/EP/day)	Equivalent Person	Flow (kL)	Total Nitrogen (mg/L)	Total Phosphorous (mg/L)
Construction camp	180	560	100.8	74	13
AN Plant	110	38	4.18	120	21.5
Temporary - composting toilets option	140	550	77	96	16.9

A number of different options were investigated for the operation of an appropriate sewage treatment plant for the construction camp. These alternatives include:

1. Membrane Bioreactors (MBR);
2. Activated Sludge Package Plant;
3. Biolytix Filters; and
4. Combination of Composting Toilets and Greywater Recycling.

Each of these treatment systems for the construction camp is assessed within the Wastewater Effluent Assessment Report (Appendix 7.12 of the EIS). Each of these alternatives has both costs and benefits to the operation of the construction camp.

The Wastewater Effluent Assessment Report (Appendix 7.12) recommends the following:

» That a lot layout is consolidated during detailed design, and that DN consider its treatment option preferences.

» It is preferable that some additional data is collected to characterise the geology onsite (preferably constant head permeability tests and laboratory tests to characterize the chemical properties of the soil). The soil sensitivity tests completed in this analysis demonstrated that a sustainable system is achievable, but collecting the geological data and checking the irrigation system design will ensure that the system operates in an efficient, sustainable fashion.

» Develop a concept design during the detailed design phase.

» Commission a suitably qualified quantity surveyor to prepare a cost estimate for a Biolytix system, an activated sludge package plant and a MBR.

The steps taken should take into account that the ultimate design will be subject to the requirements of Council and other regulatory agencies such as the EPA. Sludge wastes generated from the operation of the selected sewage treatment facility will be disposed of appropriately to landfill or an appropriate sewage treatment plant.

Operational and Maintenance Phase

Manufacturing Waste

The volumes of waste that will be produced during operation of the AN Plant have been estimated based on waste quantities at the Moura AN Plant. A summary of the waste quantities is outlined in Table 33.

Table 33 Manufacturing Waste Estimates

Waste Type	Estimated Quantity per annum
Waste Oil	19,200 L
Empty Drums	648 X 205 L 225 X 20/40 L
Rags and adsorbents	36 x 240 L wheelie bins

The main solid waste from the process is spent catalyst that is produced in negligible amounts. Disposal of discharged catalysts is arranged by the catalyst supplier, who ensures disposal is carried out in line with regulatory requirements. Where possible, spent catalyst is recycled and reconstituted, or recycled as raw materials for metal industries.

Any waste product, such as out-of-specification product, is returned to the plant for reprocessing. Other inert solid waste is currently disposed of off-site to local landfill. Dilute process waste will be recycled to the maximum practical extent and (dependant

on its nature) either sent to the evaporation ponds or disposed off-site by a private contractor to a licensed waste disposal facility.

Dyno Nobel Asia Pacific Limited will need to ensure all chemicals are stored in compliance with the relevant Dangerous Goods Codes and Australian Standards for storage (e.g. AS1940). The chemical storage and handling areas will be bunded in accordance with AS1940, emergency spill kits will be provided and staff will be trained in their use. This measure will reduce the mobility of chemical contaminants. Should a major spill event occur, the spilled chemical would be tankered away from site to an approved facility

Stormwater collected in each bunded area will be collected in a sump and diverted to the proposed evaporation pond through an oil water/separator, as the rainwater will be potentially contaminated. The collection of the stormwater will not be automated (i.e. it will not drain by gravity) to the pond to ensure that major spills are contained within the bunded areas on site. Stormwater will be utilised within the AN Plant to the maximum extent possible.

Maintenance Wastes

The maintenance of equipment requires specialist labour and equipment that is not readily available from local sources. Consequently maintenance will be carried out off site where feasible and, therefore, only minimal amounts of maintenance waste will be generated on site. It has been estimated that the domestic waste generation rate will be 1,705 kg/month. Of this 5% will be recycled, resulting in a total volume disposed of to landfill of 1,655 kg/month. This is considered a maximum waste volume estimate.

The IAS indicates that the facility will operate 24 hours a day with a total of 90 full time employees (70 plant operation staff and 20 transport staff) with an average of 60 people on site at any one time. An average waste generation rate of 341 kg/person per annum has been adopted from *The state of waste and recycling in Queensland (2003)*. It is likely that this is the maximum waste volume that will be generated per person and actual volumes may be more conservative.

Wastewater Generation from the AN Plant

Wastewater from operation of the AN Plant is estimated to be a relatively constant flow of 15 m^3/hr, or 130 ML/annum. Dyno Nobel Asia Pacific Limited has confirmed that the most appropriate nutrient concentration to characterise the wastewater from the plant is 5000 – 10,000 mg/L and 1.38 mg/L for Nitrogen and Phosphorus respectively. This data is based on the concentrations from the first evaporation pond at Moura.

The Nitrogen level in the plant's wastewater is far in excess of the concentrations in recycled water typically irrigated. For the purposes of modelling for irrigation, concentrations of 5000 – 10,000 mg/L for Nitrogen and 2 mg/L (rounded up) for phosphorus were assumed to be representative of the combined permanent sources. From the modelling undertaken for the AN Plant it is not sustainable to irrigate the wastewater. A number of iterations of the MEDLI model were run, including deficit irrigation scenarios and scenarios that irrigated a maximum of only 1 mm of effluent

per square meter. In each there was a significant amount of NO^3-N leaching, i.e. at least 2770 kg/ha/yr.

The operation of the evaporation ponds at the site have therefore been designed to be zero release to manage the volumes of nutrients generated from the operation of the facility.

Evaporation pond sizing

A water mass balance has been completed to size the evaporation pond as raised in Section 3.5.5. The water mass balance simulated the performance of a hypothetical evaporation pond from 1957 to 2005 (49 years) using daily rainfall and evaporation data supplied by the DNRW (formerly DNRMW). The water mass balance was completed on the basis that:

Rainfall on Evaporation Pond	+	Stormwater Diverted	+	Reject Flow from AN plant	=	Evaporation from the pond	+	Overflow from the Pond

The daily mass balance assumed that:

1. Stormwater was diverted from a seven hectare (ha) area towards the evaporation ponds. This figure was derived from scaling off the Preliminary Plant Layout Arrangement and assuming that runoff from the entire plant footprint is diverted towards the pond.
2. The first three mm was wasted wetting the bunded area/road etc and all of the remaining rainfall over the 5.7 ha area was diverted without further losses to the pond. This is believed to be a conservative approach.
3. 100% of the rainfall which occurred directly over the pond was collected without loss.
4. Pan evaporation was representative of evaporation from the pond.
5. A design flow of 15 m^3 per hour or 360 m^3 per day was the total process flow from the AN plant diverted towards the lagoon. The design flow figure of 15 m^3 per hour was obtained from DN, who noted that normal flow was expected to be only 13 m^3 per hour. It was assumed that the flow occurred consistently throughout the day, every day of the year.

The preliminary mass balance confirmed that there are a number of permutations of evaporation pond areas and depths which can be located within the designated 25 hectare area and would not be expected to overtop if the next 50 years are similar to the last 50 years.

The evaporation pond will contain diverted stormwater and reject water from the reverse osmosis treatment plant. It is therefore expected to potentially have chemical contaminants including traces of heavy metals and hydrocarbons associated with the collection of stormwater from roads, potentially traces of stored chemicals, and very

high levels of Nitrates from the reject Reverse Osmosis (RO) water. Table 29 of describes the water quality of a similar evaporation pond constructed at Moura.

Oil/water separators will be used to treat contaminated stormwater from the compressor and turbine bunded area and oil /diesel storage areas prior to draining towards the evaporation pond.

Domestic Wastes

The domestic sewage for the AN Plant site will be treated by on-site sewage systems utilising septic tanks as the primary settling process unit. These systems will be designed, constructed and operated according to relevant regulations including:

1. Department of Natural Resources and Mines Sewage Code (July 2002) or any subsequent update of that Code;
2. AS/NZS 1547:2000 On-site Domestic Wastewater Management; and
3. AS/NZS 1546.1: 1998 On-site domestic wastewater treatment units – septic tanks.

It is estimated that there will be two septic tank de-sludging operations per year, which equates to approximately 10 m^3 of raw sewage sludge.

Waste Disposal

Dyno Nobel Asia Pacific Limited intends to use licensed waste management contractors to remove and dispose of non-hazardous waste generate during the construction and operational phases. Once the waste is collected the contractor is responsible for ensuring that the waste is disposed of in accordance with the appropriate legislation at an approved landfill facility as detailed under the EPA.

Non-hazardous waste will be disposed of at landfills within the Belyando Shire, which has landfills at Moranbah and Clermont (both un-lined). Although the actual capacity of the landfills is unknown at this time BSC has indicated that a large landfill capacity is still available with only 17 ha of a 51 ha site currently in use. As such, Belyando Shire should be capable of accommodating construction and operational waste generated from the project for the life of the facility. At present, Belyando Shire landfills accept domestic, industrial and mining wastes and are licensed to accept asbestos material, hydrocarbon wastes and most mining wastes. The landfill license does not extent to chemical wastes. Both landfills also have scavenging rights for the collection of recyclable materials.

Belyando Shire has the facilities to improve the current recycling rate with a MRF located at Clermont and another larger facility in Mackay, both are managed by JJ Richards, the Belyando Shire waste contractor. Generally, JJ Richards (MRF) has the capacity to sort and recover glass, paper, plastic, steel and aluminium.

The impacts resulting from solid waste generation at the proposed development are limited and mitigated by the proposed management procedures for the development and the existing waste management infrastructure available in the region.

4.6 Noise and Vibration

4.6.1 Existing Conditions

A site inspection was conducted to determine appropriate noise monitoring locations for the noise and vibration assessment. The locations chosen were deemed to be sites that were indicative of the local residential noise environment. Attended monitoring was undertaken on the 27th and 28th of April, 2006 using a Svan 948 Sound Level Meter (SLM), within current calibration, to monitor the noise environment. Unattended measurements have been sourced from Maunsell (consultants for Transfield), and were undertaken between the 23rd and 29th of March, 2006. Noise monitoring was undertaken at four locations representative of the area, in addition to points on each of the sites boundaries. These locations are depicted in Figure 33.

Daily weather observations for Moranbah were obtained for the 27th and 28th of April (Bureau of Meteorology). These can be seen in Table 2.2 of the Noise Assessment Report (Appendix 7.10 of the EIS). During attended noise monitoring, it was noted that the weather was fine and sunny, with slight to medium cloud cover at times. There was a slight breeze recorded during the evening time period though suitable for environmental noise measurements (<5 m/s). Field observations noted that the ambient noise environment at the monitoring locations were typically described by intermediate background noise levels with intermittent noise contributions from:

1. Traffic noise from Goonyella Road such as mining and other trucks, and general traffic;
2. Intermittent local industrial noise such as grinding and noise associated with moving equipment;
3. Local fauna such as birds and insects, as well as cattle; and
4. Other noise such as leaves rustling.

The adjacent gas compression plant, in particular the operational compressors, were not audible during field measurements (with the exception of the monitoring location at the Enertrade gas Compression Station), however measurements were undertaken during relatively calm weather conditions with favourable winds, which did not highlight noise from that particular source.

Residential receivers

The local noise environment is characterised by noise from industry and mines, from train movements and road traffic noise. Residential dwellings and housing closer to the town of Moranbah consist of accommodation centres, motels and permanent dwellings. The nearest residential receivers correlate with the short-term monitoring locations L1 and L2 as described in Section 2.1 (shown in Figure 33) of the Noise Assessment Report (Appendix 7.10 of the EIS). It was noted during the monitoring that there were several locations possibly being used for accommodation around

Sarchenden Road (near L3). There were no measurements undertaken adjacent to these premises, due to access and safety reasons. The separation distance from the ABN Plant site boundary to the respective receivers are:

1. L1 – 2.3 km; and
2. L2 – 4 km.

The Blair Athol Railway line lies between the proposed site and the nearest sensitive receptors, approximately 150 m to the north west of monitoring location L1 (see Figure 33). Noise specifically from this source was not identified during the attended noise monitoring.

Industrial Receivers

The nearest potentially affected industrial receivers are:

1. Enertrade gas compression station;
2. Ergon Power station; and
3. Other industry such as maintenance and repair workshops, storage yards and other light industry.

The separation distance from the AN Plant site to the respective receivers are:

1. L3 – 3.75 km located on Sarchenden Road; and
2. L4 – 3.75 km (This is located near L3 and was a long term background noise monitoring location).

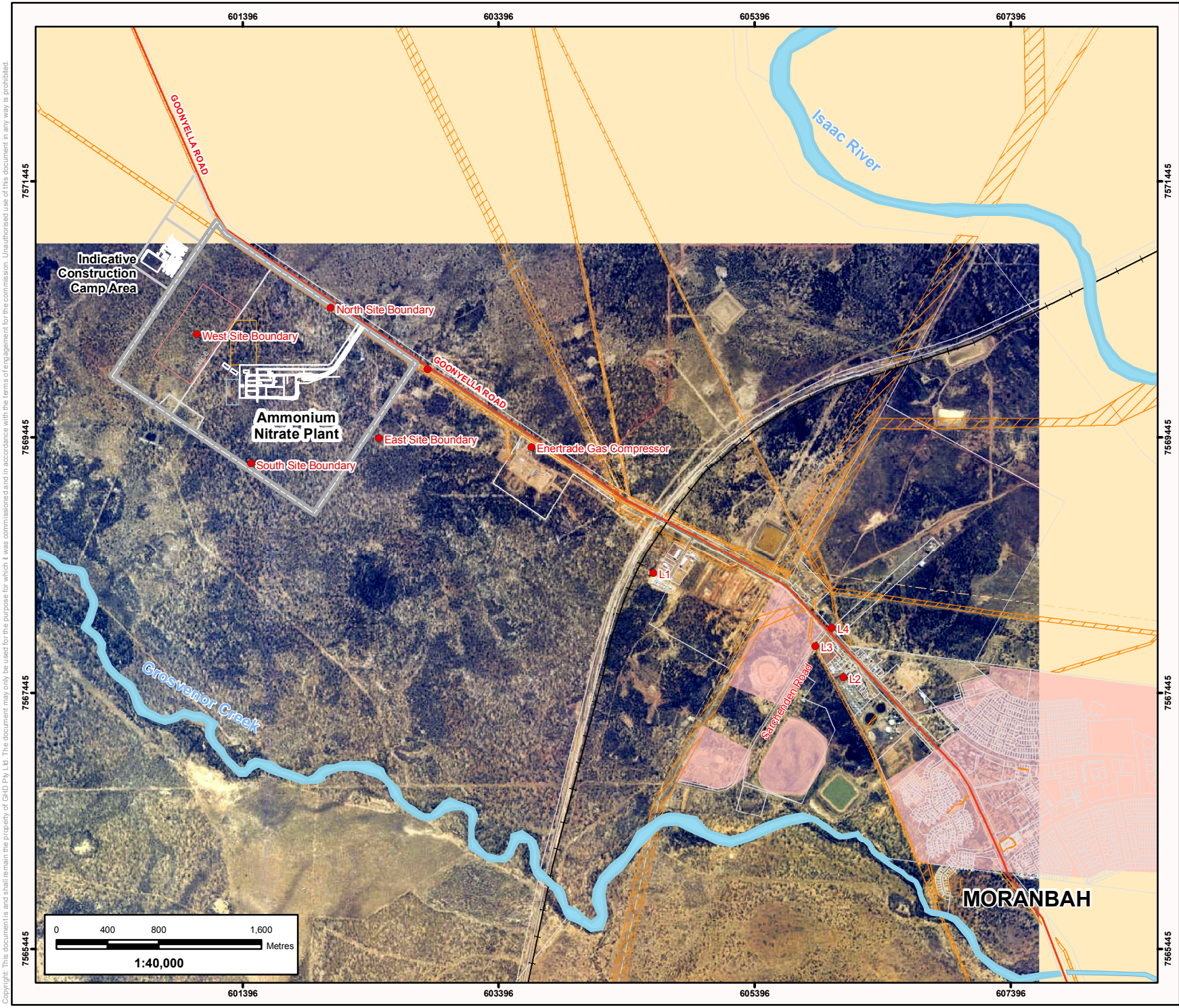
It should be noted that the Transfield Pty Ltd Moranbah and Nebo Power Station Project has been significantly delayed or altered in scope. The operation of this facility has not been included in this assessment as no data is available on the proposed development that may go ahead.

Monitoring Methodology

The monitoring methodology used in the Noise Assessment Report for the project site was in accordance with the “Environmental Protection (Noise) Policy 1997”, “Noise Measurement Manual”, ”Planning for Noise Control Guideline” and the DMR “Road Traffic Noise Management: Code of Practice, January 2000”.

Background Noise levels

The unattended background noise at L4 (see Figure 33) was recorded over a seven day period with the averaged day, evening and night background noise levels being recorded as 43dbA, 41dbA and 34dbA (L90) respectively. The attended background noise levels were slightly higher. (Refer to section 2.4 and 2.5 of Appendix 7.10 of the EIS). The slightly higher background noise levels for the attended monitoring is primarily due to the shorter measurement period and the long term background noise monitoring undertaken is a better indicator. The background noise levels recorded are indicative of a low density housing area.



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Date: 02-10-06 Rev B
Datum: GDA94 (MGA) Zone 55
Source: Base data sourced from the State of Queensland, Department of Natural Resources, Mines. All other infrastructure supplied by Dyno Nobel Asia Pacific Ltd.
File: G:\41\15824\GIS\Maps\Final\MXD fig33_Dev_Site_Location_Noise_RevD.mxd

Legend

- Noise Monitoring Locations
- Ammonium Nitrate Plant Site
- Evaporation Pond
- Generating Facility*
- Raw Water Reservior
- Cadastre
- Easements
- Developed Area
- Watercourse
- Major Road
- Railway
- Powerlines

*Generating Facility location is subject to detailed engineering.

Moranbah Ammonium Nitrate Plant

Environmental Impact Statement

Figure 33
Noise Monitoring Locations

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4.6.2 Potential Impacts and Mitigation Measures

Construction Noise

Estimated construction noise levels were sourced from *AS 2436 – 1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites* for incorporation into the noise assessment.

The levels were distance attenuated from the proposed construction site. Propagation calculations take into account sound intensity losses due to spherical spreading, with additional minor losses such as atmospheric absorption, directivity and ground absorption ignored in the calculations. As a result, predicted received noise levels are expected to slightly overstate actual received levels and thus provide a measure of conservatism. Received noise at each assessed distance, from each item of plant on site, is added (where appropriate) to determine the total received noise at that distance from construction activities. Table 34 provides the noise levels expected from the construction operation at different separation distances.

Table 34 Predicted Plant Item Noise Levels, dB(A)

Plant Activity	Distance of Source to Receiver (m)						
	50	250	500	750	1000	2000	4000
Crane 110	68	54	48	45	42	36	30
Backhoe 108	66	52	46	43	40	34	28
Compressor 100	58	44	38	35	32	26	20
Concrete Pump 109	67	53	47	44	41	35	29
Dump Truck 108	66	52	46	43	40	34	28
Water Tanker 109	67	53	47	44	41	35	29
Compactor 110	68	54	48	45	42	36	30
Pile Driving	88	74	68	62	56	50	44

Due to the distance between the construction works and the sensitive receiver it is unlikely that construction activities will be audible and cause nuisance to any residences. However, activities that cause excessive noise such as pile driving will be limited to Saturdays or business days between 6:30 am and 6:30 pm.

Vibration

Construction vibration will produce the most significant vibration impacts during the operation for ground improvement and compaction. The separation distance between this facility and other facilities in the area will mitigate vibration impacts during the construction period.

Once constructed, the operation of the facility will not generate any significant vibration and is not considered as a potential vibration impact. Goonyella Road is the main

access point into the Moranbah North Mine and already has significant usage by heavy vehicles. The volume of traffic using this road from the project site is unlikely to have any significant change on the existing vibration levels along this road.

Operational noise

A detailed description of the noise sources on site is provided in Section 4.3 of Appendix 7.10 of the EIS (including dbA and Frequency). These noise sources were used to model the noise contours from the operation of the project. An F-Class temperature inversion with a 2 m/s north westerly drainage flow in the direction of the residence was modelled to assess worst case conditions (see Figure 34). An F-class temperature inversion acts to reflect noise back from the inversion towards the ground increasing the potential noise levels encountered. Calm weather conditions do not affect noise characteristics in this way.

Modelled results suggest the noise levels generated by the facility and associated power station is well below the minimum planning noise levels. Therefore based on the information provided and the modelled results, no additional noise mitigation measures or management plans are recommended for the operation of the facility. Additionally the predicted noise levels during operations are well below the sleep disturbance criteria and the background noise levels recorded at the closest receiver L1.

Road Traffic noise

Existing traffic counts have been obtained from BSC along Goonyella Road for 5 locations between chainage 0.36 km and 21.4 km. The traffic generated by the proposed AN Plant is likely to have the biggest noise impact on residential receivers on the sections of road with the lowest existing traffic levels. Therefore, traffic count site number 4 at chainage 21.3 was used as the basis of the assessment as it is in the vicinity of the Marley Accommodation Camp (MAC)(Location 1) and has the lowest existing traffic counts.

Calculation of Road Traffic Noise (CoRTN) implemented in CadnaA was used to determine the increase in traffic noise due to the proposed facility. The increase in traffic noise at the most sensitive receiver is predicted to be less than 0.5 dB(A). Therefore the traffic generation from the operation of the facility is not expected to increase traffic noise significantly and should not have an effect on the amenity of residences in the area.

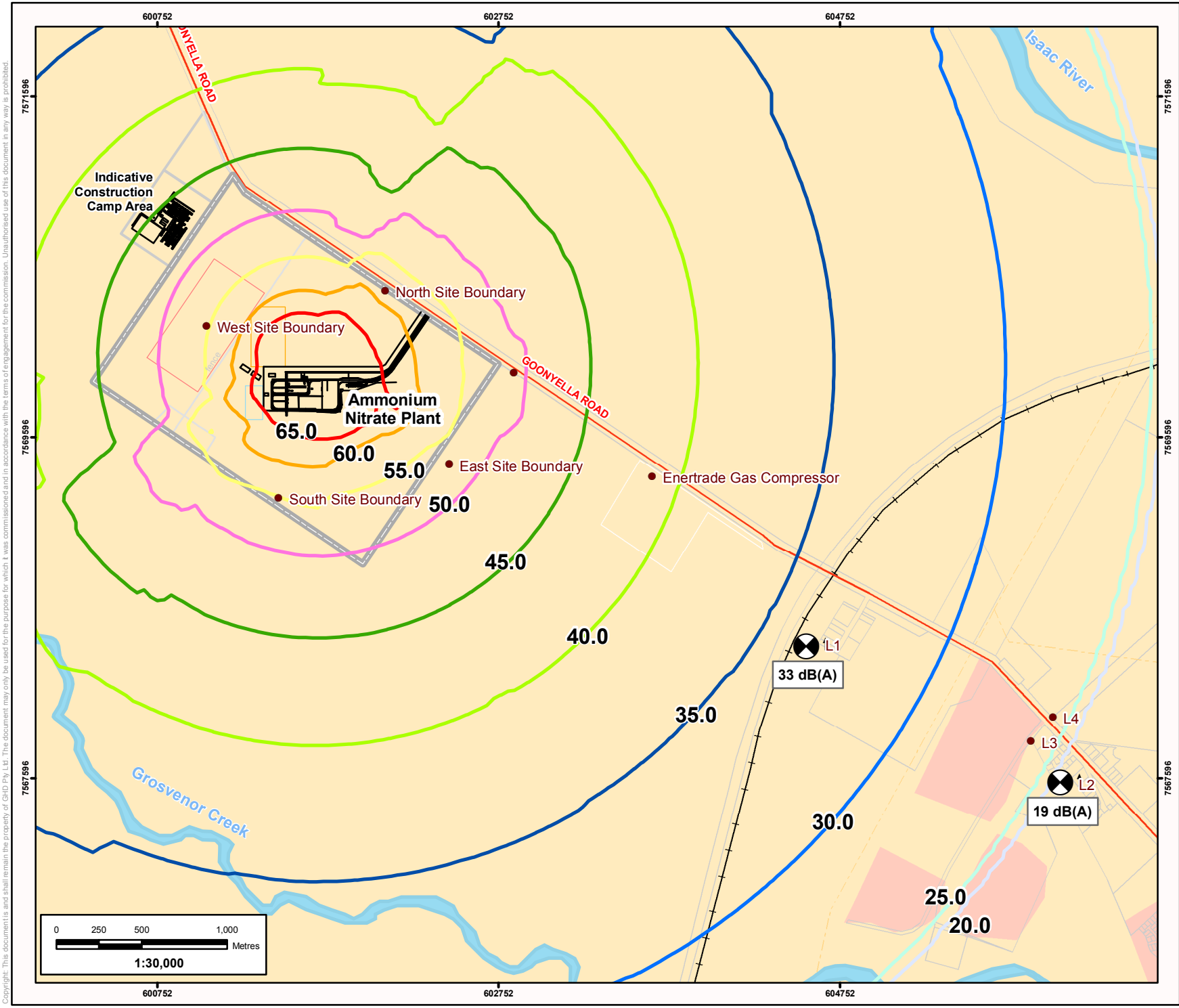
Mitigation Measures

Construction and operational noise is not likely to have an impact on the local ambient environment. While construction and operational noise is unlikely to be an issue, to minimise noise emissions during construction and operations, the following management and mitigation measures are available to ameliorate likely noise impacts:

1. All combustion engine plant, such as generators, compressors and welders should be checked to ensure they produce minimal noise with particular attention to residential grade exhaust silencers;

2. Vehicles will be kept properly serviced and fitted with appropriate mufflers. The use of exhaust brakes will be eliminated, where practicable;
3. Where practical, all vehicular movements to and from the construction site will be made only during normal working hours;
4. Where practical, machines will be operated at low speed or power and will be switched off when not being used rather than left idling for prolonged periods;
5. Activities that cause excessive noise such as pile driving will be limited to Saturdays or business days between 6:30 am and 6:30 pm;
6. Machines found to produce excessive noise compared to industry best practice will be removed from the site or stood down until repairs or modifications can be made; and
7. Where practical, impact wrenches will be used sparingly, with hand tools or quiet hydraulic torque units preferred.

With regard to potential traffic noise, by keeping plant related vehicles serviced, fitted with mufflers and eliminating exhaust brake usage, noise due to trucking activity associated with the operation and construction of the proposed development can be significantly mitigated.



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Date: 02-10-06 Rev A
Datum: GDA94 (MGA) Zone 55
Source: Base data sourced from the State of Queensland, Department of Natural Resources, Mines. All other infrastructure supplied by Dyno Nobel Asia Pacific Ltd.
File: G:\41\15824\GIS\Maps\Final\MXD\fig34_Site_Noise_Monitoring_Inversion.mxd

Legend

- Ammonium Nitrate Plant Site
- Evaporation Pond
- Generating Facility*
- Raw Water Reservior
- Noise Monitoring Locations

Noise Contours dB(A)

- > 20.00
- > 25.00
- > 30.00
- > 35.00
- > 40.00
- > 45.00
- > 50.00
- > 55.00
- > 60.00
- > 65.00

Noise assessment data taken at ground level (1.5m)
*Generating Facility location is subject to detailed engineering.

Moranbah Ammonium Nitrate Plant

Environmental Impact Statement

Figure 34 F-Class Inversion (2 m/s)

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4.7 Nature Conservation

4.7.1 Existing Conditions

Flora

The site proposed for this project is mapped as heterogenous Regional Ecosystems (REs) 11.5.9 (80%)/11.5.3(20%) and 11.7.2 (80%)/11.5.3 (20%) (See Table 35 and Figure 36). Both REs are classified under the Queensland VMA as 'Not of Concern', with a biodiversity status (set under the Environmental Protection Agency (EPA) Biodiversity Planning Assessment process) of 'no concern at present'. Neither RE listed is a threshold RE, meaning that neither is on the threshold of being listed as 'Of Concern'.

The vegetation community on site was characterised as open woodland, thickening occasionally to woodland, on a sand plain with a slope of less than 3% (Refer to Figure 35). Two tree layers, a shrub layer and a ground cover were always present at varying densities, with the tallest tree layer being the ecologically dominant layer for the community across the site. The results of vegetation structure measurements at the three transects are reproduced in Part A, Flora Report (Appendix 7.5 of the EIS). Findings from this report indicated that:

1. No species of flora listed under either the Queensland Nature Conservation (Wildlife) Regulations 1994 (NCA) or the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) were located on the site.
2. No threatened vegetation community listed under the EPBC Act was found on the site. Although *Acacia harpophylla* was located on the site, it was found in small, discrete stands, was not found on the land zones associated with the protected brigalow community, and was not of sufficient above ground biomass to either dominate or co-dominate the vegetation community in which it was growing. Therefore, it is concluded that the *Acacia harpophylla* on the site exists in very small mono-specific stands, and not in its own RE.
3. Field investigations confirmed the remnant status of the vegetation, with the exception of the belt of non-remnant vegetation mapped across the western border, which appears to have been cleared previously.
4. Field investigations confirmed the RE mapping for the site as RE 11.5.3, with some areas of RE 11.7.2. Both REs 11.5.3 and 11.7.2 are Not of Concern and No Concern At Present, and both REs have a remnant extent greater than 10 000 hectares, with more than 30% of the pre-clearing extent remaining.
5. Both REs 11.5.3 and 11.7.2 are well represented in protected areas across the Brigalow Belt.
6. Proposed clearing will meet the requirements of the Northern Brigalow Regional Ongoing Clearing Code. An application to clear has been lodged with DNRW.

7. The site has been affected by the grazing of cattle over many years – soils are compacted, the understorey has been grazed and extensive gully erosion is evident in the eastern section of the lot.
8. An area of Indigenous cultural heritage significance has been identified in the north-eastern section of the lot.

Table 35 Regional ecosystems mapped on the project site

RE	Short Description[1]	Conservation Status	Protected Area Representation	Remnant Extent
11.5.9	*Eucalyptus crebra* & other *Eucalyptus spp*. & *Corymbia spp*. woodland on Cainozoic sand plains/remnant surfaces. Plateaus & broad crests. *Eucalyptus crebra* &/or *Eucalyptus melanophloia* woodland.	VMA- not of concern BPA[2] – no concern at present	Blackdown Tableland National Park, Taunton National Park Scientific Reserve	At least 10000 ha and > 30% of the pre-clear extent remaining
11.5.3	*Eucalyptus populnea* &/or *E. melanophloia* &/or *Corymbia clarksoniana* woodland on Cainozoic sand plains/remnant surfaces	VMA - not of concern BPA[2] – no concern at present	Carnarvon National Park, Dipperu National Park, Epping Forest National Park, Mazeppa National Park, Narrien Range National Park, Wilandspey Conservation Park	At least 10000 ha and > 30% of the pre-clear extent remaining
11.7.2	*Acacia* spp. woodland on lateritic duricrust. Scarp retreat zone	VMA – not of concern BPA[2] – no concern at present	Blackdown Tableland National Park, Blackwood National Park, Goodedulla National Park, Narrien Range National Park, Taunton National Park Scientific Reserve	At least 10000 ha and > 30% of the pre-clear extent remaining

[1]As per descriptions provided in the Regional Ecosystems Descriptions Database (REDD) Version

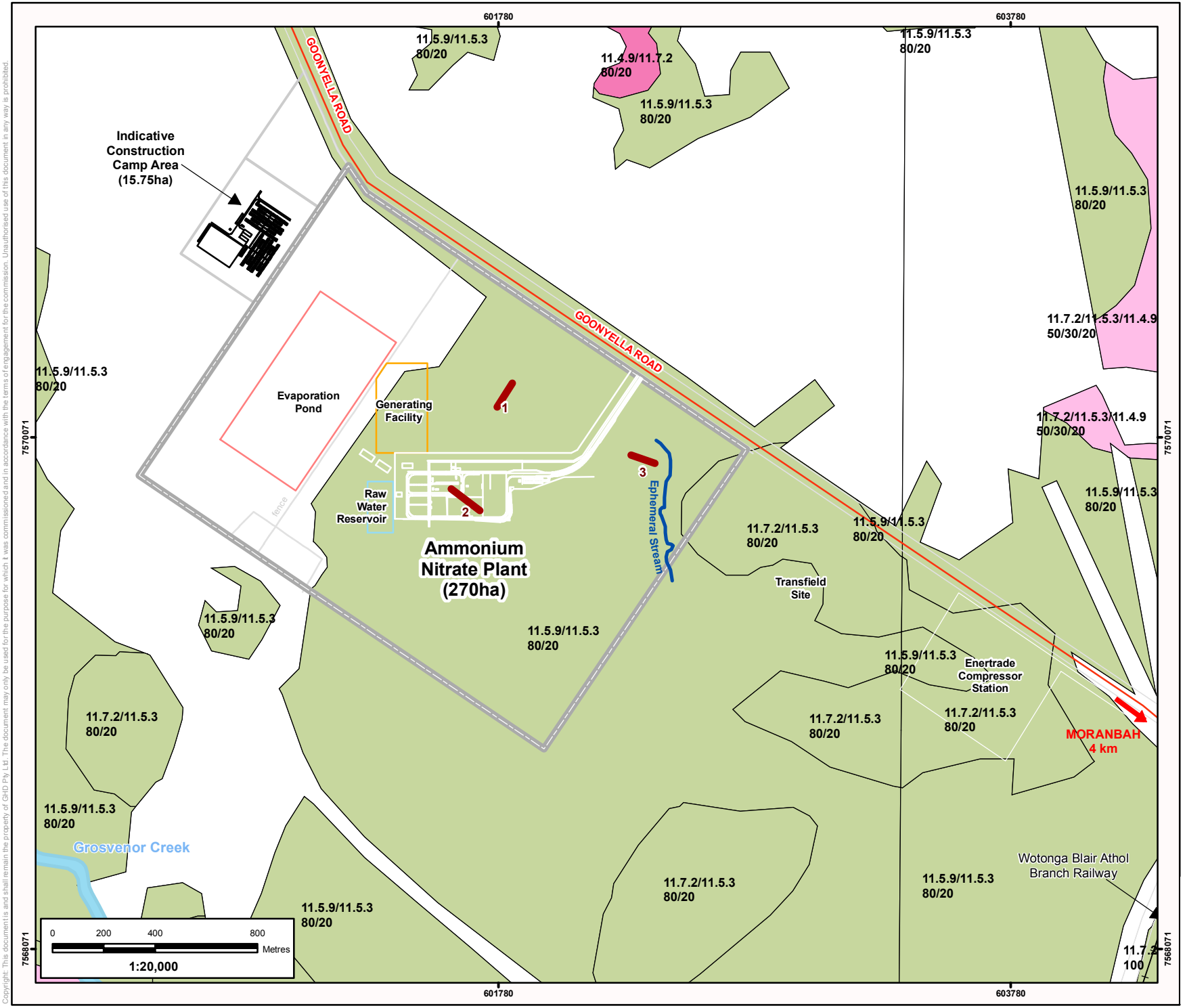
[2]Biodiversity Planning Assessment – an Environment Protection Agency method for determining biodiversity values.

The investigations suggest that the site has little to differentiate itself from other open woodland sites dominated by *Eucalyptus populnea* and/or *Corymbia clarksoniana* found across large areas of the Brigalow Belt bioregion on Land Zone 5, including extensive representation in protected areas.

Therefore, as the site does not affect any plant protected under the NCA or the EPBC Act, and as the proposed clearing will meet the objectives of the VMA, the project is considered unlikely to pose any significant threat to flora values within the local and regional area. However, the presence of a significant area of Indigenous cultural

heritage in the north eastern section of the site, combined with a greater diversity of flora species in that area and active gully erosion in the east, suggest that development should be concentrated on the western side of the lot. Discussion regarding flora in greater detail is provided in the Nature Conservation Flora Report contained in Appendix 7.5 of this EIS.

Figure 35 *Eucalyptus populnea* woodland to open woodland



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Date: 02-10-06 Rev D
Datum: GDA94 (MGA) Zone 55
Source: Base data sourced from the State of Queensland, Department of Natural Resources, Mines. All other infrastructure supplied by Dyno Nobel Asia Pacific Ltd.
File: G:\41\15824\GIS\Maps\Final\MXD fig36_Site_RE_Transect_RevD.mxd

Legend

- Ammonium Nitrate Plant Site
- Evaporation Pond
- Generating Facility*
- Raw Water Reservior
- Cadastre
- Watercourse
- Major Road
- Ephemeral Stream
- Transect

Regional Ecosystems

- No mapped vegetation
- Endangered RE (dominant)
- Endangered RE (subdominant)
- Of Concern RE (dominant)
- Not Of Concern RE

RE Numbering System:
11.4.9/11.7.2 = mosaic of two ecosystem types
80/20 = proportion of each ecosystem type
*Generating Facility location is subject to detailed engineering.

Moranbah Ammonium Nitrate Plant

Environmental Impact Statement

Figure 36
Regional Ecosystems

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Fauna

Four main habitats were identified across the study area: open grassy woodland (Figure 37), shrubby woodland (Figure 38), rocky outcrops ("jump-ups") with Acacia spp. overstorey (Figure 39) and semi-cleared woodland (mapped as non-remnant vegetation) (Figure 40). The boundaries between these habitats are not distinct, with overlap and intergradation occurring particularly with regard to the open and shrubby woodland habitat types.

A total of 63 native terrestrial fauna species and two introduced fauna species were recorded within the Moranbah study site during the field survey (see Table 36). Of the native species, 11 mammal, 41 bird and 11 reptile species were recorded. There were two introduce mammal species. Species detected at the site are discussed in the Nature Conservation Fauna Report (Appendix 7.5).

Of note during the assessment was the presence of seven species of bat within the study site, including the little pied bat (*Chalinolobus picatus*) (listed as rare by the Queensland NC Act). The prevalence of hollow stags (dead hollow trees) and hollow mature trees provide diurnal roosting sites for many bat species.

Table 36 Fauna species recorded from the study area, Moranbah, Queensland, 8 – 12 May 2006

Common Name	Scientific Name	Type of Record
Mammals		
Northern Freetail Bat	*Chaerephon jobensis*	Ana
Eastern Freetail Bat	*Mormopterus* species 2	Ana
Gould's Wattled Bat	*Chalinolobus gouldii*	Ana
Hoary Wattled Bat	*Chalinolobus nigrogriseus*	Ana
Little Pied Bat (r)	*Chalinolobus picatus*	Ana
Greater Broad-nosed Bat	*Scoteanax rueppellii*	Ana
Eastern Cave Bat	*Vespadelus troughtoni*	Ana
Short-beaked Echidna	*Tachyglossus aculeatus*	Ind
Delicate Mouse	*Pseudomys delicata*	Pit, Ell(A)
Eastern Grey Kangaroo	*Macropus giganteus*	Obs
Red Kangaroo	*Macropus rufus*	Obs
*European Rabbit	*Oryctolagus cuniculus*	Obs
*European Fox	*Vulpes vulpes*	Ind

Common Name	Scientific Name	Type of Record
Birds		
Grey-crowned Babbler	*Pomatostomus temporalis*	Obs
Brown Treecreeper	*Climacteris picumnus*	Obs
Varied Sitella	*Daphoenositta chrysoptera*	Obs
Noisy Friarbird	*Philemon corniculatus*	Obs
Yellow-throated Miner	*Manorina flavigula*	Obs
Striped Honeyeater	*Plectorhyncha lanceolata*	Obs
White-throated Honeyeater	*Melithreptus albogularis*	Obs
Grey Shrike-thrush	*Colluricincla harmonica*	Obs
Dusky Woodswallow	*Artamus cyanopterus*	Obs
Magpie Lark	*Grallina cyanoleuca*	Obs
Jacky Winter	*Microeca fascinans*	Obs
Masked Lapwing	*Vanellus miles*	Hrd
Mistletoe Bird	*Dicaeum hirundinaceum*	Obs
Rufous Whistler	*Pachycephala rufiventris*	Obs
Crested Pigeon	*Ocyphaps lophotes*	Obs
Common Bronzewing	*Phaps chalcoptera*	Obs
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	Obs
Weebill	*Smicornis brevirostris*	Obs
Yellow Thornbill	*Acanthiza nana*	Obs
Striated Pardalote	*Pardalotus striatus*	Obs
Rufous Fantail	*Rhipidura rufifrons*	Obs
Grey Fantail	*Rhipidura albiscapa*	Obs
Variegated Fairy Wren	*Malurus lamberti*	Obs
Willie Wagtail	*Rhipidura leucophrys*	Obs
Rainbow Lorikeet	*Trichoglossus haematodus*	Obs
Pale-headed Rosella	*Platycerus eximius*	Obs
Galah	*Cacatua roseicapillus*	Obs
Sulphur-crested Cockatoo	*Cacatua galerita*	Obs

Common Name	Scientific Name	Type of Record
Red-winged Parrot	*Aprosmictus erythropterus*	Obs
Double-barred Finch	*Taeniopygia bichenovii*	Obs
Red-backed Kingfisher	*Todiramphus pyrrhopygia*	Obs
Blue-winged Kookaburra	*Dacelo leachii*	Obs
Laughing Kookaburra	*Dacelo novaeguineae*	Obs
Grey Butcherbird	*Cracticus torquatus*	Obs
Pied Butcherbird	*Cracticus nigrogularis*	Obs
Australian Raven	*Corvus coronoides*	Obs
Torresian Crow	*Corvus orru*	Obs
Australian Magpie	*Gymnorhina tibicen*	Obs
Nankeen Kestrel	*Falco cenchroides*	OH
Whistling Kite	*Haliastur sphenurus*	Obs
Black Kite	*Milvus migrans*	OH
Reptiles		
Eastern Bearded Dragon	*Pogona barbata*	Obs
Burns' Dragon	*Amphibolurus burnsi*	Obs
Carnaby's Wall Skink	*Cryptoblepharus carnabyi*	Obs
Major skink	*Egernia frerei*	Obs
Eastern Striped Skink	*Ctenotus robustus*	Obs
A striped skink	*Ctenotus strauchii strauchii*	Obs
Bynoe's Gecko	*Heteronotia binoei*	Obs
A gecko	*Gehyra catenata*	Obs (S)
A gecko	*Gehyra dubia*	Obs (S)
Ocellated Velvet Gecko	*Oedura monilis*	Obs (S)
Myall Snake	*Suta suta*	Pit

Common Name	Scientific Name	Type of Record

Key to Table:

Type	Type of record of fauna from present assessment
Obs	Observed on the ground or in vegetation
Obs (S)	Observed spotlighting
OH	Observed in flight overhead
Hrd	Heard only
Ind	Indirect evidence (e.g. scats, tracks, diggings, burrows).
Pit	Pit trapped
Ell(A)	Elliot trapped (Type A)
Ell(B)	Elliot trapped (Type B)
Ana	Identified from ultrasonic call detection (Anabat)
*	Introduced, non-Indigenous species
r	Rare under the NC Act

No wetlands or permanent waterways exist on the site. However, a number of small, eroded channels do cross the study site, which could fill during periods of heavy rain. These areas have suffered from severe bank erosion, possibly caused by domestic cattle trampling and overgrazing of supporting vegetation. Due to the lack of standing water on the study site, no aquatic sampling was undertaken and therefore no fish species observed. Grosvenor Creek nearby could potentially provide habitat for a number of fish species at certain times of the year (Figure 41).

Figure 37 Open grassy woodland habitat

Figure 38 Shrubby woodland

Figure 39 Rocky outcrops with Acacia spp. stands

Figure 40 Semi-cleared areas of woodland

Figure 41 Grosvenor Creek

4.7.2 Potential Impacts and Mitigation Measures

The potential impacts on native flora and fauna species discussed in this section of the EIS are those predicted to occur should no mitigation measures at all be undertaken. For a full discussion of potential impacts and mitigation measures for flora and fauna conservation, refer to Appendix 7.5 of this EIS.

Loss of habitat

The proposed development process would result in the clearing of 60 ha of native woodland to open woodland vegetation mapped as Not of Concern regional ecosystem (RE) 11.5.3 and containing vegetation meeting the description of Not of Concern RE 11.7.2. Large areas of identical habitat will be available after clearing in land directly adjacent to the site. In addition, increased levels of human impacts to the surrounding remnant vegetation can be expected. This process will result in the removal of many large eucalypt trees (some containing hollows), hollow ground debris and clumps of shrubs that are currently likely to provide habitat for local bird, bat, reptile, amphibian and mammal species.

Direct injury or mortality

The proposed clearing process will likely involve the use of large earth moving machinery in order to remove large trees, flatten out the construction area and build the dam site. These activities may possibly cause injury and/or mortality to sedentary, nocturnal and less mobile species of fauna that are unable to escape the area during the clearing process.

The increased presence of vehicles and people in the area during the plant construction process and following establishment of the plant may increase the occurrence of road mortality and injury to local fauna.

Disturbance to fauna

An increased level of disturbance to native fauna is likely to occur as a result of the light plant establishment. Human and vehicular movements, in addition to noise and vibration created by the plant could possibly cause various species of fauna to avoid the development area. However, the site is currently within earshot of industrial activity, and is located beside a busy highway, so that background noise and some vibration is already a feature of the site.

Spread of exotic weeds

The site currently contains prickly pear and harrisia cactus, both of which are Class 2 weeds under the *Land Protection (Pest and Stock Route Protection) Act 2002*. These weeds are not widespread within the subject lot or in any way dominant within the vegetation communities they are found in. It is unlikely that the proposed development will alter this status. However, increased traffic during the construction process may result in the deposition of weed seeds or vegetative material.

Objectives for conservation of natural values

The following objectives are recommended to guide mitigation measures and are discussed at length in the Nature Conservation – Potential Impacts and Mitigation Report contained in Appendix 7.5 of this EIS:

1. Minimise the loss of RE diversity on the site and for the Brigalow Belt generally;
2. Ensure clearing and operational activities are conducted in accordance with legislation. This includes the objectives of the VMA and the requirements of the *Nature Conservation Act 1992,* the *Aboriginal Cultural Heritage Act 2003* and the EPBC Act*;*
3. Minimise the loss of top soil and associated water quality issues during construction;
4. Minimise the loss of habitat trees and habitat resources;
5. Minimise the impact of the project on habitat of the Little Pied Bat;
6. Maximise movement possibilities for fauna across the lot during the operational stage of the project;
7. Avoid causing or contributing to existing land degradation on the site, in particular gully erosion occurring in the eastern section of the lot;
8. Minimise the impacts of construction activities on natural values, including reducing distress for fauna directly impacted by clearing activities; and,
9. Restore areas affected by construction and effectively manage the operational stage.
10. Formulate weed control and feral animal management strategies.

Ongoing ecological monitoring

A program of ongoing ecological monitoring should be implemented to determine whether the condition of the lot on which the project is situated changes from the baseline condition. Baseline condition is defined as the condition described in the flora and fauna reports undertaken for the EIS.

The ongoing ecological monitoring program should have the following objectives:

» Document over time the health of the flora and fauna populations and ecological communities in the woodland on the lot;

» Gather data that can be used to make effective management decisions on environmental issues for the land;

» Determine whether gully erosion to the stream in the east of the property is ongoing or has stabilised;

» Determine whether any pest or weed species declared under the *Land Protection (Pest and Stock Route Management) Act 2002* or controlled under the Belyando Shire weed and pest management strategy are present on the lot; and

» Determine the effects, if any, of the project on Grosvenor Creek.

4.8 Cultural Heritage

4.8.1 Existing Conditions

The AN Plant site is located on the 1:100 000 topographic mapsheets of Wyena (Ed. 2), No. 8454 and Harrybrandt (Ed. 1) No. 8554. It is part of Picardy pastoral holding (owned by the Camm family) within the Belyando Shire. The study area lies towards the northern end of a registered Native Title Claim on behalf of the Barna/Barada/Kabelbara/Yetimarala Traditional Owners (BBKY#4, National Native Title Tribunal No. QC01/25; Federal Court No. QG6230/98). In the last decade, Native Title legislation has had a significant impact on the way in which cultural heritage studies are undertaken.

Cultural heritage surveys of the project located a total of eighteen cultural heritage sites, items or features. They comprised five scarred trees, a number of stone artefacts and a large bare, approximately circular area of compacted gravel among Lancewood trees that has been determined to be a 'corroboree' ground with associated clearings and cultural items. The study area was divided loosely into four units, mainly on the basis of vegetation:

Unit 1. The open *Eucalyptus populnea* (Poplar Box) forest, sandy clay soil;

Unit 2. The *Acacia* spp. (*Acacia harpophylla* [Brigalow] and *Acacia shirleyi* [Lancewood]) forests and scrubs. Soils are mainly brown clay and red gravelly clay;

Unit 3. The *Melaleuca* spp. growth towards the western and lower side of the study area;

Unit 4. The area of dead and regrowth forest on mainly sandy clay, northern end of survey area.

All finds were made in Units 1 and 2. No cultural heritage items or sites were found in Units 3 and 4.

Scarred Trees (AN1, AN2, AN3, AN4, AN14)

Five mature *Eucalyptus populnea* (Poplar Box) trees with scars of likely Aboriginal cultural origin were located within Unit 1 of the study area. All but one of these trees is located towards the north westerly end of the site and all but one is still living. Three of the trees have multiple scars. AN2 has a very large scar of a type that would usually be interpreted as a small canoe, but the distance of this site from water would indicate an alternative usage, possibly bark for a shelter. This tree was revisited and the small scar in the fork of the trunk was identified by Elders as a possum hole. AN3 has three small scars and AN4 two scars.

There are a number of problems in positively identifying scarred trees of Aboriginal origin. Poor preservation from the impacts of fire and insects often results in the loss of features such as the original shape. Bark sometimes grows back unevenly, and

sometimes the bark regrowth can actually hide the scar. Scars can result from natural processes such as the tearing of limbs and branches, natural shedding of bark, natural splitting of the bark, the impacts of animals, fire, or insects. Though scars of Aboriginal cultural origin tend to be uniform and symmetrical in shape (often consistent with the size and shape of wooden artefacts such as shields, canoes or carriers), it is possible that shapes, which also appear to be somewhat symmetrical, can be produced naturally and they therefore require closer scrutiny in their identification.

Regionally, trees with scars of traditional Aboriginal origin are a fast diminishing cultural resource and it is therefore a matter of priority that especially well preserved ones on healthy, living trees be protected from all impacts.

Stone Artefacts (AN5-AN9, AN14-AN17)

Ten stone artefacts were identified in this study, six during the June visit and an additional four in July. All of these artefacts were found at the south eastern end of the study area and seven of the ten lie within a 30 m² area at the southern end of the circular clearing. Three of the seven are steep edge scrapers of petrified wood, hence some possibility of a similar use to which all three may have been put. Another utilised steep scraper of silcrete together with two other brown silcrete flakes were found beside a small eroding drainage line on the eastern side of the clearings, again among lancewood.

The sparse distribution of the artefacts across the site stands in stark contrast to the extremely large and complex artefact scatters, some over a kilometre long, that lie closer to the Isaac River and its larger tributaries such as Grosvenor and Skull Creeks and Cleanskin Gully. These latter sites are supported by Leichhardt's observations of people living along the Isaac River. It is suggested that these present artefacts are all related to the clearings and activities that would have been carried out there.

Circular Clearing (AN11-13)

This site was found at the southern extremity of the study area. It lies among *Acacia shirleyi* (Lancewood) forest on red lateritic clays. Prior to coal mining, this area would have been isolated and hidden by the thick scrub, but now it lies less than 300 metres from the Goonyella/Moranbah road and near several industrial installations.

The site comprises several clearings. When the team first saw these clearings it was thought that the area might have been used for gravel extraction (another gravel extraction area lies near the Enertrade compression station). This was eliminated as a possibility as there are no signs of any workings, or any previous human disturbance of any kind. This observation was corroborated during a second visit when several Elders independently made similar observations. The site identified as a corroboree ground is different from the other clearings. It is roughly circular, approximately 40 metres in diameter and the surface is composed of compacted gravel. It can be seen in the photographs of the site and its surrounds that the ground surfaces of the adjacent clearings are looser and less compacted (Refer Appendix 7.11 of the EIS).

A review of the available historical literature has found no direct evidence at this stage that significant European historical heritage sites are located in the vicinity of the study

area. Physical evidence that may be encountered in the study area would be limited to pastoral activities and might include old structures, fences, camps and tracks.

Consultation

On the 20th April 2006, a notice was issued to the registered Native Title claimants, the landholder, and the Cultural Heritage Unit of the DNRW regarding the area of development. The two registered Native Title claims for the area were the Wiri People and the Barna/Barada/Kabelbara/Yetimarala (BBKY) People. Searches were also undertaken of the Cultural Heritage Register held by the EPA and the Aboriginal Torres Strait Islander Database held by the DNRW.

The registered Traditional Owners of the area (BBKY) undertook cultural heritage surveys of the area with an archaeologist to identify items of cultural heritage over the site.

4.8.2 Potential Impacts and Mitigation Measures

A draft Cultural Heritage Management Plan has been prepared for the project and is currently in a process of negotiation between the Traditional Owners of the area and DN. The sites of significance as identified by the Traditional Owners of the area have been incorporated in the layout design of the project to ensure the protection of this cultural heritage.

4.9 Social

4.9.1 Existing Conditions

Consultations with the Moranbah community revealed the following issues already existing within the community and which may be compounded as a result of the project:

1. Limited availability of housing;
2. Restricted participation in sporting and community service organisations;
3. Waiting lists to access medical and dental services in Moranbah and other surrounding regional centres;
4. Current water restrictions for domestic use of water in Moranbah;
5. Limited access to childcare services; and
6. High cost of living.

Moranbah is well serviced with community infrastructure and services. However, the capacity of services are at their upper threshold, especially with regards to the availability of land / housing, availability of medical and dental services and access to water. Additional growth in Moranbah will need to be in keeping with the provision of adequate community services and facilities. Refer to Appendix 7.4 of the EIS for the SIA for a detailed discussion regarding existing conditions and potential social impacts of the project on the Moranbah community.

Examination of the existing environment and consultations with the Moranbah community has identified the following impact categories.

1. Population;
2. Social/Cultural profile of Moranbah;
3. Economic profile of Moranbah;
4. Community values;
5. Current lifestyles of local residents;
6. Housing and household income;
7. Local Business, health care;
8. Community services and cohesion; and
9. Construction camp impacts.

Impacts associated with each of these categories will be dependent on the source of the potential workers of the project. Employees sourced from or living for extended periods in the local Moranbah community will ensure that the social fabric of Moranbah remains solid, and that the cohesion of the community is built on rather than decayed. Use of fly in/fly out or drive in/drive out staff for the project would add to the continuing decline in community values in Moranbah, discouraging sustainable growth for the town.

Constraints exist within the current environment to cope with the added pressures of housing and water resources, and these will only be compounded as a result of the project unless special mitigation measures are implemented. Increased pressure on an already limited availability of housing (including high prices and lack of available land) and water were identified as potential issues.

4.9.2 Potential Impacts and Mitigation Measures

As part of the EIS, GHD developed a Community Consultation Strategy (CCS), which was approved for implementation by DN. The purpose of the CCS was to outline:

1. The consultation objectives, techniques and timeframes included in the EIS process; and
2. The approach that covered consultation with the directly affected landowner, residents of Moranbah, project stakeholders, local government and the general community.

The IAS for the project set out the importance of community consultation in the EIS process. The information generated by the CCS was integrated into the relevant technical studies (primarily the SIA). This SIA report is Appendix 7.4 of the EIS.

It should be noted that GHD has not undertaken any community consultation on the inclusion of the power generation facility into the proposed project. This is based on the assessment that as long as the power generation facility is included as part of the project and not separate, there will not be any additional significant social impacts.

As part of the community consultation process a number of strategies were used to inform the community and obtain feedback for the project. These strategies included:

1. Production of a newsletter;
2. Focus Groups and one on one meetings; and
3. A Community Information Session, which was advertised in the Morning Bulletin and the Daily Mercury on Saturday 27 May 2006; a letterbox drop to all Moranbah residents on Saturday 27 May 2006, and invitations to project stakeholders.

The SIA identified a number of key social benefits of the project, including increased investment and employment directly associated with construction and operation of the facility; greater regional economic stability through a broadening of the economic base; improved utilisation of social and economic infrastructure in the region; and multiplier effects giving rise to further substantial increases in regional and national output and employment.

Outcomes of the SIA also included a number of mitigation strategies to minimise negative impacts surrounding limited housing, water access and increased traffic. These included comprehensive plans for accommodation, with the construction camp to be situated adjacent to the plant in order to reduce pressure on limited housing and reduce traffic; minimising traffic during peak hours and having a temporary concrete batch onsite which would result in fewer concrete trucks; and providing water via private pipeline for construction and operation, the workforce and their families.

If the majority of permanent employees for the operation of the proposed AN Plant are based in Moranbah with their families there will be the opportunity to develop the family focus and associated community values. This includes participation in:

- Community service and sporting organisations;
- Local economy by spending money locally (rather than Mackay or other locations along the coast); and
- Children attending the local preschool, primary schools and high school.

The study area has a higher level of families without children than the rest of the state and the surrounding region. At the time of the 2001 Census, the ratio of males to females was 1.3:1, indicating a substantial male population. This is likely to be due to the lifestyles and occupations of the residents in Moranbah.

The results and outcomes from the community consultation undertaken are provided in Table 37. Monitoring of impacts provides the opportunity to verify the efficacy of mitigation and enhancement strategies identified as a component of the SIA. (Refer to Appendix 7.4 of this EIS).

Table 37 Key Issues Raised through Community Consultation Strategy

Question/Issues	Response	
	DN	GHD (EIS)
What will happen if there is a fire on the site?	A Safety Management System (SMS) will be developed for the facility under the Dangerous Goods Management Act 2001. Provision has been made for fire fighting and emergency response on site, which will be in coordination with the Rural Fire Service.	Discussed in the Hazard and Risk Assessment Report (Appendix 7.7) and within section 4.12. of the EIS
What are the chances that the plant will explode?	AN is not classified as an explosive. Its security and storage is governed by Queensland regulation, specific to Security Sensitive Ammonium Nitrate (SSAN). AN will be handled in accordance with the regulations and requirements under the Dangerous Goods Management Act 2001. The chances of explosion are very low as the material requires the combination of contamination, heat and pressure. Handling procedures for these materials are in place at other sites operated by DN to prevent this from occurring and will be used for this site.	Discussed in the Hazard and Risk Assessment Report (Appendix 7.7)
What will happen if the plant explodes?	As discussed AN will be handled in accordance with the legislative requirements. The risk due to the possibility of explosion has been examined and is very low). In the highly unlikely event that the AN explodes the site has been developed to prevent offsite impacts from occurring.	Discussed in the Hazard and Risk Assessment Report (Appendix 7.7) and within section 4.12. of the EIS.
What will happen if one of the trucks carrying the AN explodes (Taroom example)?	The truck will explode however the likelihood of an explosion is exceedingly low.	Discussed in the Hazard and Risk Assessment Report (Appendix 7.7)

Question/Issues	Response	
	DN	GHD (EIS)
Can DN make provision for transport around peak times on the Goonyella and Moranbah Access Road (e.g. when the school bus is on the road and shift changes)?	Dyno Nobel Asia pacific Limited has committed to minimising the impact of vehicles on the road both during construction and during operation. These proposed actions include a construction camp close to the camp with a proposed connecting road.	Discussed in the Traffic Impact Assessment Report (Appendix 7.6).
What type of security will there be for the plant and for transporting the AN? Taking into consideration the increased terrorism risk of small and remote air fields.	Dyno Nobel Asia Pacific Limited is required to develop a Security Management Plan as the material is classed as security sensitive AN. This requires significant security measures in accordance with provisions under relevant state legislation.	
What is the possibility of transporting the AN by rail?	It is a future consideration. At this point rail does not provide a viable option for DN it may in the future.	
Where will DN be transporting the AN too?	Initially customers in Queensland.	Details of transport routes are provided in Figure 3,4 and 5 of the EIS.
Will DN be transporting the AN over the Nebo Range?	No.	
Where is DN going to get water for the new housing?	Pressures on local infrastructure will be limited to the maximum extent practical. Water will be accessed via private pipeline and both plant and potable water will be provided for this facility, including construction and operation, its workforce and their families.	
Comments on the amount of water required by the plant in comparison to the amount the town already uses on restrictions.	Dyno Nobel Asia Pacific Limited will minimise its impact on the town's resources through the provisions of water for its employees and their families during construction and operation.	

Question/Issues	Response	
	DN	GHD (EIS)
How will DN balance the needs of the Moranbah community and Moranbah community/family values with the needs of the plant?	Pressures on local infrastructure will be limited to the maximum extent practical. Dyno Nobel Asia Pacific Limited intends to have its permanent workforce based in Moranbah.	
How does DN propose to support the Moranbah community?	Dyno Nobel Asia Pacific Limited will support the community through the use of local contractors of goods and services where possible.	Included in the Social Impact Assessment Report of the EIS as a mitigation strategy.
What community benefits does DN propose for Moranbah?	Dyno Nobel Asia Pacific limited is investigating the purchase of property for its operational workforce in Moranbah. This will provide an addition to the community and a permanent workforce in the area.	Included in the Social Impact Assessment Report of the EIS as a mitigation strategy.
What will the 'pollution' impacts be on Moranbah and surrounding areas? » Air quality; » Emissions; and » Water pollution.	Dyno Nobel Limited will take all reasonable measures to minimise the impact on the surrounding areas.	Addressed within the specialist studies in the EIS.
Will DN have comparative wages and conditions (4x4x12 shifts) to the coal mines?	The wages will be similar to the wages within the mines.	Included in the Social Impact Assessment Technical Report of the EIS as a mitigation strategy.
Dyno Nobel Asia Pacific Limited would like to accommodate its operational staff in Moranbah – where are they likely to be located, and will DN own the houses or will staff have to purchase their own?	Dyno Nobel Asia Pacific Limited is investigating a number of options including purchasing housing within Moranbah. The maximum number of personnel will be sourced from the local area. However, due to the scarcity of suitably skilled labour in the Moranbah area, most of the construction and operational workforce will need to be obtained outside the local area.	

4.10 Economic Environment

4.10.1 Description of Environmental Values

This section provides a description of the existing economic environment that may be affected by the project and associated development. The character and basis of the economies of Moranbah and the Belyando Shire are described, including:

» Current local and regional economic activity;

» Existing labour force and unemployment statistics;

» Types and numbers of businesses; and

» Availability and prices of goods and services.

Current local and regional economic activity

Belyando Shire has an economic base that is supported by both the administrative and commercial infrastructure of Clermont and Moranbah. The town of Moranbah was originally developed to house workers and their families associated with the Goonyella-Riverside and Peak Downs mines. Moranbah is the major mining centre of Belyando Shire and services the surrounding coal mines, and features a shopping centre, cinema, and a small business precinct which is located within the centre of the town.

Moranbah's local community is somewhat strained due to the high levels of itinerant workers living in construction camps associated with the mines without the supporting internal infrastructure within the town for this additional fluctuating population. Three new coal mines have opened in the past 12 months, which has increased the towns population. However, a lack of land available for housing has increased the number of construction camps. Workers are spending limited amounts of money within the town on small purchases such as personal care items, takeaway food and entertainment.

Local stakeholders attribute twelve-hour shifts over four-day periods as the primary reason for mine workers not spending their money within the town. Generally, if the workers are not on shift they are sleeping, and with meals provided by the construction camps, there is no reason to travel into Moranbah.

Existing labour force and unemployment statistics

The labour force information was obtained from the 2001 census data. The mining sector has grown dramatically since that time and the data presented should be regarded as conservative.

Labour Force Status

The unemployment rate of Moranbah is comparable to the region, but lower than the state, while Moranbah has the highest percentage of weekly household income in the state ($1,500 to $1,999).

In 2001, the majority of residents (70.3%) were employed on a full-time basis, compared to 69.8% of Belyando Region and 58.6% of Queensland. People employed on a part-time basis account for 23.1% of the workforce, while those employed part-time at a regional level is similar at 23.3%, and slightly higher at 30.3% for

Queensland. These trends reflect the nature of occupation of the majority of Moranbah's residents with the development of the town based around the mining industry, which is currently booming. Refer to Section 4.9 (Appendix 7.4, Volume 2 of the EIS) of the SIA for a full breakdown of employment statistics.

Unemployment Rate

In 2001, Moranbah had a lower unemployment rate than that of Queensland (4.1% compared to 8.2%), which is consistent with the purpose of the town being constructed specifically for the mining industry. However, Moranbah's unemployment rate was consistent with that of the Belyando shire, at 4.0%. Low unemployment rates may also be reflective of the high number of employed youths working in the mines.

Occupation

Occupations within the study area reflect those associated with the mining industry. In 2001, intermediate production and transportation jobs comprised 29%, followed closely by tradespersons (21%), and professionals (11%). Employment rates associated with the mining industry were high within Belyando Shire at 83.1%, whereas only 1.2% of Queensland overall was employed in the mining industry.

Types and numbers of businesses

Moranbah is generally well serviced by local businesses. A future population increase will require extra provision of services, especially healthcare professionals. Refer to Section 5.0 of the SIA (Appendix 7.4) for a full breakdown and discussion regarding existing community services and facilities.

Availability and prices of goods and services

Availability of services within Moranbah is limited. Anecdotal evidence provided by the local Moranbah community suggests that the cost of goods and services has been steadily increasing, especially the cost of housing, which is linked to limited access to vacant land (Refer to Section 5.3 of the SIA, Appendix 7.4)**.**

The Accessibility/ Remoteness Index of Australia (ARIA) measures prices of goods in a regional context and compares costs with that of metropolitan areas. In each category of the index, Moranbah residents pay more overall for all categories of goods, including transportation, than their metropolitan counterparts.

Moranbah residents pay less for housing than metropolitan residents, although, they pay more than other rural communities not associated with mining Section 6.4 of the SIA discusses Belyando Shire's remote rating under ARIA in greater depth.

4.10.2 Potential Impacts & Mitigation Measures

Moranbah will experience increased economic activity as a direct result of implementation of the project, and as such, potential economic impacts on labour and housing markets are expected to be highly visible to the local community. Potential economic impacts associated with construction and operation of the project may be:

- A direct increase in Moranbah's population, especially during the construction phase;
- Increased competition for temporary housing and accommodation in an already limited market;
- Increased housing shortages and higher rental costs;
- Increased demand and competition for local goods and services; and
- Increased demand for water, and other essential services.

Consultation undertaken with the Moranbah community has revealed that the following economic issues are already visible to the local community, in addition to those described above and may be compounded as a result of the project:

- Waiting lists to access medical and dental services in Moranbah and other regional centres;
- Current water restrictions for domestic use of water in Moranbah; and
- High cost of living.

The effect on local and regional labour markets

Moranbah is a town based on mining and the labour markets of the area reflects the industry. The anticipated workforce for the project is expected to be sourced from outside Moranbah. There is however, the possibility of sourcing people already employed in the local area if employment conditions and wages are better or comparable to the wages paid by the coal mines.

There is the possibility that people employed in Moranbah in employment unrelated to coal mining may leave their current employment to work on the construction of the proposed plant. According to NEATO, a local employment assistance service, the greatest opportunity for local employment is the employment of women on a part time or job-sharing basis, but only if adequate child care can be sourced.

Given the limited opportunities to employ local people, there will be an increase in the population of Moranbah during construction and the potential impacts associated with this have been identified in the SIA specialist study (Appendix 7.4, Volume 2 of the EIS).

The proponent will consult with the Queensland Department of Employment and Training (DET) and the Department of Aboriginal and Torres Strait Islander Policy (DATSIP) on the employment of Indigenous people in the Moranbah area.

Potential impacts on the Central Queensland regional labour pool

The project will have a positive impact on the Central Queensland labour pool through construction and operation of the facility. As the majority of Moranbah residents are already employed on a fulltime basis (70.3%), there will be a requirement to source workers from areas other than Moranbah. Therefore, the impact on the Central Queensland labour pool would be positive through the creation of new job opportunities.

Relative significance of this proposal in the local and regional economic context

The project is significant in terms of Moranbah's longevity, which would be derived from local economic growth associated with both the construction and operational stages of the facility. Moranbah experienced a decline in population and service provision during the 1990s due to a lack of industry diversity. Therefore, the proposal for an alternative (but related) industry would assist in the overall sustainability of the town.

Short and long term benefits and any potential adverse impacts that may arise

The project is closely related to the mining industry, therefore there are a number of benefits associated with construction and operation that would ensure economic growth of the Moranbah community, which would in turn enhance economic growth of Belyando Shire. Benefits associated with industry diversification include the creation of new jobs. However, the project would need to establish wages similar to that of the coal mines in order to ensure employees are not tempted by higher coal mining wages.

An increase in permanent accommodation in Moranbah will allow workers of the project to establish themselves as members of the Moranbah community. Integration into the local community would serve to reduce transport costs to workers and would allow them to increase spending in the town, rather than elsewhere. This would lead to new local employment opportunities through increased local economic activity. Creation of local employment opportunities would be through an increase in town centre services and facilities and would provide an opportunity for families of the project staff to engage in employment (Refer to Section 7.2.9 of the SIA, Appendix 7.4).

The need for any additional regional infrastructure triggered by the additional economic development (but not specifically required for the Project)

Mining is a vital component of the economy of the Belyando region. There is the potential with the expansion of mining activities (and associated service provision) that the population of Moranbah could increase by approximately 6,000 people from 6,673 (2001 Census data) people to 12,673 people. While this projected growth would occur over a period of 5 to 10 years, the socio-economic impacts of such an increase in population would necessitate the need for careful planning for regional infrastructure to service the area.

An increase in population within Moranbah would require an increase in the availability of water. Use of Moranbah's water supply is currently restricted, with watering of lawns allowed only during prescribed times of the day. Belyando Shire Council has also ceased permitting the construction of new pools past July 2006.

Dyno Nobel Asia Pacific Limited is in the process of obtaining agreement between BMA and Sunwater on the provision of raw water from the Burdekin pipeline to provide for the operational workforce (including dependents). This water will also provide for the operation of the AN Plant. Water will be purchased from a third party for the construction of the AN Plant to mitigate impacts on the local water supply.

Implications for future development in the region (including constraints on surrounding land uses and existing industry)

The current land use of the site will change from a pastoral lease running cattle to an AN facility, and as such, implications are attached to future development of the region. Section 7.0 of the SIA (Appendix 7.4) discusses impacts of construction and operation of the facility on Moranbah and Picardy Station in greater depth.

Dyno Nobel Asia Pacific Limited has had meetings with the Industry Capability Network and the Mackay State Development Centre (the DSDIR) and is working with them regarding local industry participation and attracting other related businesses to the area.

The extent to which local goods and services will be used

The use of local goods and services for the development of the AN Plant will be dependent on the availability. Primarily, the construction of the AN Plant will be self-contained and the operational workforce will be located for the most part in permanent accommodation within Moranbah and will be more reliant on the goods and services available within the town.

There is an opportunity to facilitate a positive impact on the local businesses and identify new enterprises (e.g. a child care centre) to assist in the active development of direct, indirect and cumulative benefits of the proposed project. However, it should be appreciated that many of the local businesses are restricted by the difficulty to attract staff and retain staff (because of the land and housing shortage and high rental and purchase price of housing). Section 5.3 of the SIA (Appendix 7.4) discusses community service issues in greater depth.

Impacts on local property values

Property prices in Moranbah have increased dramatically since the towns' inception in the 1960s. Between the December and September quarters of 2005, median house prices rose 6.3% from $300,000 to $319,000 (REIQ 2006). Consultations with Moranbah residents (Section 4.5 of Appendix 7.3 details the Moranbah Stakeholders consulted) confirmed that Moranbah is experiencing a housing shortage. They also linked the shortage to the increase in housing prices and the inability of families to move to Moranbah because of family commitments in coastal areas.

Consultation with the local community suggested that rent for three to four bedroom houses can vary from $300 to $900 per week, and $150-$200 per room in a house. However, no formal data on rental costs in the immediate study area were available. According to members of the Moranbah community, the only 'affordable' housing in Moranbah is considered to be the caravan parks, however these are permanently occupied. Section 4.7 of the SIA (Appendix 7.4) discusses housing and property values in greater depth.

Rural and industrial land is under the same type of restrictions as is encountered with the housing. There are tight limitations on the available land for development and if the trend of industrial facilities continues with development around Moranbah these prices will continue to increase. In the immediate vicinity of the AN Plant there are extensive

tracts of rural land most of which is leased by the Camm family. The development of the AN Plant in the area is unlikely to impact on rural land prices. However if the land is over coal or petroleum resources the costs of the land will be elevated due to these aspects rather than of the AN Plant.

4.11 Transport Infrastructure

4.11.1 Description of Environmental Values

The assessment of transport infrastructure was undertaken based on the operation of the AN Plant site (incorporating the construction camp). The assessment included the impacts of these facilities on the volume and type of traffic on the roadway and the capacity of the intersections and infrastructure to support the traffic from these facilities.

The focus of the transport infrastructure assessment has been on existing road infrastructure. The location of the AN Plant has been based on road transport of product to mining operations around the Bowen Basin.

At present, there is insufficient railway infrastructure for the development of this as a viable means of transportation, both with regards to the access to this infrastructure and the limitations of its distribution (product from the AN Plant will be delivered from the site to a number of locations without adequate rail facilities or connections). The use of rail may be a future opportunity for this project, however this was not assessed.

Traffic

Existing transport infrastructure servicing the Moranbah area is limited. Goonyella Road is currently the only access road in the vicinity of the proposed site. It provides access to the Moranbah central district via Mills Avenue and Curtin Street, and connects with the Suttor Developmental Road in the north (via Red Road) and the Peak Downs Highway to the south. Belyando Shire Council is the responsible authority for the Moranbah Access Road south of the Blair Athol Railway line and Goonyella Road. Goonyella Road north of the railway line is under lease from BMA.

Consultation with the BSC has revealed that there are plans to rehabilitate a section of Moranbah access road near the Moranbah airport. There are no plans for other works in the area on locally owned roads.

Public transport servicing Moranbah is limited to the daily Emerald to Mackay bus service, stopping at the town square bus stop. There is also a school bus service operating in the Moranbah area.

4.11.2 Potential Impacts and Mitigation Measures

Traffic

The road infrastructure that will be developed for the project will cross the pipeline infrastructure along Goonyella Road in at two road access locations (to the AN Plant and the construction camp). Measures for the protection of this infrastructure will be

implemented in accordance with the conditions of the easement for this infrastructure (see Section 4.1) and through agreement with the easement holder.

The Traffic Impact Assessment Report analyses the impacts of traffic from the AN Plant (incorporating the construction camp) onto Goonyella Road. An internal road connecting the construction camp to the AN Plant site will be constructed to provide for the use of a shuttle bus that will transport the workers between both sites. The analysis undertaken does not include the internal road and does not take into account the mitigation of transport onto Goonyella Road by its development**.**

For an analysis of traffic issues in greater detail, refer to the Traffic Impact Assessment prepared for the EIS (Appendix 7.6 of the EIS). Peak periods of transport along Goonyella Road based on traffic count data over a 1.5 week period are provided in Figure 14.

Peak hour flows are relatively constant throughout the working week, but drop by approximately half during the weekend period. Traffic count data provided by BSC on the traffic counts in the area and a growth rate of 4.5% p.a. was used to predict the future traffic volumes on all roads.

The number of construction workers for the project has been used for calculating the traffic impacts on Moranbah during the construction period. Figure 15 provides the fluctuations of the workforce over the construction period for the AN Plant.

Analysis of the peak periods of traffic for the construction camp access on the site and the access to the AN Plant site has been undertaken for the project and is provided in Appendix 7.6, Volume 2 of the EIS (a summary is provided below).

Pavement

A Pavement Impact Study has also been prepared as part of the supporting documentation for the Traffic Impact Assessment Report. The Pavement Impact Assessment specifically looks at the impacts from heavy vehicles on the existing road infrastructure from the AN Plant during construction and operation. The Pavement Impact Assessment Report is provided in Appendix 7.6 of the EIS.

The pavement impact assessment was based on the DMR “Guidelines for Assessment of Road Impacts of Development Proposals” this study assumes that a significant pavement impact occurs where the existing heavy vehicle traffic volumes (in ESAs) increase by 5% or more. Based on this premise, Table 6 presents the haulage routes where development generated traffic exceeds the 5% threshold in any given 1-year period between 2008 and 2013 for roads over 500 AADT.

This report found that the AN Plant will generated significant heavy traffic (>5% increase in ESAs per year) on sections of the following roads:

» Flinders Highway 14C (Saleyards Road – Richmond)

» Flinders Highway 14D (INT 5803 – Julia Creek)

» Flinders Highway 14E (INT 78A – INT 13H)

» Peak Downs Highway 33A (INT 27C – INT 514)

- Suttor Development Road 82A (INT 33B – Hail Creek Access)
- Bowen Development Road 88B (CH10.5 – INT Cerito Road)
- Gregory Development Road 98A (INT 5309 – District Boundary)
- Gregory Development Road 98B (Belyando – CH143)
- Collinsville Elphinstone Road 5307 (Newlands Mine Turnoff – INT 82A)
- Peak Downs Dysart Road R44 (INT 33A – Peak Downs Mine)
- Moranbah Access Road (INT 33A – INT Goonyella Road)
- Goonyella Road (Moranbah Access – Rail Crossing)
- Yan Yan Road (INT 519 – INT Lillyvale Road)

It is recommended that due to the currently low AADT levels (<500), the following roads be analysed on a case by case basis with the relevant DMR district and local government to ascertain the appropriate contribution:

- Flinders Highway 14C (Saleyards Road – Richmond)
- Flinders Highway 14D (INT 5803 – Julia Creek)
- Flinders Highway 14E (INT 78A – INT 13H)
- Peak Downs Highway 33A (INT 27C – INT Dysart Road)
- Bowen Development Road 88B (CH10.5 – INT Cerito Road)
- Gregory Development Road 98A (INT 5309 – District Boundary)
- Gregory Development Road 98B (Belyando – CH143)
- Collinsville Elphinstone Road 5307 (Newlands Mine Turnoff – INT 82A)
- Yan Yan Road (INT 519 – INT Lillyvale Road)

The contributions proposed in this report are for those roads where the AADT is above 500 and the ESAs are increased by greater than 5%. These roads are listed below:

- Peak Downs Highway 33A (INT Dysart Road – INT 514)
- Suttor Development Road 82A (INT 33B – Hail Creek Access)
- Peak Downs Dysart Road R44 (INT 33A – Peak Downs Mine)
- Moranbah Access Road (INT 33A – INT Goonyella Road)
- Goonyella Road (Moranbah Access – Rail Crossing)

Due to the increase in heavy vehicle traffic on the above roads, contributions should be made to the following DMR Districts and local government shires:

- Northern District;
- North Western District;
- Central Highlands District;
- Mackay District;
- Belyando Shire; and

» Peak Downs Shire.

Traffic Assessment

For the development of the AN Plant site and the construction campsite two intersections will need to be developed. A traffic assessment was undertaken for the EIS based on the volumes of traffic generated during the construction and operational phases of the project for both the construction camp and the AN Plant and the existing traffic flows at the different intersections impacted by the operation of the project.

Each of the intersections was assessed in relation to the level of service over a specific period. *Ausroads "Guide to Traffic Engineering Practice - Part 2 Roadway Capacity"* (Jan 1988) defines level of service as:

The level of service is defined as a qualitative measure describing operational conditions within the traffic stream, and their perception by motorists and/ or passengers.

The "*Guide to Traffic Engineering Practice - Part 2 Roadway Capacity*" defines each of the levels of service as:

Level of service A

Is a condition of free flow in which individual drivers are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high, and the general level of comfort and convenience provided is excellent.

Level of service B

Is in the zone of stable flow and drivers still have a reasonable freedom to select their desired speed and to manoeuvre within the traffic stream, although the general level of comfort and convenience is a little less than with the level of service A.

Level of service C

Is also in the zone of stable flow, but most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience declines notably at this level.

Level of Service D

Is close to the limit of stable flow and is approaching unstable flow. All drivers are severely restricted in their freedom to select their desired speed and to manoeuvre within the traffic flow will generally cause operational problems.

Level of Service E

Occurs when traffic volumes are at or close to capacity, and there is virtually no freedom to select desired speeds or to manoeuvre within the traffic stream. Flow is unstable and minor disturbances within the traffic stream will cause break-down.

Level of Service F

Is in the zone of forced flow. With it, the amount of traffic approaching the point under consideration exceeds that which can pass it. Flow break-down occurs, and queuing and delays result. These level form the basis on the assessment of the different intersections assessed.

Construction Camp

The analysis in Part A of the Traffic Impact Assessment Report (Appendix 7.6 of Volume 2 of the EIS) shows that:

» A "BA" type intersection form, with one lane approaches/exits on each leg, provides adequate performance for the peak construction period for the construction site access to Goonyella Road (see Figure 42). Minimum Levels of Service are C and B for the peak traffic conditions under weekday and weekend peak periods, respectively.

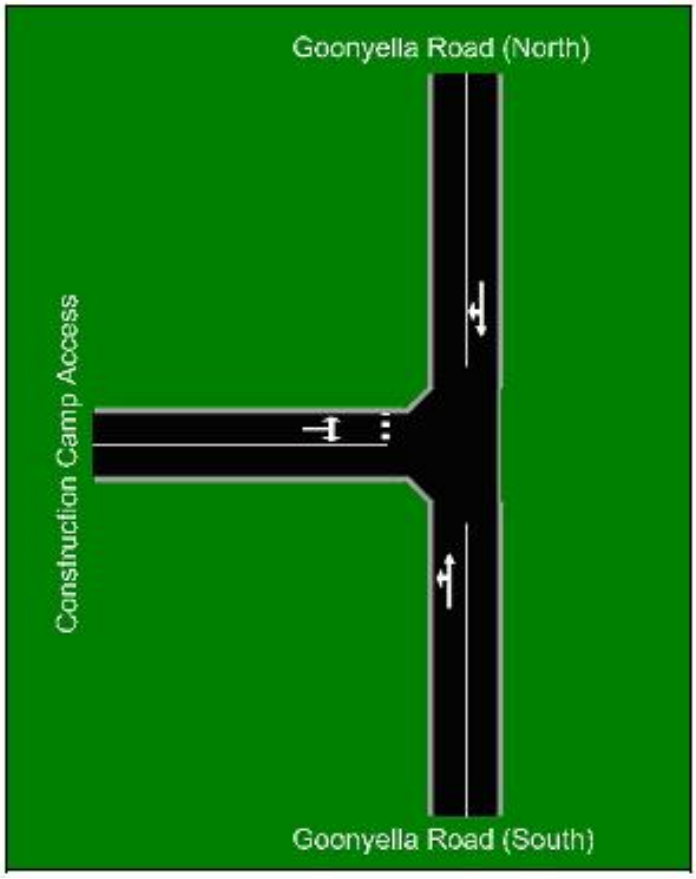


Figure 42 Construction camp / Goonyella Road intersection

» The existing intersection configuration at Mills Avenue/Goonyella Road provides sufficient capacity to cater for the additional traffic demand resulting from the construction camp facility (see Figure 43). A minimum Level of Service B is provided under both weekday and weekend peak hour traffic loading.

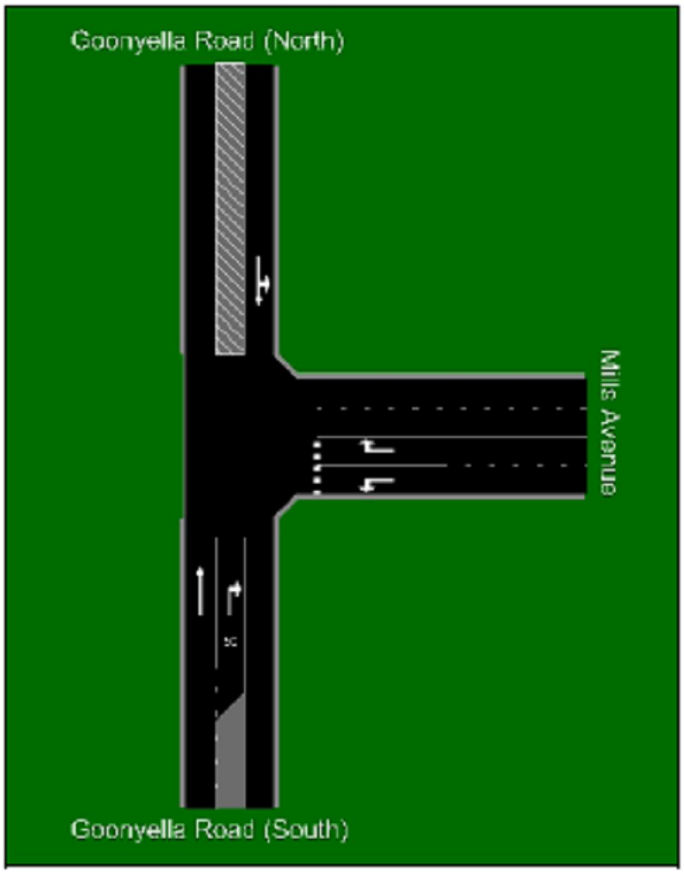


Figure 43 Mills Avenue/ Goonyella Road intersection

» An “AUL” type intersection form is adequate for the project Access/Goonyella Road intersection under 2008 peak construction traffic loading. Minimum Levels of Service are C and A for the peak traffic conditions under weekday and weekend peak periods, respectively.

Traffic Assessment AN Plant

The analysis in part B of this report (Appendix 7.6 of Volume 2 of the EIS) shows that:

» A ‘basic’ type intersection is sufficient to provide adequate performance through to 2018 for access to the site from Goonyella Road. A minimum level of service B is provided in Figure 44. Dyno Nobel Asia Pacific Limited may opt for the addition of acceleration/deceleration lanes (see Figure 45), which would improve the flow, access, and safety of the intersection.

» A further alternative is the development of acceleration and deceleration lanes on Goonyella Road. The proposed configuration would be a combination of a Rural Type “AUL” with a terminating leg and a rural type “AUR” intersection (see Figure 46). An acceleration lane of 70 metres is generally applicable for a speed environment of 70km/hr for the access back towards Moranbah. A deceleration lane of 70 metres would be developed for the Goonyella Road from Moranbah to the AN Plant access. The acceleration and deceleration lanes will be dependent on surface

topography. No assessment of this intersection was undertaken however it is anticipated that the presence of these lanes would lead to increased efficiency and safety.

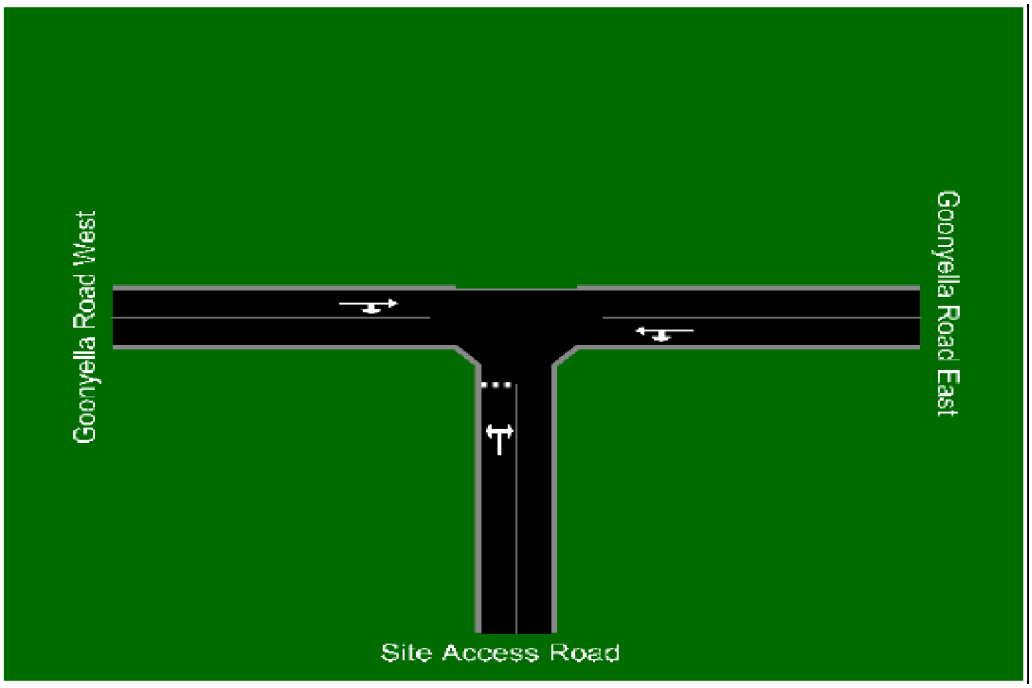


Figure 44 AN Plant access /Goonyella Road intersection

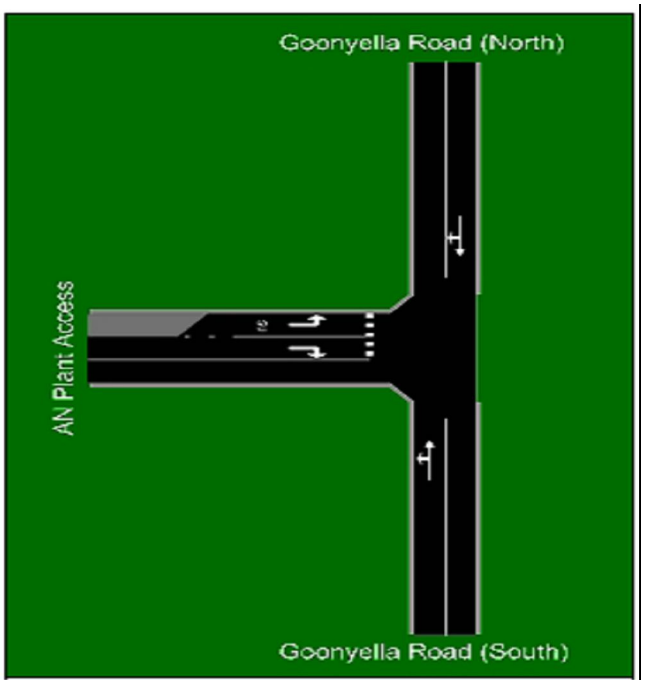


Figure 45 Alternative AN Plant access / Goonyella Road intersection

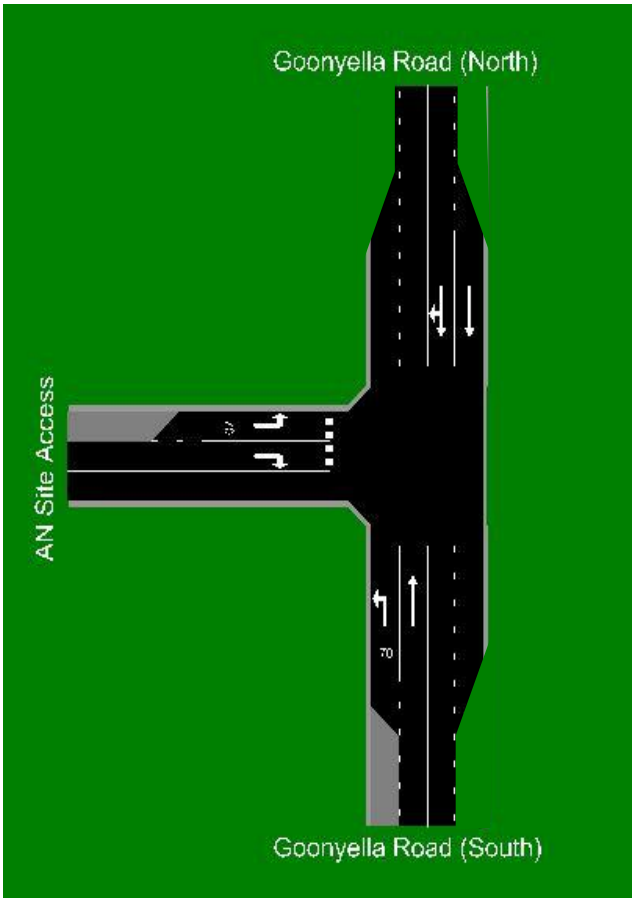


Figure 46 Alternative Plant Access (acceleration and deceleration lanes)

» The performance of the existing intersection between Mills Avenue and Goonyella Road is deemed adequate to 2018 on all approaches (Figure 43). A minimum level of service B is provided.

» The performance of the intersection of the Peak Downs Highway and Moranbah Access Road is adequate to 2008 conditions. However, it will require remedial works in order to adequately handle the forecasted traffic in 2018. The proposed intersection with an 'AUL/AUR' type treatment approach on the Moranbah Access Road was found to provide a minimum level of service C under 2018 conditions (see Figure 47).

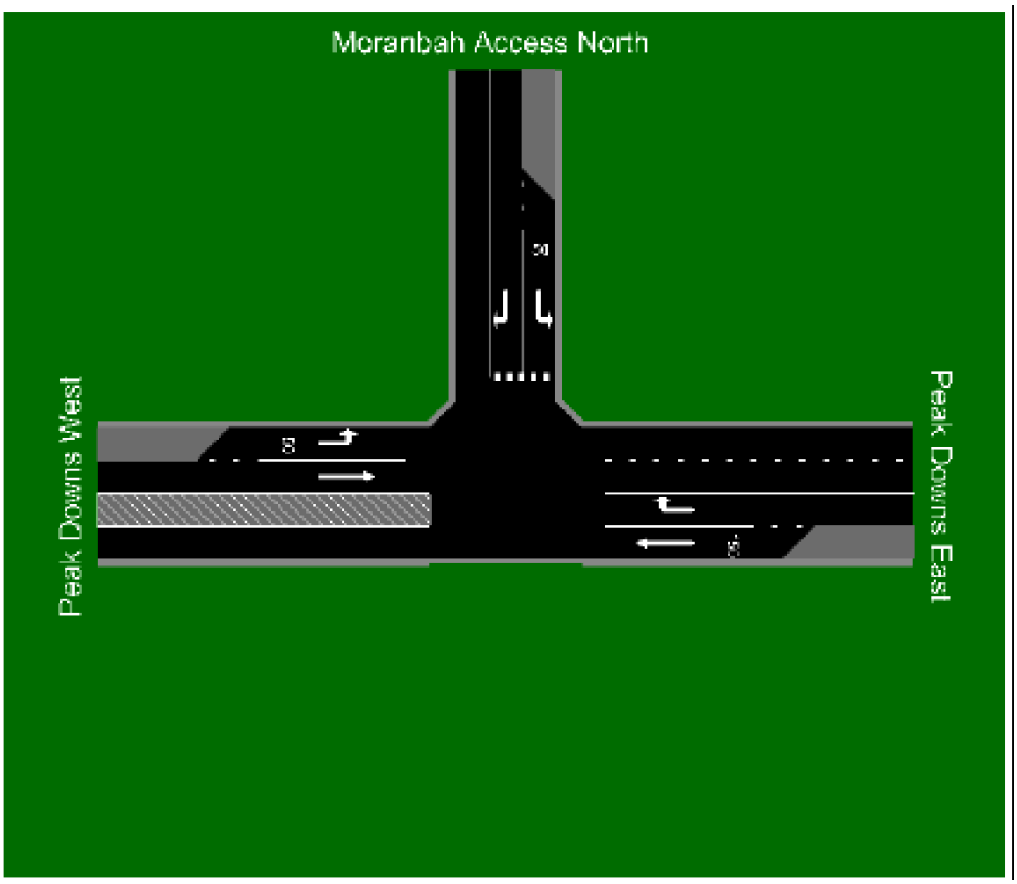


Figure 47 Proposed Peak Downs Highway / Moranbah Access Road intersection

Outcomes

- The development of the AN Plant should not affect either existing or future public transport infrastructure. There should be no impact on the movement of existing services as the traffic generated by the plant is small in comparison to the current existing traffic.
- In the event of an incident, the maximum amounts of AN spilled would be 67 t of Prill and 52 t of Emulsion.
- Pavement impacts and contributions for road maintenance will be undertaken in accordance with DMR guidelines.

4.12 Health and Safety

4.12.1 Existing Conditions

The site selected for the development of the project has been chosen to minimise the potential impacts on the community and the surrounding land uses. The site is undeveloped and does not have any existing infrastructure. It is relatively flat (see Figure 21, Slope Analysis) and aproximately 4.5 km to the west of Moranbah.

The assessment of the existing air quality within the area has identified air quality well below the applicable National Environmental Pollution Measure (NEPM) action targets (refer to Appendix 7.8 Section 3). The noise assessment undertaken for the area has identified a number of contributing facilities to the ambient noise conditions including the Enertrade Compression Station to the east of the site. The existing ambient noise for the town of Moranbah demonstrated comparably high background noise conditions at night to those identified during the day although still lower.

Moranbah has a high number of shift workers that work in the mines in the surrounding area. There is a high community and government expectation that employers will ensure safe workplace to work.

The *Workplace Health and Safety Act 1995* (WH&S Act) is the principal legislation in place for the management of occupational health and safety in Queensland. This legislation is administered by the Workplace Health and Safety section of the DSDIR and sets out the obligations for the management of occupational health and safety in the workplace.

A detailed assessment of onsite risks to health and safety will be undertaken by DN to ensure its compliance with its obligations under both the WH&S Act and the DGSM Act.

Dyno Nobel Asia Pacific Limited's knowledge of the applicable Queensland workplace health and safety standards for the operation of this type of facility has been demonstrated through the development and operation of the Moura facility and the requirements to meet relevant codes and standards including the requirements under the WH&S Act and the DGSM Act.

It is also notable that DN has extensive experience in precursor manufacturing facilities around the world including Canada, Australia and the United States of America and has been a significant developer of explosive precursors and detonators in different environments around the world.

4.12.2 Potential Impacts and Mitigation Measures

The operation of the project will fall under the definition of a major hazard facility as defined under the DGSM Act due to the type and quantities of materials stored at the site.

The proposed Transfield Moranbah and Nebo Power Stations Project has had limited consideration within the EIS as no data is available on the development of this Power Station, specifically with regards to the type and size of the facility. The development of this project has been delayed.

A PRA has been completed for this project to identify and assess all potential major accidents that may result from operation that may impact offsite from the facility (refer to Appendix 7.7 of the EIS). This risk assessment however does not address onsite risks from the facility and a further detailed risk assessment will need to be undertaken to comply with the requirements under the WH&S Act once the development of the design for the facility has been finalised.

The major accidents identified from the PRA undertaken for the AN Plant in this location included:

1. Ammonia and NO_X gas release;
2. Explosion risk; and
3. Fire risk.

The onsite operational risks likely to be identified from the operation of the AN plant in this location include:

1. Storage and handling of hazardous materials including: -
2. Nitric acid;
3. Ammonia Gas;
4. Ammonium Nitrate (solution, prill and emulsion);
5. Coal seam methane/natural gas;
6. Diesel;
7. Noise impacts from the operation of plant and machinery;
8. Operation of plant and machinery; and
9. Construction and operational risks.

Dyno Nobel Asia Pacific Limited has specific procedures in place that address chemical spills in general:

Chemical Spillage Management Guidelines

General Requirements

» Once a spill has occurred,an immediate and effective response is mandatory to minimise its environmental impact. All spills are to be managed using the three Cs - Control, Contain and Cleanup.

» All spills will be acted upon immediately. Operations should not continue in preference to spill response.

» All spills will be reported through the DN internal reporting system.

» All sites around the AN Plant will stock hydrocarbon absorbent response materials that can be disposed of in landfill.

Job Safety Analysis

» Task Inventory techniques will identify when an activity, such as maintenance, will result in chemicals being spilt. Suitable preventative measures, such system flushing, or control measures, such as collection receptacles or tarpaulins, will be used to stop chemicals contacting the ground or becoming waste.

» All spilt material that ends up, as waste will be labeled in accordance with DN requirements.

» In developing Emergency Response and spill clean up plans, reference to the product MSDS (Material Safety Data Sheets) will be made.

» A licensed regulated waste contractor will be used for disposal to an appropriate licensed landfill.

Recovery Goals

» The first priority when recovering spilt product is to maintain the quality of the product. It will then be possible to return it to storage, thereby generating no waste. If this is not possible, the level of contamination or quality loss will be minimised. This improves the chances of product recycling.

» Recovery processes are to minimise the potential of causing environmental harm.

Solid Dry Addition Materials - Ammonium Nitrate Solid (Prill or Crystalline), Urea, Calcium Nitrate, Sodium Nitrate

» Source of the spill will be identified and isolated.

» Containment of solid AN will usually not require the use of bunding devices. If the spill is exposed and there is a risk of imminent rain, then immediate actions will be taken to minimise the exposure of the spill to water. Bunding and blocking of nearby draining will be undertaken as a precaution.

» Spilt material will be cleaned up by use of a broom, shovel or any other appropriate dry method.

» Collection of spilled material will be completed in a manner that reduces the risk of contamination by rocks or other ground materials.

» Collected, uncontaminated material will be placed back into storage.

» Collected, contaminated material will be disposed of down a blast hole or by controlled irrigation methods.

Ammonium Nitrate Solution

» All bunds will be isolated and will require a valve to be opened to release any spilled material within the bund.

» The source of the spill will be identified and isolated.

» If the spill has occurred outside a bund area, response measures will ensure that the area contacted by the liquid is minimised and nearby drains are blocked.

» In most situations the majority of AN will not remain in solution, due to its high crystallisation point. The crystallized AN will be collected and redissolved into solution.

» When this is not possible or crystal contamination is too great, the waste will be collected and assessed for reuse. If the material is not acceptable for reuse it will be appropriately disposed of.

Hydrocarbon - Liquids

» All bunds will be isolated and will require a valve to be opened to release any spilled material within the bund.

- Source of spill will identified and isolated.
- If the spill has occurred outside a bund area, response measures must ensure that the area contacted by the liquid is minimised and nearby drains are blocked.
- Where pools of uncontaminated hydrocarbon liquid exist, recovery pumping systems will be used to collect the liquid and then return to storage.
- Where hydrocarbons have mixed with another liquid, namely water, absorption materials will be used to remove the hydrocarbon. The used absorption pads, fibres or socks can be disposed in landfill.
- Where hydrocarbon has contaminated ground soil, the soil will be excavated and placed into a remediated facility. This facility may exist on site or may require transport to an off site licensed contaminated soil facility by an approved contractor.
- Where hydrocarbon stains appear on concrete, quick breaking degreasing chemicals will be used. The run off water will pass through an oil /water separation system.

AN Emulsion

- Source of the spill to be isolated.
- As emulsion storage tanks will be bunded on the hard stand.
- The preferred method of Emulsion recovery is to use a portable air diaphragm pump (e.g. Wilden) and pump back to storage tanks or temporary storage. A screening device will be used to avoid the contamination of storage vessels. A specialist engineering unit will provided advice on a case by case basis if a emulsion spill occurs.
- Where the volume of spilt product is insufficient for pumping, manual loading in a transport receptacles will used.
- Emulsion not in direct contact with the ground will be collected first and stored in a manner that will enable its return to the original storage vessel. Emulsion in direct contact with the ground will inevitably be contaminated. This emulsion will be stored separately and either treated prior to recycling or disposed of in a blast hole.
- Hydrocarbon response equipment is not effective on emulsion spills and will not be used in these cases. However, the use of temporary barricades to prevent the dispersion of the spill may be required.

Chemicals not Previously Mentioned

- Chemicals that exist in this category are not typically stored in large quantities at DN sites.
- As with all other spills, these will be firstly controlled and then contained.
- The material MSDS will be consulted for suggested disposal method.
- Disposal will be by a DN Approved Waste Contractor if required.

» Before a spill occurs, a review of MSDSs will be done to identify any special disposal requirements. Arrangements will then be made to ensure that method is available if a spill occurs.

Traffic

Management of traffic during both the construction and operation of the site will be implemented to reduce the risk of injury to the workforce on the site and to the impacts from dust and noise generation. Additionally, access onto and off the site will be managed to minimise the risk of accidents before after and during work hours.

The traffic impact assessment recommends a number of management measures for the operational and construction workforce to minimise the potential impacts related to traffic from the project (refer to Appendix 7.6 of the EIS).

Dyno Nobel Asia Pacific Limited has proposed to minimise the travel to and from the site for both the construction and operational workforce. During construction, shuttle buses will be used from the construction camp to the worksite to minimise the amount of traffic generated during the work day on a proposed internal access road. Dyno Nobel Asia Pacific Limited is also working to provide an adequate supply of accommodation in Moranbah for the majority of its operational workforce to minimise driver fatigue.

Safety Systems and Emergency Planning

The key to effective management of incidents and emergencies is the effectiveness of the preventative actions taken before any situation reaches a reportable or critical level. Therefore, monitoring and surveillance activities are extremely important. During construction activities on the site, the following inspection or preventative actions will be performed by the Contractor:

1. weekly and daily inspection of works; and
2. an induction process for all site personnel that includes relevant information on site emergency procedures.

An Emergency Response Plan will be prepared which includes response procedures for environmental incidents such as chemical, wastewater or fuel spills, fire or floods. Dyno Nobel Asia Pacific Limited will develop a comprehensive range of emergency procedures in collaboration with the Department of Emergency Services.

These procedures will be integrated into the Emergency Response Plan for the facility and may include coordination with adjacent operations where required (i.e. the proposed Transfield Moranbah and Nebo Power Stations Project).

If an environmental incident occurs, all necessary action will be taken to minimise the size of any adverse impacts. If adequate resources are not available to contain a chemical release, and if it threatens public health, property or the environment, the Queensland Fire Brigade will be contacted for emergency assistance.

If the Queensland Fire Brigade are called, they may notify the EPA if they consider the environment or public health to be threatened. Notification by the Queensland Fire

Brigade does not negate the need for person carrying on the activity or the occupier of the premises to notify the appropriate regulatory authority. EPA staff can be contacted 24-hours/day via Pollution Hotline on 1300 130 372 to provide urgent advice on cleaning-up the incident or on the disposal of any resulting waste materials.

Duty to Notify

Section 320 of the EP Act states that if persons while performing their work, notice that serious or material environmental harm is being caused or threatened by their actions or the actions of someone else, they should then report the matter.

Fire

Whilst the risk of significant fire or explosion is low onsite, fire-fighting facilities such as hydrants with hoses will be provided consistent with normal practice. Fire fighting equipment will be fitted to ensure that the plant operators are able to fight fires and rapidly provide cooling water to at risk equipment.

Safety equipment including firewater monitors with fogging nozzles, hydrants, mobile and portable fire extinguishers, protective clothing and self-contained breathing apparatus will be provided where required. The management procedures for dealing with bushfires around the facility will be developed with the Rural Fire Brigade operating around Moranbah to ensure an integrated approach to fire fighting. Staff will be trained in emergency response procedures including in the event of a fire at the AN Plant or nearby.

The proposed AN Plant requires the provision of a substantial water supply for its operation and evaporation ponds for the management of wastewater from the manufacturing process.

Mosquitos

Conditions at the AN Plant may provide conditions for mosquito breeding in the area. As a result measures will be implemented to manage mosquito breeding on site. The objective will be to minimise the number of potential mosquito breeding sites created on-site by preventing water from ponding. Strategies to minimise the potential impacts from mosquitoes will be based on “Guidelines to Minimise Mosquito and Biting Midge Problems in New Development Areas” (Queensland Health, 2002).

4.13 Hazard and Risk Analysis

4.13.1 Overview

The PRA found that the proposed AN production facilities are compliant with the relevant Queensland CHEM Services Land-Use Safety Planning (LUSP) criteria for offsite individual risk. The land to the north and west of Moranbah is unoccupied and access to the area is via Goonyella Road. Transfield has an adjacent site, with the Enertrade Pty Ltd compression station just to the east of this location. The Transfield site is currently undeveloped and the Enertrade compressor station is unmanned. A gas-fired power station is located onsite.

Hazardous events have been identified though analysis of information relevant to the facility made available in combination with the criteria established in Section 6.0 of the PRA Report (Appendix 7.7 of the EIS). Figure 48 presents the Location Specific Individual Risk (LSIR) contours developed in this study. These relate to the overall risk from the operation of the AN Plant. The risk contours relate to the acceptability of the risk in relation to sensitive receivers (eg: industrial, commercial, residential etc).

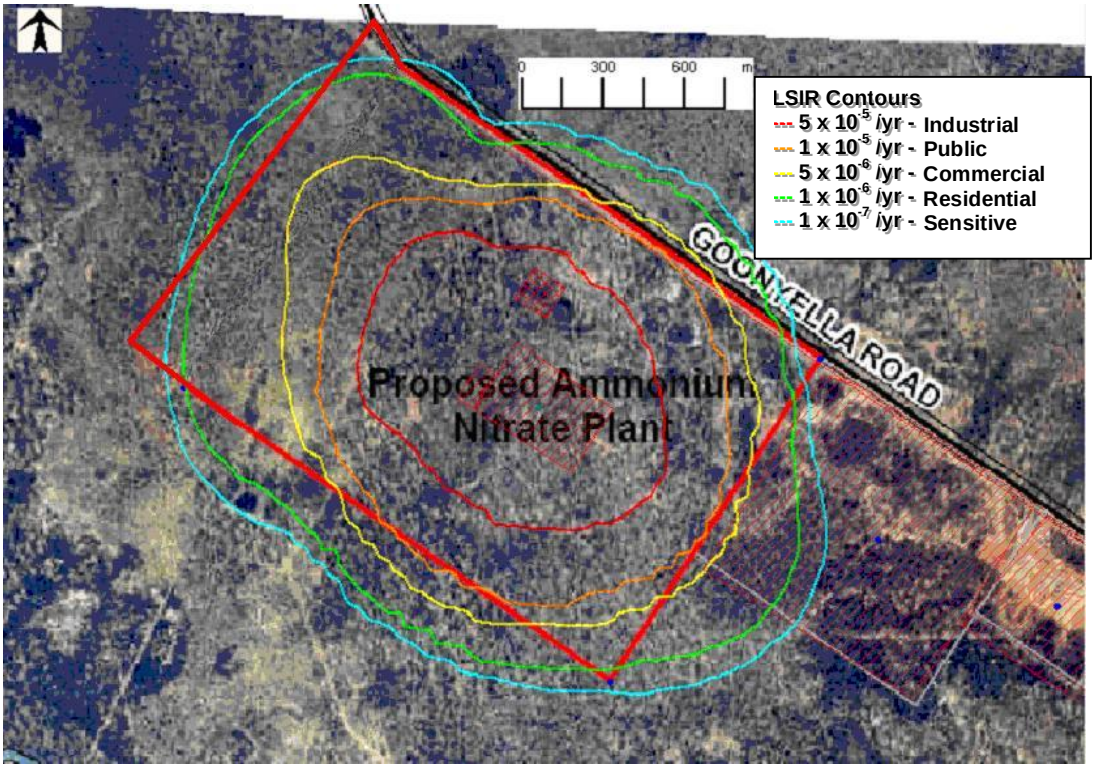


Figure 48 Location Specific Risk Contours

The site's south-western boundary is approximately 500 metres from the edge of the proposed nitric acid, AN and emulsion plant. In each situation, events not considered capable of reaching these distances in lethal effect (i.e. causing offsite fatalities) were screened out. A full list of the hazards and their detailed information is shown in Appendix A of the PRA Report (Appendix 7.7). Overall, 32 events were considered to have the potential to cause offsite fatalities through either toxic or overpressure effects and were thus escalated to a more detailed consequence and frequency analysis to determine the plant's offsite risk.

The HAZOP study, which will be undertaken during the detailed design and incorporate the assessment undertaken in the PRA, will identify any special operating or storage procedures to be adopted to reduce the possibility and or severity of accidents occurring.

4.13.2 Legislation and Standards

The following regulations, codes of practice and information documents are applicable for the operation of the AN Plant:

- Australian Explosives Manufacturers Safety Committee (AEMSC) – Code of Good Practice – Precursors for Explosives, Edition 1, 1999.
- Council of Australian Government (COAG) Document "Principles for the Regulation of Ammonium Nitrate"
- Explosive Act 1999 and Explosive Regulation 2003
- Dangerous Goods Safety Management (DGSM) Act 2001 and Regulation
- Declaration of SSAN as an Explosive 29 Oct 2004
- Explosives Information Bulletin No 41 – Persons Appropriateness to Access
- Explosives Information Bulletin No 53 – Storage Requirements for SSAN 2006
- Australian Standard AS 4326 – The Storage and Handling of Oxidising Agents
- Australian Code for the Transport of Dangerous Goods by Road and Rail (6th Edition) 1 Jan 1998 (ADG Code)
- Australian Code for the Transport of Explosives by Road and Rail (2nd Edition) Mar 2000
- AS 2187.1 Explosives: Storage, Transport and Use, Part 1

4.13.3 Facility Description

Although the design of the plant has not been fully completed, it will be similar to other AN and AN emulsion plants (i.e. Moura Joint Venture). The description presented in the following sections details the key processes and utilities handling toxic and / or explosive materials relevant to the offsite risk assessment. A full process description is provided in Section 3.3.

Power Station

A 15 MW gas-fired facility will be situated to the north of the proposed AN Plant in Moranbah. The facility will be 8 or 9 generators of 2 MW capacity to provide the power of 8 MW x 50 Hz and 7 MW x 60 Hz plus some spare capacity.

The size of the footprint of the facility will be approximately 150m x 200m (3 Ha) for the layout of the engines. The additional facilities, including the control room, workshop, switch room, switchgear transformers and let-down station, etc, will occupy additional space.

The natural gas pipeline to the power generation facility will be a branch off the existing gas pipeline running to the ammonia plant. The power station will be ancillary to the operation of the AN Plant and will be incorporated into the site. The facility is anticipated to be unmanned.

Ammonia Manufacture

Coal seam methane entering the plant is compressed and transferred to a reforming plant. After the reforming stage the reformed gas is cooled before entering a shift reactor. Hydrogen is then separated from other undesired products in a Pressure Swing Adsorption (PSA) unit.

Nitrogen is also separated from air in an air separation unit. A mixture of purified hydrogen and nitrogen is then sent to a converter where ammonia is formed. The ammonia gas is cooled and condensed before being stored in a refrigerated storage tank. This ammonia is then used in the nitric acid plant and the AN Plant.

Nitric Acid Manufacture

The nitric acid plant uses ammonia and air as raw materials. Anhydrous liquefied ammonia will be supplied at high pressure from the ammonia tank. The ammonia will be vaporised in the ammonia evaporator and superheater to a pressure of approximately 1300 kPa and 100 °C. Ammonia will then be fed at a lower pressure into a mixer where it is combined with filtered clean air. The ammonia/air mixture will then be fed into a burner where the mixture is reacted over catalytic platinum gauze. The reaction produces a mixture of nitrogen oxides and steam.

After the burner, the hot reaction products are passed through a series of heat recovery processes including a tail gas heater, an economiser, and a gas cooler-condenser. The gas mixture will be cooled to less than 60 °C resulting in production of weak nitric acid solution, which is then separated out and fed as weak nitric acid into the absorption tower. The non-dissolved nitrogen oxide gases (NO_X) are subsequently absorbed into the weak acid in the tower to form nitric acid at a concentration of approximately 60% w/w. The acid flows from the bottom of the Tower to storage tanks.

Ammonium Nitrate Manufacture

Anhydrous liquid ammonia at approximately 1600 kPa is fed to the ammonium nitrate plant (part of the AN Plant) where it is vaporised in the ammonia evaporator and superheater to a pressure of approximately 530 kPa and 70 °C before being fed to the pipe reactor.

The plant uses liquid nitric acid and gaseous ammonia as raw materials in the process to produce AN solution in a tubular pipe reactor. The exothermic reaction provides sufficient energy to maintain non-saturated water in a vapour phase, which is separated as process steam in the Reactor Separator. Approximately 40% of the process steam flow passes to a number of heat exchangers, all of which return the condensate to the Concentrated Process Condensate Tank. The AN solution flows under gravity to a flash tank where the solution is concentrated. The solution is then pumped to an evaporator and collects in the remelt tank before being fed to the prilling processes.

Prill Manufacture

Prilling is the process of forming solid particles from a solution maintained at a higher temperature than its saturation and the crystallization temperatures. Liquid Ammonium

Nitrate is passed through spray nozzles with suitable size holes through which the solution flows. The counter-current flow of air cools and solidifies the prill during their fall. The prill is then dried, cooled, screened, coated, weighed and sized for product quality. Prill, which is out of specification is returned to the system. On-spec prill is conveyed to storage for bagging and/or dispatch.

Emulsion Manufacture

Ammonium nitrate solution is blended with process oils (emulsifiers, mineral oils, and diesels), then cooled and stored as an emulsion. The emulsion plant produces batches of up to 140 T of AN emulsion, suitable for sensitisation (density lowering, gassing) in the bulk vehicles used in the surrounding mining operations.

AN Dispatch

The product is dispatched to customers in bulk. The prill is transported either (mainly) in truck tanks or 1.2 T Bulka bags, both loaded from a conveyor and hopper. Bulka bags are loaded onto truck trays using a forklift. AN prill and emulsion will be transported in accordance with the requirements of the National Code for Transport of Dangerous Goods.

4.13.4 Inventory of Dangerous Goods

Table 38 provides an inventory provides of the specifications of the hazardous materials in the AN Plant and the AN emulsion Plant (further information is provided in Appendix 7.7 of the EIS).

Table 38 Hazardous Materials addressed in the AN and AN Emulsion Facilities

Ref No.	Hazardous Material	Phase	Produced/Used	Maximum Quantities in Assessed Sites on the AN & AN Emulsion Facilities
1	Anhydrous Ammonia	Liquid and Gas	Produced at the Ammonia plant and consumed in both the AN and Nitric acid plants for the production of acid and AN.	Storage of up to 1,300 T.
2	Ammonium Nitrate	Solution, Prill, and Emulsion	Produced in AN plant. Facility end product	Storage of up to 14,000 T of prill and emulsion.
3	Nitrogen oxides (monoxide, dioxide, tetroxide, nitrous)	Intermediate Gas	Produced and consumed in Acid plant for the production of acid.	In-situ usage. No storage of gas.

4	Nitric acid	Liquid	Produced in Acid plant and consumed in AN plant to produce AN.	Storage of up to 2000 T
5	Alkyl amine (coating agent)	Liquid	Consumed in AN plant for prill stabilisation.	Storage of up to 100 T
6	Emulsion agents (oils, diesel)	Liquid	Consumed in emulsion plant.	Storage of up to 200 T
7	Steam	Gas	Produced and consumed by Ammonia, Ammonium nitrate and nitric acid plants.	No storage of steam
8	Nitrogen	Pressurised Liquid and Gas	Consumed by both plants as purge.	Storage of up to 12 m^3

4.13.5 Methodology

Anything with the potential to cause harm is defined as a hazard. Accidents are the realisation of the hazards that result in harm. Accidents may range from small leaks of gas that disrupt the plant operation but cause no other damage, up to major failures of pipes or vessels or explosions causing extensive damage to property and the death of one or more people in the area.

A Quantified Risk Assessment (QRA) was conducted for the AN Plant PRA as this form of assessment is appropriate for demonstrating the adequacy of location with respect to Land Use Safety Planning requirements. The QRA process utilized follows the Queensland CHEM Services risk criteria to assess the risk of a potential fatality beyond the site boundary. The QRA process is outlined below:

1. **Define System**. Defines the intent of the study and identifies system operations, environment, and boundaries. Criteria relevant to the study are identified at this point.
2. **Hazard Identification**. During this step, the identification and preliminary screening of hazardous events is conducted.
3. **Consequence Analysis**. The consequences of each event are determined using either empirical means or by consequence modelling software. In this study, the consequence package PHAST was used for process releases.
4. **Frequency Analysis**. The frequency for each event (identified in Step 2) is determined by assessing and comparing the scenario against either a relevant historical record or by determining the likelihood of its contributing events.
5. **Risk Assessment**. Risk is determined by the combination of frequency and consequence for each event. The overall risk profile may then be assessed against the study criteria defined in Step 1. Where the overall level of risk is determined not to be tolerable, action can be taken to reduce the risk to

ALARP levels through the identification and management of risk driving events. **S**oftware for the **A**ssessment of **F**ire, **E**xplosion, and **T**oxic **I**mpact (SAFETI) is a software program used for the consequence and frequency analysis. SAFETI provides the ability to produce a full spectrum of individual risk at given locations, societal risk curves, and various other risk result presentations.

6. **Input into Safety Management System (SMS)**. The QRA may be used as a tool to support the subsequent design activities used in the proposed facility SMS, by providing insight into risk-based activities (control, maintenance, etc) or as a starting point for compliance to MHF requirements.

4.13.6 Natural Events

The following natural events were considered for the Moranbah area:

» Cyclones; The applicable code for wind loading (AS1170.2) indicates that Moranbah is not in a cyclonic zone. Based on this standard Moranbah is located in Region A4 - non cyclonic. The structures built at the site will be constructed in accordance with this standard.

» Earthquakes; An earthquake does not present a credible risk scenario for the proposed facilities. Design will be in compliance with the Building Code of Australia, with respect to Earthquake protection.

» Bush Fires; there is a low to medium risk of a bush fire near Moranbah. The bush will be cleared to a specified distance (see Figure 9) from the area of the main plant and evaporation lagoons but most would remain on the plot.

» Flooding; the risk of flooding from a rain event is also low due to the location and elevation of the site.

» Lightning; although unlikely all equipment will be earthed and designed to comply with AS 1768 (Lightning Protection), lightning should not be an issue onsite.

4.13.7 Construction Risk

There are no offsite risks associated with construction of the AN Plant. Standard Construction Methods are to be used. There are no adjacent facilities to the site that may be impacted by the construction activities associated with the AN Plant.

4.13.8 Toxic Release

Consequence modelling for the toxic release scenarios was conducted using Process Hazard Analysis Software Tool (PHAST). PHAST models the dispersion of vapour clouds to concentrations of interest and determines the toxic dose / loading over those areas. PHAST calculates the lethality of toxic doses.

The inventory with the most significant consequence is the Ammonia Tank Storage. The tank is intended to be double walled, in order to provide secondary containment in the event of a crack or leak in the inner tank shell. One of the key issues with refrigerated storage tanks is the filling points. Figure 49 provides a map of the worst-

case ammonia gas release from the facility where all of the ammonia is released from the tank but the liquid is contained within a bund.

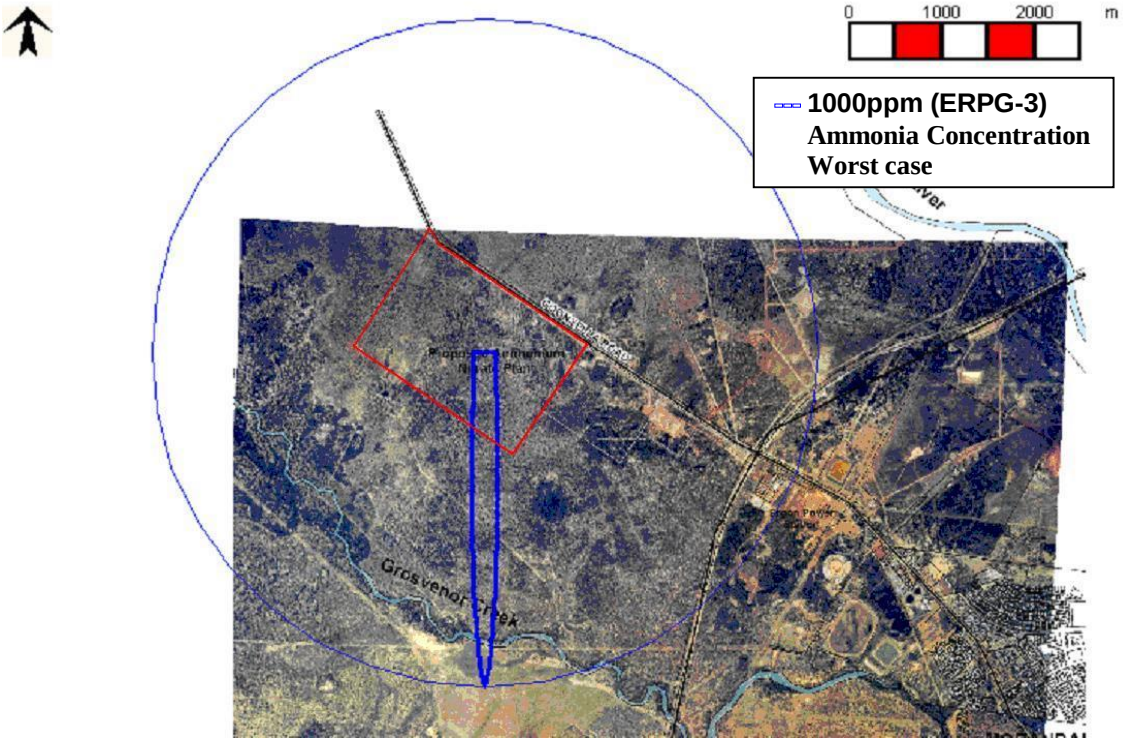


Figure 49 Ammonia gas release

The impact emission is contained within the site boundaries while the gas escapes. The ERPG-3 Ammonia concentration of 1000ppm (the blue line) and nitrogen dioxide concentration of 30ppm, are the maximum airbourne concentrate for which nearly all individuals can be exposed for up to 1 hr without experiencing or developing life threatening health effects.

Dyno Nobel Asia Pacific Limited will develop the ammonia tanks with an inlet pipe through the roof of the tank with a submerged pump inside the tank. This removes the potential for loss of containment due to pump failure or inlet pipe failure.

The comparison between single and double walled tanks is investigated in Appendix E of the Hazard and Risk Assessment (Appendix 7.7 of the EIS). Dyno Nobel will use double walled tanks for the ammonia storage.

Explosion

Ammonium Nitrate as prepared by DN to UN 1942 specification is classed as an oxidiser and has the following characteristics:

» It cannot burn without a combustible material present;

» It melts at 169 ºC;

» It begins to decompose after melting, releasing fumes of NO_X, HNO_3, NH_3 and H_2O; and

» At roughly 290 ºC decomposition reactions of both exothermic and endothermic types generate an equilibrium keeping the temperature constant at this temperature, noting that this is dependant upon the decomposition gases being able to vent.

Security Sensitive Ammonium Nitrate (SSAN) is classed as an explosive under the *Explosives Act 1999.* The sensitivity of Ammonium Nitrate to detonation is largely dependant on three variables; high temperature, confinement and contamination. Without any of these three being present, Ammonium Nitrate requires a strong initiation charge (an example being high explosives) to detonate.

The quantity of AN involved in an explosion was determined through consideration of historical incidents. An explosion in Toulouse was used as a benchmark regarding historical explosive events and a tool for the development of explosion management scenarios. Essentially the Toulouse explosion involved some 400 T of out of specification / contaminated material giving an overall TNT equivalence of between 20 to 40 T.

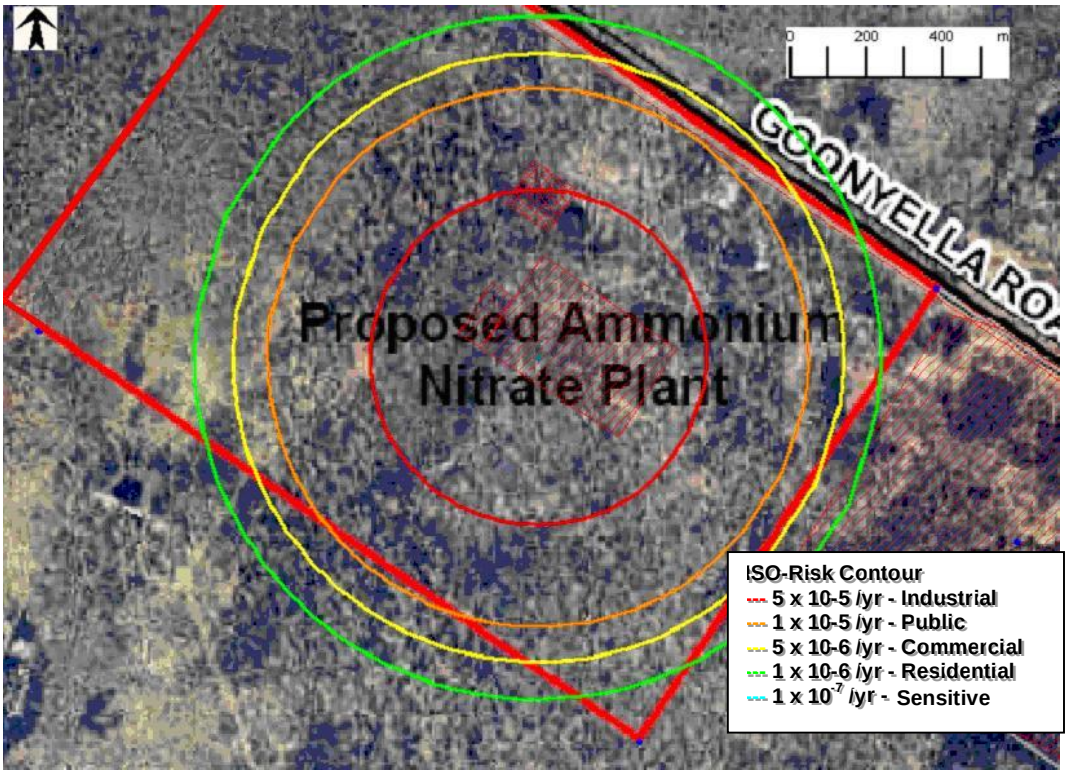
The scenarios investigated in this study (The PRA Appendix 7.7) involve accidental explosions between 2000 to 6000 T of uncontaminated material involving a limited / contaminated fraction (10% based upon the findings of the Toulousian study) with overall TNT equivalencies ranging between 70 to 330 T of TNT (5 to 10 % equivalencies). Given DN's experience in handling / producing AN materials and proposed quality control mechanisms, the Toulousian efficiencies are considered appropriate, though a level of conservatism was added.

AN Solution and Emulsion explosions were screened from the offsite risk analysis during the preliminary consequence modelling stages of the study as mentioned in Appendix A of the PRA (Appendix 7.7 of the EIS).

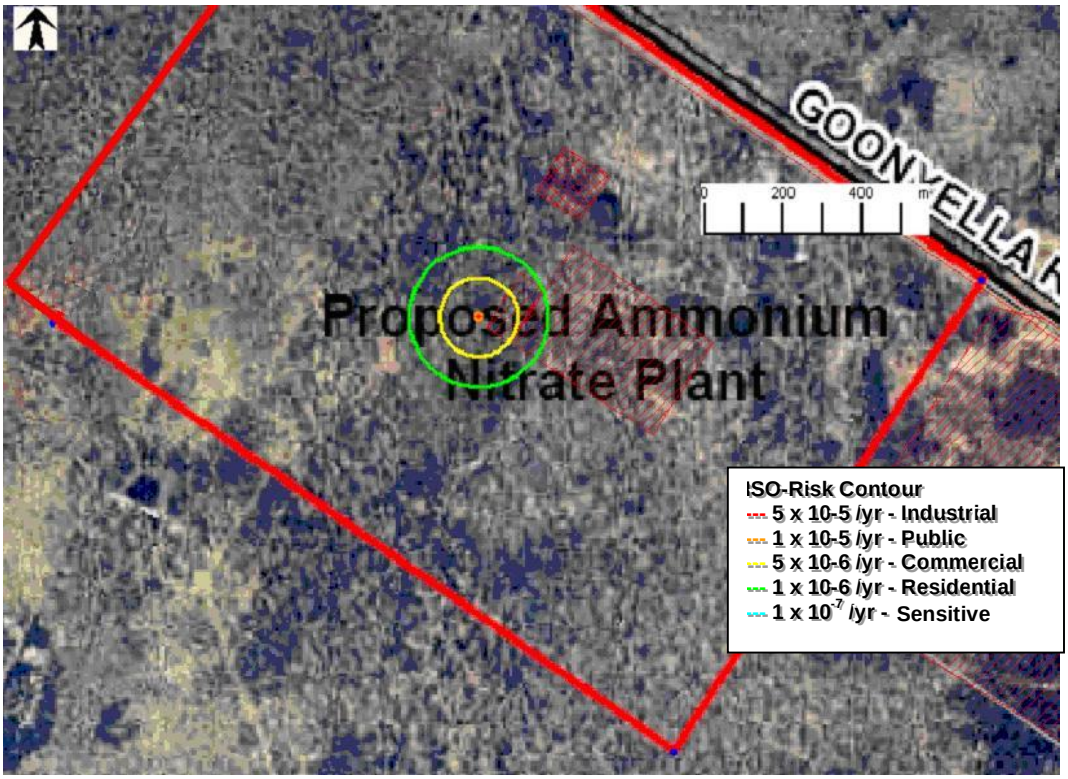
Nevertheless the implications of knock-on events between explosions of the AN solution and toxic releases were considered with regard to the overpressure levels required to cause integrity failure (loss of containment) of process equipment and were factored into the toxic event failure frequency (frequency of toxic release).

Figure 50 shows the blast overpressure contours in relation to both an explosion from the AN emulsion plant and an explosion of the AN prill storage. These risk contours take into account the Hazardous Industry Planning Advisory Paper (HIPAP) overpressure levels and the frequency of the event occurring.

The HIPAP overpressure levels are the kilopascals of pressure exerted by an explosion. These range from lower overpressure levels of 3.5 kPa that will cause a 90% chance of glass breakage up to 70 kpa which is the threshold of lung damage, with a 100% chance of fatality for a person in a building or in the open and complete demolition of houses. The blast overpressure contours provided in Figure 50 are in accordance with the HIPAP requirements. The contours are taken to be the risk of death per year and are primarily reported in the form of an iso-risk contour plot. Iso-risk contours relate to the sensitivity of the receiver (eg: industrial, residential and commercial). The explosion overpreasures are contained on the AN Plant site. The contour represents risk to sen



AN Prill (6,000 T) Explosion Overpreasures (Risk Contours)



AN Emulsion (140 tonnes) Explosion Overpressures (Risk Contours)

Figure 50 Explosion Overpreasures for AN Prill and AN Emulsion

Security

As AN is Security Sensitive Ammonium Nitrate (SSAN) there are stringent requirements in place. To ensure that it does not fall into the hands of terrorists or others that may misuse it, DN will use management plans it developed for the management of SSAN at its operation in Moura. This will include:

» Demonstration of a legitimate need for SSAN;

» Demonstration of transportation and storage of SSAN securely;

» Demonstration of security requirements for the site based and transportation activities of SSAN;

» Demonstrate that controls are adequate to prevent the risk of AN produced at the plant being used in a terrorist attack;

Dyno Nobel Asia Pacific Limited has experience in operating an AN Plant to these stringent requirements in Moura and will transfer this experience to the operation of the AN Plant.

Recommendations for incorporation into final AN Plant Design

The following recommendations will be adopted by DN for incorporation into the final AN Plant design:

1. The largest explosive/flammable consequence distance from the project is from an AN Prill explosion. Given an explosion event involving 6,000 T of Prill, the overpressure impacts conservatively reach a distance of 792 m at 21 kPa overpressure. As the Emulsion Plant is directly adjacent to the AN and Ammonia Facilities, the potential for knock-on effects needs to be further explored at the detailed analysis phase.

2. Dyno Nobel Asia Pacific Limited will introduce a minimisation program to reduce, by engineering design, the number of small-bore fittings, valves, and flanged joints on equipment operating with toxic chemicals, as these items constitute the greatest proportion of leaks likely to affect offsite areas. This reduces the volume stored and potential leaks. This matter should also be addressed in the development of the piping material specification. Screwed joints will not be used.

3. The Quantitative Risk Analysis will be updated once the facility design is finalised and the Safety Management System (SMS) modified via the Major Hazard Facility Safety Case. The update will incorporate onsite risks and any potential changes to the population in the area since the PRA was completed.

4. Undergo further investigation into the World's best practice will be adopted for the storage of Ammonia – considering the filling points, pumps and their location and the level of integrity required (material specification, double/single walled tanks), in order to ensure the risks associated with the Ammonia Storage are reduced to a level as low as reasonability practical.

5. The AN Prill Storage location, design and layout will be optimised for safety wherever practical. Factors that will be included in this optimisation are type of storage (drums, shed, domes) and separation between stockpiles.

6. All security measures will be put in place to prevent theft or loss of inventory.

4.14 Greenhouse Gas Emissions

The emissions assessment conducted for this EIS estimated the construction phase and ongoing operational emissions of the project, including transportation of workers, raw materials and products.

There are a number of gases that have been shown to have the potential to enhance the natural greenhouse effect of the earth's atmosphere (global warming potential or GWP). GWP varies greatly between GHGs, and is normally given in terms of carbon dioxide equivalent (CO_2-e). The GWP of common GHGs over a 100-year time horizon is given in Table 39.

Table 39 Global Warming Potentials for Various Greenhouse Gases

Greenhouse Gas	GWP (CO2-e)
Carbon dioxide	1
Methane	21
Nitrous Oxide	310
hydrofluorocarbons (HFCs)	150 - 11700
perfluorocarbons (PFCs)	6500 - 9200
sulphur hexafluoride (SF_6)	23900

Benchmarking data is not widely available in the public domain in relation to energy use and GHG emissions associated with good practice in production of AN or other similar products. The *Australian Greenhouse Office's Methodology for the Estimation of CHG Emissions and Sinks 2003: Industrial Processes* includes a methodology for calculation of emissions from production of ammonia and nitric acid, however emissions factors are stated in that document as being confidential. One source of benchmarking data available for use in this assessment was from the Intergovermental Panel on Climate Change (IPCC (2004)). This document gives the following energy requirements for production of ammonia, nitric acid and AN:

Table 40 Summary of Typical Emissions from NH_3, HNO_3 and Ammonium Nitrate production

Emission Source	Ammonia production	Nitric acid production	Ammonium nitrate
Energy	Up to 39 – 42 GJ (HHV)/T in partial oxidation plants, including imported power and/or auxiliary steam for driving the machinery.	Typically a net exporter of energy to the order of 1.6 GJ/T HNO_3.	25-60 kWh/T of solid product, with up to 70 kWh additional to retrofit existing facilities; 5 kWh/T of liquid product (solution)
Carbon dioxide	2-2.6 kg CO_2/kg NH_3 dependent upon the feedstock C/H ratio in partial oxidation of residual oils		
Other		N_2O: 580 – 6860 mg N_2O/m^3 tail gas	

This information indicates that emissions from the proposed operation are within the range associated with current good practice for production of AN. See the summaries below and Appendix 7.9 of this EIS for additional details.

4.14.1 Construction phase emissions

GHG emissions during the construction of the project have not been considered in detail in this assessment, preliminary estimates indicate a peak energy use of 0.52 MW. Average energy use and an average energy use of 0.2 MW based on maximum staff numbers and staffing profile for construction workforce. It has been assumed that construction will take place over 22 months, and will be undertaken over two shifts, with a total of 16 hours work per day, five days per week.

This approach gives total energy use of 1525 MWh, equating to GHG emissions of approximately 1,760 T CO_2-e during the construction phase using standard emissions factors for Queensland.

Transport of workers will predominantly be from the adjacent construction camp by bus, with a minor contribution from light vehicle transport from Moranbah. As was assumed in the traffic impact assessment, it has been assumed that personnel transportation will comprise 16 bus trips and 18 car trips per day for 475 days of construction. A distance of three km per trip has been used in this calculation. This approach gives GHG emissions of up to 26 T CO_2-e from the workforce transportation sources during the construction phase, which can be considered insignificant.

Transportation of construction materials and plant has been assumed, based on data contained within the traffic impact study, to average four two-way trips per day, although the distance of travel is not known. If half of the trips were local (distance 10

km each way) and the remainder were to transport materials from Gladstone (a distance of 520 km), which is likely to be a conservative estimate, this would give emissions for diesel vehicles of approximately 790 T CO_2-e during the construction phase.

Other construction phase emissions will be due to the operation of heavy plant such as excavators, cranes, generators, etc. While the type and number of items had not been defined at this stage of design, operation of diesel equipment is expected to result in approximately three tonnes CO_2-e per kL fuel used, based on emissions factors contained in the Australian Greenhouse Office Factors and Methods Workbook, December 2005.

Typical construction phase emissions sources and mitigation measures considered for the construction phase are summarised in Table 41.

Table 41 Typical Construction phase emissions and mitigation measures

Emissions source	Typical Emissions mitigation measures
Transportation Fuel Consumption	
Transportation of construction materials to the site and waste materials from the site	» Schedule deliveries of construction materials and/or disposal of waste materials to minimise length and number of trips required, by ensuring full loads and sourcing materials locally where practicable.
Transportation of workers to/from the site	» Carpooling and buses will be used to transport workers to the site; » Ensure that the construction camp is located as close as practicable to the construction site.
Use of vehicles onsite during construction	» Ensure that vehicles are maintained and operated according to manufacturers instructions to maximise efficiency; » Program works to minimise double handling and materials transfer; » Ensure that vehicles are turned off when not in use; » Where possible, select vehicles and equipment that are efficient (e.g. avoid using older, less energy efficient vehicles); » Where possible, dispose of wastes to local disposal facilities.
Electricity Use	
Use of electrical equipment during construction	» Ensure that equipment is appropriately sized for the task; » Turn electrical equipment off when not in use; » Where practicable, purchase electricity from a renewable or lower emissions source; » Ensure that equipment is well maintained.

Emissions source	Typical Emissions mitigation measures	
Other Emissions		
Wastewater treatment emissions	»	The sewage/wastewater treatment system should be designed and operated in such a way as to minimise methane emissions.
Land Clearance activities – reduction in carbon sequestration	»	Identify options for replacement of any trees cleared in the construction phase. These plantings can include plantations, boundary plantings, or other plantings, including plantings at a separate site.

Operations phase emissions

Electricity and fuel-based GHG emissions were calculated using the Australian Greenhouse Office Emission Calculator Tool 2006, which uses emission factors that are consistent with the *AGO Factors and Methods Workbook*, December 2005. It calculates the total emissions (made up of 'full fuel cycle' or 'direct and indirect emissions'). The emission factors used to calculate total emissions also apply to transport energy. The spreadsheet used to calculate emissions is given in Appendix A of the Greenhouse Assessment (Refer to Appendix 7.9 of the EIS).

Transportation of Raw Materials

The primary feedstock to the plant is the coal seam methane feed to the reformer, which is essentially methane (over 97% methane) and less than 1% CO_2. This resource of almost a pure methane feedstock as the ideal process feed for efficient Ammonia production. Use of this material minimises environmental impact (minimum treatment and minimum waste) prior to use and is also energy efficient. Many Ammonia Plants are LPG/CNG feedstock, which requires processing prior to use.

Coal seam gas is a local resource, which minimises the environmental impact from extraction and transport (energy/facilities) prior to use. The degassing and capture of gas in the coal prior to its mining prevents its release to the atmosphere thereby reducing fugitive methane emissions directly to atmosphere. The coal seam methane is supplied from a local source, minimising transport emissions.

Other raw materials to be used at the site will include sulphuric acid, sodium hydroxide, corrosion inhibitor, dispersion agent, biocide used for water treatment, and oxygen scavenger. The most likely source of these materials is Gladstone. Emissions associated with the transportation of raw materials is expected to be insignificant compared to those associated with transportation of products.

Transportation of Products

A comparison was made between expected transportation emissions from the project and those that would be expected for continued supply of AN from the Moura plant.

Based on vehicle movements given in the transport section of the EIS, an estimated 4308 B-triple loads of Prill will leave the site per year. Based on the Australian Methodology for the Estimation of GHG Emissions and Sinks 2003 – Energy (Transport), a diesel consumption rate of 0.4 L/km has been used in this calculation.

The calculation indicated that emissions due to the transportation of products to the various final destinations would total approximately 2100 tonnes CO_2 equivalent per year, a reduction of approximately 3,690 tonnes CO_2-e, or around 60% from the current situation, where AN is supplied from a Plant located at Moura.

Energy use

It is expected that electricity used at the proposed Plant will be sourced from a combined cycle gas fired power generation facility adjacent to the plant and supplemented if required from the grid. The power generation facility will be fired by local coal seam gas sources.

The maximum facility generating capacity will be 15 MW, based on 350,000 T per year of AN, equivalent to 360 kWh/T of AN produced. It is expected that average electricity use will be 11 MW based on 330,000 T per year of AN, equivalent to 264 kWh/T of AN produced.

It has been estimated that combined cycle gas fired power generation facilities can generate electricity at 550 kg CO_2-e per MWh, compared to approximately 900 kg CO_2-e per MWh for a best practice black coal power station. For the 92,400 MWh per year (maximum 126,000 MWh per year) used at the proposed AN Plant, this gives GHG emissions of approximately 51,000 T CO_2-e per year (maximum 63,300 T), a saving of over 56,000 T CO_2-e per year (maximum 76,000 T) over using power from the grid.

The average emissions due to electricity use at the site if connected to the grid would be 107,000 T CO_2-e per year (145,500 T CO_2-e per year at the maximum 15 MW capacity) based on standard electricity emission factors for Queensland.

Total annual emissions of GHGs from operation of the Plant is expected to be approximately 430,000 T CO_2-e per year (maximum of 469,000 T), including both energy-related emissions and direct emissions from the process. This is considered to be minor, approximately 0.08% of national emissions, and approximately 0.27% (maximum 0.3%) of Queensland's annual emissions.

The most recent publicly available data for National and State GHG emissions is from 2004. Australia's total GHG emissions in 2004 amounted to 564.7 million T CO_2 equivalent. Of this, Queensland emissions were 158.5 million T CO_2 equivalent.

4.13.3 Potential Impacts and Mitigation Measures

A number of opportunities have been implemented or are being considered to minimise GHG emissions from the proposed plant. These include:

» Use of fuel gas that is free from sulphur and therefore requires no sulphur removal treatment. This reduces environmental impact - there is no atmospheric sulphur (SO_2) discharge or disposal of sulphur cake required;

» The most significant air pollutants associated with the plant are oxides of nitrogen in the nitric acid and ammonia plant emissions, although these may be insignificant as GHG emissions, as the oxides of nitrogen are expected to contain an insignificant amount of nitrous oxide. Well established catalysts are used to minimise emissions of nitrogen oxides. The activity of the catalysts will be closely monitored to ensure

that emission levels are kept to a minimum. Catalysts will be regenerated as required and replaced during the operation of the plant with best available catalysts to improve NO_X reduction;

» Plants will be operated by DN in accordance with best available practice. Dyno Nobel Asia Pacific Limited is a major supplier and manufacturer of AN Prill and Emulsion and operates a number of plants in Australia to international standards.

In order to monitor and minimise GHG emissions from the plant, DN will:

» Maintain an inventory of GHG emissions for the project once operations starts, by monitoring use of electricity, liquid and gaseous fuels and other direct and indirect emissions;

» Publicly report greenhouse emissions and progress on GHG mitigation measures; and

» Obtain and maintain membership of the Commonwealth Government Greenhouse Challenge Program.

Opportunities to offset greenhouse emissions from the plant construction and operation process (e.g. through planting trees, etc) are currently being considered, to establish the magnitude of the work required to produce a significant impact. An option being considered is tree-planting and landscaping at the Moranbah site. For a full discussion on GHG emissions and an analysis of comparable technologies, refer to the Greenhouse Assessment contained at Appendix 7.9 of the EIS.

4.15 Cross Reference with Terms of Reference

GHD has taken into consideration the terms of reference (ToR) when designing and implementing the methodology for the SIA.

Section	Title		Relevant EIS section	Page
1.0 Introduction			**1**	**5**
1.1	**Project Proponent**		**1.1**	**5**
1.2	**Project Description**		**1.2**	**5**
1.3	**Project Objectives and Scope**		**1.3**	**11**
1.4	**The EIS Process**		**1.4**	**12**
	1.4.1	Methodology of the EIS	1.4.1	13
	1.4.2	Objective of the EIS	1.4.2	13
	1.4.3	Submissions	1.4.3	13
1.5	**Public Consultation Process**		**1.5**	**14**
1.6	**Project Approvals**		**1.6**	**19**

5. Environmental Management Plan

5.1 Introduction

This draft Environmental Management Plan (EMP) includes the draft construction EMP (CEMP) and draft Operations EMP (OEMP), that relate to the environmental requirements that are anticipated to be required for the construction and operational phase of the project. This will be a dynamic document, taking into account construction techniques and development approval conditions yet to be finalised and is representative of the project as proposed at date of publication of this EIS.

Dyno Nobel Asia Pacific Limited (DN) is committed to ensuring that its activities are undertaken in an environmentally sound manner by placing environmental performance as a key performance indicator of this project. The preparation of this EMP also forms an integral part of DN's commitment to minimising the environmental impact of its activities.

5.1.1 Purpose and Objectives

The purpose of the EMP is to provide an overall document that sets parametres for environmental management and provides a framework for the subsequent construction contractor's EMP and procedures that will need to bridge to, and be consistent with this CEMP.

The objectives of the EMP are to:

- Consider all aspects of the project that may have a significant environmental impact and adopt mitigation measures as required;
- Ensure that works are undertaken in accordance with the requirements of all relevant environmental legislation and guidelines;
- Ensure that works are undertaken in compliance with conditions of approvals;
- Define environmental roles, responsibilities and accountabilities of personnel;
- Provide adequate information and instruction to ensure personnel comply with this CEMP and OEMP and provide a framework for the definition of additional requirements that may be required during design finalisation; and
- Ensure that senior management and all personnel understand their environmental duty of care and have concern for the overall environmental effects of their performance by implementing, managing and continually reviewing this EMP.

5.1.2 Health, Safety and Environmental Policy

Dyno Nobel Asia Pacific Limited shares the community's desire to protect and preserve the environment. Dyno Nobel Asia Pacific Limited is committed to facilitating material recycling, waste minimization, energy conservation and pollution prevention. The DN Environmental Management System encompasses:

- Advanced cleaning technologies, efficient operation and adherence to best practice principles;
- Waste management where continual improvement in the handling and management of waste products including used oils, drums and chemical containers is sought ensuring that water discharge from all DN facilities complies with legal standards;
- Environmental training that ensures that DN personnel are educated regarding sound and responsible environmental practices, as well as regular environmental monitoring programs;
- Environmental Audits enable review of the effectiveness of environmental management strategies through the use of DN's Health Safety and Environmental (HSE) Audit System.

It is the policy of DN to provide a safe and healthy workplace, to protect the environment, to preserve corporate assets and to satisfy their customers' expectations. Safety and quality are line responsibilities and all employees are accountable, responsible and committed to the implementation of the policy. In observing the policy, DN will:

- Comply with all applicable laws and regulations and corporate guidelines relating to health, safety, environment, quality and security;
- Provide the necessary resources and effective systems, programs and management to accomplish specific objectives and continuous improvement;
- Evaluate the impact on safety, health, environment and quality when developing new products, processes and operating facilities;
- Facilitate material recycling, waste minimisation, energy conservation and pollution prevention;
- Prevent accidents and injuries through systematic analyses of risk, periodic audits and training;
- Maintain openness and trust and work constructively with government agencies, community organizations, employees, customers and other interested parties.

5.1.3 Legislative Requirements

Dyno Nobel Asia Pacific Limited will give due consideration to the likely environmental impacts of the project under various Commonwealth, State and Local government legislation, guidelines and policies. This section includes legislative requirements and guidelines that are likely to be applicable for the construction and operational phases of the project. Further review of this legislation, guidelines and policies is recommended prior to finalisation of this CEMP.

- *Environmental Protection Act 1994 (EP Act);*
  - Environmental Protection Regulation 1998;
  - Environmental Protection (Waste Management) Policy 2000;

  - Environmental Protection (Waste Management) Regulation 2000;
  - Environmental Protection (Water) Policy 1997;
  - Environmental Protection (Noise) Policy 1997; and
  - Environmental Protection (Air) Policy 1997.
- *National Environment Protection Measure (NEPM) (Implementation) Act 1998*;
- *Integrated Planning Act 1997*;
- *Transport Infrastructure Act 1994*;
- *Nature Conservation Act 1992*;
- *Vegetation Management Act 1999*;
- *Water Act 2000*;
- *Plant Protection Act 1989*;
  - Plant Protection Regulations 1990;
- *Queensland Heritage Act 1992*;
- *Aboriginal Cultural Heritage Act 2003*;
- Soil Erosion and Sediment Control - Engineering Guidelines for Queensland Construction Sites (IEAUST);
- Environmental Protection Agency Guidelines including, but not limited to:
  - Contaminated Lands: Draft Guide for the Assessment and Management of Contaminated Land in Queensland; and
  - Preparation Guidelines for Environmental Management Plans;
- Building (Flammable & Combustible Liquids) Regulations 1994;
- AS 2436-1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites;
- AS 2724.1 1984 – Ambient Air – Particulate Matter – Determination of Deposited Matter Expressed As Insoluble Solids, Ash, Combustible Matter, Soluble Solids and Total Solids;
- AS 1940-2000 The Storage and Handling of Flammable and Combustible Liquids;
- AS 1055-1997 Acoustics - Description and Measurement of Environmental Noise; and
- Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture Resource Management Council of Australia and New Zealand (ARMCANZ) (2000). Australian and New Zealand Water Quality Guidelines for Fresh and Marine Waters.
- Queensland Water Quality Guidelines (2006), Environmental Protection Agency.

5.2 Draft Construction Environmental Management Plan

5.2.1 Overview

The following draft CEMP contains environmental management strategies detail the minimum requirements to provide environmental management during construction activities.

Environmental management actions have been prepared for the environmental impacts addressed in Section 4 of the EIS.

The objectives of the CEMP in relation to eliminating or reducing impacts are included in Table 42 below. If possible, activities will be scheduled or planned to avoid causing impacts. If the activity cannot be avoided then management measures will be implemented to impede, prevent or minimise the environmental harm.

Table 42 Approach to reducing impacts of activities

Preferred	**Avoid**	activities that could cause adverse impacts
	Prevent	measures that impede the occurrence of negative impacts
	Preserve	preventing future actions that may negatively impact a resource or attribute
	Minimise	limiting or reducing the degree of an impact
	Rehabilitate	repairing or enhancing affected areas
	Restore	restoring an affected resource to its state prior to impact
Less Preferred	**Compensate**	create or enhance resource to compensate for what is lost

5.2.2 Organisation and Responsibilities

The organisation structure for the construction phase for environmental management is shown in Figure 51. This structure may be modified on the appointment of the construction contractor, however the roles and responsibilities of DN and the contractor will remain.

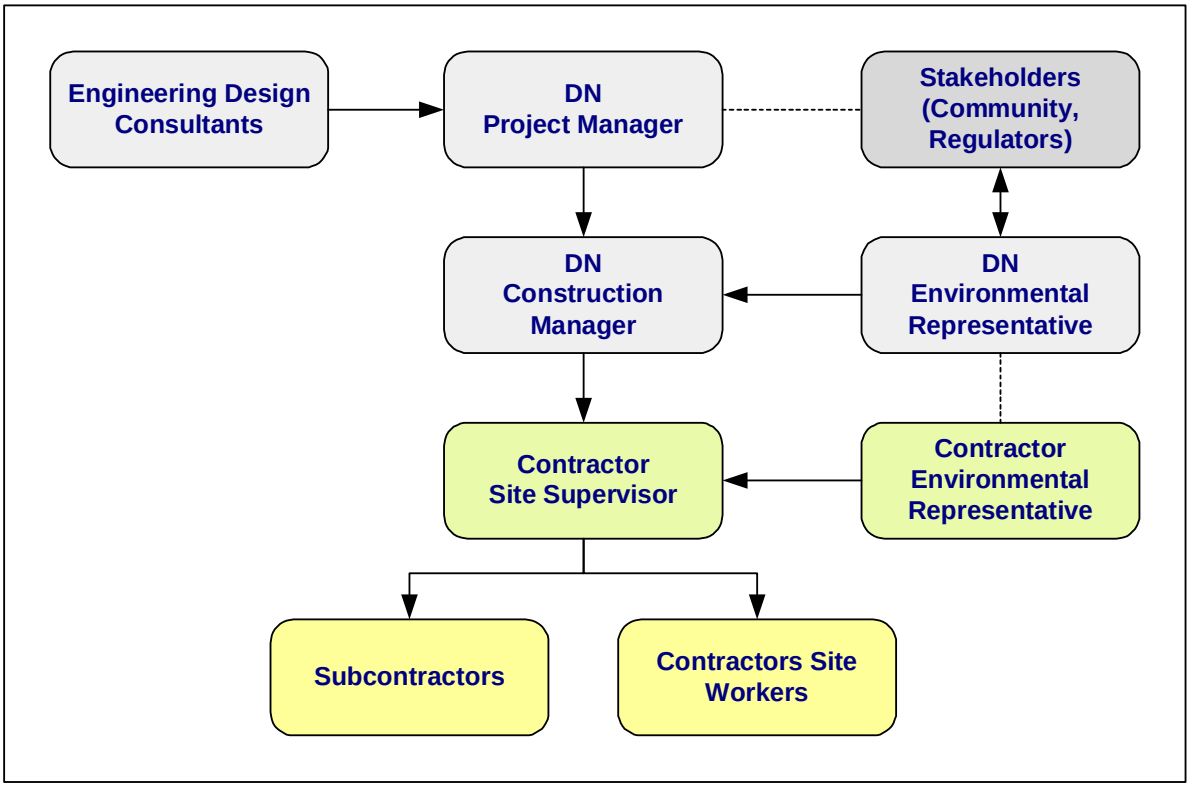


Figure 51 Construction Organisation Structure

All personnel are responsible for the environmental performance of their activities and for complying with the 'General Environmental Duty Section 320' of the EP Act. It is also the responsibility of the executive officer under section 493 of the EP Act to ensure the compliance of the corporation to which they belong complies with the EP Act. Table 43 below details the responsibilities of key positions involved in the project as related to Figure 51.

Table 43 Responsibilities for Environmental Management

Position / Role	Responsibility
Dyno Nobel Asia Pacific Limited Project Manager; Construction Contractor Project Manager; DN Environmental Representative and Construction Contractor Environmental Representative	» Ensure the planning, design and construction phases comply with legislation and DN's HSE Policies and procedures; » Ensure that all the relevant permits and licenses for construction are obtained by the relevant regulatory agencies; » Serve as contact point for external stakeholders, including the community and regulatory organisations, with assistance from the DN Environmental Representative; » Manage any environmental incidents and corrective actions as per CEMP.

Position / Role	Responsibility
Dyno Nobel Asia Pacific Limited Project Manager and Environmental Representative, Construction Contractor Project Manager and Environmental Representative	» Ensure construction is conducted in accordance with the legislation and project objectives, the CEMP and management commitments in the EIS; » Ensure site workers have a clear understanding of the CEMP requirements relevant to their area of work; » Notify Contractor Site Supervisor of environmental complaints, incidents and improvement opportunities.
Dyno Nobel Asia Pacific Limited Environmental Representative	» Implement DN mitigation strategies from the final CEMP; » Prepare environmental reports to the authorities as required; » Maintain suitable records of environmental management on site.
Construction Contractor Site Supervisor	» Ensure construction is conducted in accordance with the legislation, project objectives, the CEMP and management commitments in the EIS; » Obtain Registration Certificates and Development Approvals as required under the *Environmental Protection Act 1994* for any ERA for which the Contractor is wholly responsible e.g. concrete batch equipment; » Advise the DN Construction/Project Manager immediately of any complaints received in relation to the construction activities from stakeholders or local residents; » Note: The Contractor is not directly responsible for complaint resolution and should direct any complaints or inquiries from stakeholders (government or landholders) to the DN Construction/Project Manager.
Construction Contractor Environmental Representative	» Manage the implementation of Contractors' mitigation strategies from the final CEMP; » Undertake regular site inspections using checklist from final CEMP; » Conduct environmental training induction; » Assist Contractor Site Supervisor with environmental actions; » Register complaints and manage corrective actions to address complaints.

Position / Role	Responsibility
Engineering Design Consultants	» Implement mitigation strategies from the final CEMP; » Performing an assessment of the constructability of the design, taking into account incorporation of and compliance with the EMP.
Subcontractors and Contractor's Site Workers	» Comply with the requirements of the CEMP; » Notify the Contractor Site Supervisor of non-compliance and environmental incidents.

5.2.3 Environmental Training, Awareness and Competence

All personnel directly involved in environmental management will be appropriately qualified and experienced to undertake their relevant tasks. All employees will receive environmental induction training prior to commencement of work on this project. The induction training will include the following:

» Content and intent of the CEMP;

» Importance of conformance with the CEMP, and roles and responsibility in achieving conformance with the CEMP;

» Legal responsibilities;

» Individual responsibilities and penalties under the legislation;

» Environmental management techniques for important elements including cultural heritage, dust suppression, flora and fauna, noise, and traffic;

» Waste minimisation and recycling; and

» Incident Management.

The Construction Contractor is responsible for delivering induction and on-going training during the Construction phase. The DN Environmental Representative will assist where required.

The Construction Contractor will receive training in relation to:

» Its general environmental duty under the *Environmental Protection Act 1994 (Section 320)*;

» The specific environmental requirements of the CEMP;

» Its responsibilities under the EMP in relation to the construction of the plant, in relation to the CEMP, implementing performance criteria, monitoring, reporting and implementing corrective actions;

» Its responsibilities in an environmental incident;

» The consequences of not implementing performance criteria or departure from specified operating conditions;

» Internal and external communications practices; and

» Document control.

The Construction Contractor will maintain records of inductions completed, including details of topics covered, attendees and duration. Attendees would be expected to sign an appropriate induction form. Should any modifications of the CEMP be required during construction, these will be made aware to personnel on site as soon as practicable.

5.2.4 Communication

Internal project communications will be agreed between the DN project manager and construction contractor project manager prior to construction. At a minimum, this will include weekly communication of environmental matters, including incidents and complaints and any non-conformances. In addition, the regular meetings held to discuss operational aspects will include a review of environmental performance and issues. These will include project meetings with the contractor, for which environmental matters will be an agenda item, and these meetings will be minuted.

5.2.5 Complaints

Complaints can be made to the construction contractor environmental representative in relation to impacts from the project during construction. All complaints received will be recorded and where required investigated to determine if the compliant is a valid complaint (i.e. evidence supports the complaint e.g. visible dust offsite etc).

The construction contractor environmental representative will then take actions to address the cause of the complaint and where necessary notify management in relation to the cause of the complaint for rectification.

5.2.6 Emergency Preparedness

The key to effective management of incidents and emergencies is the effectiveness of the preventative actions taken before any situation reaches a reportable or critical level. Therefore, monitoring and surveillance activities are extremely important. During construction activities on the site, the following inspection or preventative actions will be performed by the Contractor:

» Weekly and daily inspection of works; and

» An induction process for all site personnel that includes relevant information on site emergency procedures.

Emergency contact details will in included in a project Emergency Response Plan (ERP). The ERP will be prepared to include response procedures for environmental incidents such as chemical, wastewater or fuel spills, fire or floods.

If an environmental incident occurs, all necessary action should be taken to minimise the size of any adverse impacts. If adequate resources are not available to contain a chemical release and if it threatens public health, property or the environment, the Queensland Fire Brigade should be contacted for emergency assistance - phone 000.

If the Queensland Fire Brigades are called, they may notify the EPA if they consider the environment or public health to be threatened. Notification by the QLD Fire Brigades does not negate the need for person carrying on the activity or the occupier of the premises to notify the appropriate regulatory authority (see below).

EPA staff can be contacted 24-hours/day via Pollution Hotline on 1300 130 372 to provide urgent advice on cleaning-up the incident or on the disposal of any resulting waste materials.

5.2.7 Duty to Notify

Section 320 of the EPA states that if persons while performing their work, notice that serious or material environmental harm is being caused or threatened by their actions or the actions of someone else, they should then report the matter.

Under the EPA, the following people have a duty to notify a pollution incident occurring in the course of an activity that causes or threatens material harm to the environment:

» The person carrying on the activity;

» An employee or agent carrying on the activity;

» An employer carrying on the activity; and

» The occupier of the premises where the incident occurs.

Notification must be given as soon practicable after the person becomes aware of the incident.

5.2.8 Environmental Monitoring and Auditing

Monitoring and auditing will be undertaken to determine the impact on the environment as a consequence of construction of the proposed project. General monitoring and inspections will be conducted weekly throughout the construction stage.

Monitoring and reporting provides a direct measure of the project's impacts, consequences of its operations and efficiency of the CEMP. More specific monitoring and reporting actions are included within the environmental management strategies (Section 5.1.10). This includes:

» Monitoring of implementation of CEMP;

» Regular inspection of construction activities against performance criteria;

» Environmental monitoring of impacts over time i.e. photo-monitoring and audits; and

» Reporting and analysis of discharges, emissions and waste disposal (where regulations required)

The audit and review process will be used to verify that the project is managing environmental risks to 'as low as reasonably practical' (ALARP) and is able to demonstrate evidence and therefore due diligence. The audit program will be developed and managed by DN. Table 44 includes a recommended audit schedule for the construction and post construction phase of the project.

Table 44 Construction Environmental Audit Schedule

Description Type	When	Reference Protocol
Internal Compliance	» 6 monthly during construction	CEMP, License Conditions
Internal Compliance	» 1 month after construction	CEMP, License Conditions, Corrective Actions
Internal Compliance	» 6 months after construction during operations	Reinstatement and rehabilitation success, weed inspection, Corrective Actions
Internal Compliance	» Regularly (6 monthly)	Regular inspection of the site by Construction Contractor Environmental Representative

5.2.9 Non-conformance and Corrective Actions

Control of Environmental Incidents

An important aspect in any environmental program is the management of non-conformances or “incidents” or potential non-compliances. An environmental incident is defined as an event that either resulted in, or could have resulted in environmental nuisance or environmental harm as defined in the EPA.

It is emphasised to all personnel working on the site that all incidents should be documented, investigations conducted and action plans established in order that the event does not occur again.

Incident Investigation and Reporting

An environmental incident investigation includes the following basic elements:

» Identifying the cause, extent and responsibility of the incident;

» Identifying and implementing the necessary corrective action;

» Identifying the personnel responsible for carrying out the corrective action;

» Implementing or modifying controls necessary to avoid repetition;

» Recording any changes in written procedures required; and

» Advising the EPA and BSC if required.

Corrective Action

Any request for corrective action arising from the following may result in the raising of a Corrective Action Request (CAR):

» Internal audits;

» External audits;

» Regulatory authority inspections;

» Inspection by project management;

» Dyno Nobel Asia Pacific Limited Environmental Representative reports/inspections; and

» All community complaints (including waste).

The CAR must include:

» Timing for correction;

» Document the proposed corrective action;

» Nominates responsibility for rectifying the non-conformance;

» Nominates responsibility for following-up the CAR.

All Environmental Incident Reports will be completed and followed-up by the DN Environmental Representative. All environmental incident reports will be stored and filed by the DN Environmental Representative.

5.2.10 Environmental Records

The records outlined in Table 45 will be maintained in a legible form at the site office:

Table 45 Environmental Records to Be Maintained

Record	Responsibility
Construction Environmental Management Plan (draft and current versions)	Construction Contractor Project Manager with assistance from Construction Contractor Environmental Representative
Environmental incident reports	Dyno Nobel Asia Pacific Limited and Construction Contractor Project Managers
Environmental/community complaints	Dyno Nobel Asia Pacific Limited and Construction Contractor Project Managers
Regulatory authority inspection and audit reports	Dyno Nobel Asia Pacific Limited Construction Manager
Dyno Nobel Asia Pacific Limited inspection and audit reports	Dyno Nobel Asia Pacific Limited Construction Manager
Environmental Induction Records	Construction Contractor Project Manager
Records of hazardous materials	Construction Contractor Project Manager
Waste tracking	Construction Contractor Site Supervisor
Environmental checklists and reports	Construction Contractor Site Supervisor

5.2.11 Environmental Mitigation Strategies

The following section includes environmental mitigation strategies of the CEMP for managing environmental aspects and impacts as identified in the EIS. These mitigation strategies are related to the following elements:

- Erosion and Sediment Control;
- Flora and Fauna;
- Noise;
- Air;
- Waste;
- Transport / Trafffic.
- Cultural Heritage;
- Weeds;
- Bushfire;
- Chemicals and Fuels;
- Dangerous Goods;
- Cleanup and Rehabilitation.

This CEMP applies to the construction phase of the project. These elements are addressed as specific strategies include in the following section. Each strategy for he environmental elements are to be managed comprising the following structure:

- Performance objective;
- Performance indicators;
- Issues and impacts;
- Mitigation strategy and responsibility;
- Monitoring;
- Reporting;
- Corrective action; and
- References.

At the time of writing, engineering design was continuing for the project. Therefore specific details of the construction of the plant and associated facilities are yet to be finalised. Therefore this CEMP provides an outline of general management strategies known at this stage. The CEMP will be updated and finalised during detailed design following the appointment of a construction contractor and prior to construction commencing.

5.3 Environmental Management Strategies Plan

Erosion and Sediment Control Management Plan	
Performance Objectives	» To minimise the impacts on surface water and drainage during construction activities; To implement and maintain suitable erosion and sediment control measures; To minimise the extent of disturbed land at any one time; » To minimise the impacts on surface water and drainage.
Performance Indicators	» Sedimentation has been limited off site to as low as reasonably practical (; » Erosion control measures are reviewed and maintained regularly.
Issues and Impacts	» Degradation of water quality and loss of soil; » Erosion and sedimentation; » Modification of existing drainage patterns.

Construction	
» **Mitigation Measures**	» **Responsibility**
» Undertake a pre-construction meeting to identify what sediment and erosion controls are to be put in place.	» Dyno Nobel Asia Pacific Limited
» Instruct all construction site workers in the implementation and management of erosion control measures and drivers and plant operators involved in earthworks activities to minimise damage to the local environment.	» Construction Contractor
» Roads used during construction will be hardened and/or watered to reduce the potential for soil wind erosion.	» Construction Contractor
» Restrict the area of vegetation and soil disturbance during the construction works to area identified in clearing plan (No. 600001-272-3Y71-0004)	» Construction Contractor
» Prevent uncontaminated runoff from entering excavations by diverting runoff around the works.	» Construction Contractor
» Stormwater runoff will be managed to minimise the potential for erosion including diverting flow over stable areas and away from disturbed areas and installation of appropriate structures.	» Construction Contractor

Erosion and Sediment Control Management Plan	
» Uncontaminated sediment removed from all sediment control deviceswill be incorporated in landscaping, fill batters, or mounds on site, or as otherwise approved by the Site Construction Supervisor. Contaminated sediment will be disposed of to an approved stockpile area or disposal area.	» Construction Contractor
» Culvert structures are to be designed to accommodate a 1 in 50 year flow event.	» Construction Contractor
» Construction within waterways to be scheduled, as far as possible, during dry season; » Where heavy rains or floods are predicted, work will cease and the site will be made as stable as practical.	» Construction Contractor
» Any waste, concrete washings or similar construction materials will be disposed of in bunded areas for containment and treatment.	» Construction Contractor
» The condition of erosion/stormwater control structures will be periodically checked during construction, especially after rainfall to ensure they remain effective e.g. berms, silt fences, turn-off drains.	» Construction Contractor
» Soil and construction stockpiles will be placed away from drainage lines or stormwater drains.	» Construction Contractor
» Sediment or silt barriers such as sand bags and straw bales (weed free) will be used where required.	» Construction Contractor
» Erosion control structures will be installed in the following areas: – Down slope of disturbed soil; – Any areas where wind can disperse soil; – Around soil stockpiles; and – At discharge point from construction sites and roads.	» Construction Contractor
» Permanent (restored) batters shall have topsoil spread evenly and shall then undergo hydraulic seeding/mulching (hydro mulching). Refer to Cleanup and Rehabilitation EMP for hydro seeding requirements.	» Construction Contractor
» Soil and construction stockpiles will be placed away from drainage lines or stormwater paths.	» Construction Contractor

Erosion and Sediment Control Management Plan	
Monitoring	» Construction Contractor shall inspect all stormwater drains and erosion control measures for discharges of suspended solids to waters daily in response to significant rainfall events (>50 mm in 24 hours); » During construction, and if Grosvenor Creek is flowing or containing pools, water quality assessments both up- and down-stream of the site should be conducted every three months until complete. All assessments should consider the full suite of water quality parametres considered appropriate under the Australia and New Zealand Environment and Conservation Council (ANZECC)/Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) Guidelines for fresh water quality (ANZECC/ARMCANZ, 2000), and should be conducted in the manner prescribed in the Guidelines; » Monitoring of revegetation progress and soil stabilisation; » Receiving waters water quality as per regulations and conditions; » Daily or weekly reports (as appropriate) will be completed by the Construction Contractor Environmental Representative on site and reviewed by the site Construction Contractor Site Supervisor.
Reporting	» Erosion and sediment control will be included in monthly reports prepared by the Construction Contractor Environmental Representative. The reports will be copied to the Construction Contractor Site Supervisor and are to recommend appropriate controls to minimise erosion on site.

Erosion and Sediment Control Management Plan	
Corrective Action	» The DN Construction Manager and the Environmental Representative are to be notified in the event of non-compliance; » Corrective actions in the event of non-compliance include inspection of maintenance and erosion control measures and identification of sediment control deficiencies. Sediment fences and additional control (or rock check dams on drainage lines) may be installed to prevent transport of sediment to any waterway; » Undertake revegetation works in areas of likely erosion; » Some areas may have to be temporarily closed to repair erosion damage and to prevent further sediment transport off site.

5.4 Flora and Fauna Management Plan

Flora and Fauna Management Plan	
Performance Objectives	To minimise known and potential fauna and flora impacts; To minimise the clearing of habitat; To minimise the impact on water quality and riparian ecosystems.
Performance Indicators	» Clearing beyond the required limits; » Presence of noxious weeds within site area; » Loss of hollows and/or fauna habitats.
Issues and Impacts	» Disturbance of ground cover vegetation; » Destruction and relocation of habitat and fauna; » Movement of vehicles; » Death or injury of native fauna; » Rehabilitation and revegetation.

Construction

» **Control Measures**	» **Responsibility**
» Clearly flagging the boundaries of the construction zone with brightly coloured fencing and construction workers clearly instructed on their obligations to protect retained woodland.	» Construction Contractor
» Habitat within the area proposed to be cleared (such as canopy trees, shrubs, grasses, hollow logs, rocks etc) should be thoroughly inspected by a qualified ecologist for fauna species prior to construction activities commencing. Any animals found should be salvaged and translocated to an appropriate area of habitat in accordance with a salvage and translocation protocol, which should be developed in conjunction with this proposed project and prior to construction commencing.	» Construction Contractor
» Peripheral lighting should be kept to that necessary for a minimal level of security and safety, and should not be directed into remnant vegetation.	» Construction Contractor
» A qualified ecologist should be present on-site during the site preparation process (clearing process) in order to salvage and translocate fauna disturbed during tree, shrub and ground debris removal.	» Construction Contractor
» Where possible ongoing cleared vegetation is to be mulched and used in rehabilitation activities.	» Construction Contractor

Flora and Fauna Management Plan		
	» Cleared vegetation or soil is not to be pushed up against trees, stored against fence lines or within 50 m of gullies and drainage lines.	» Construction Contractor
	» Vegetation clearing will be from west to east where possible to allow fauna to relocate into adjacent vegetation.	» Construction Contractor
	» Erosion control measures should be implemented during the construction phase in order to prevent additional degradation from occurring on site.	» Construction Contractor
Monitoring	» Construction Contractor Environmental Representative to ensure vegetation to be cleared is clearly delineated; » Construction Contractor Environmental Representative to ensure all vegetation clearing is undertaken in accordance with EMP and any other work plans; » Daily herbicide application sheet and weed removal works records from weed removal contractor to be recorded and submitted to Construction Contractor Environmental Representative daily; » Photo-monitoring of selected sites will be instigated prior to construction and continue through the construction period. These sites will be photographed on a regular basis and collated into a Site Photo Register.	
Reporting	» Weekly Progress rejuvenation monitoring records to be maintained on file by Construction Contractor Environmental Representative. » Monthly rejuvenation operational works sheet are to be recorded and submitted to Construction Contractor Environmental Representative.	
Corrective Action	» Natural ground surface to be restored if disturbed; » Immediate reinstatement of area if works are beyond limits of construction; » Replacement of hollows destroyed and relocation of them to other areas onsite not disturbed by clearing activities.	

5.5 Noise Management Plan

Noise Management Plan	
Performance Objectives	To undertake all reasonable and practicable measures to prevent or minimise noise nuisance to local residents and landholders. To comply with all statutory and approval requirements.
Performance Indicators	» Comply with EPA noise guidelines » Complaints of noise disturbance from residents of and other sensitive receptors
Issues and Impacts	» Noise nuisance from construction vehicles and equipment

Construction

» Control Measures	» Responsibility
» Notify neighbouring properties as well as noteworthy properties along the proposed vehicle access route of the upcoming works at least 48 hours before construction.	» Dyno Nobel Asia Pacific Limited
» Site works will be carried out between the hours of 6.30 am to 6:30 pm Monday to Saturday inclusive. No works will be carried out beyond these hours unless prior approval has been obtained from the relevant local council in accordance with the provisions of the Environmental Protection Regulation 1988.	» Construction Contractor
» All plant and machinery used during construction must be fitted with exhaust silencers and, where necessary, sound attenuators maintained in good operating condition. The Construction Contractor's attention is drawn to the recorded sound pressure levels for typical construction plants, measured at 10 m (see Table 46).	» Construction Contractor
» Any blasting will be designed to achieve the air blast overpressure and ground vibration requirements of the Environmental Protection Regulation 1998 and Australian Standard AS 2187.2.	» Construction Contractor
» Where practical, impact wrenches will be used sparingly with hand tools or quiet hydraulic torque units preferred.	» Construction Contractor
» Where practical, machines will be operated at low speed or power and will be switched off when not being used rather than left idling for prolonged periods.	» Construction Contractor

Noise Management Plan		
» All combustion engine plant, such as generators, compressors and welders should be checked to ensure they produce minimal noise with particular attention to residential grade exhaust silencers.		» Construction Contractor
» Vehicles will be kept properly serviced and fitted with appropriate mufflers. The use of exhaust brakes will be eliminated, where practicable.		» Construction Contractor
» Where practical, all vehicular movements to and from the construction site must be made only during normal working hours.		» Construction Contractor
» Machines found to produce excessive noise compared to industry best practice will be removed from the site or stood down until repairs or modifications can be made		» Construction Contractor
Monitoring	» Noise monitoring may be undertaken during construction to determine threshold limits are not being exceeded. » All valid noise complaints will be investigated and assessed to determine if the noise is unreasonable. Such investigations may require noise monitoring at the complainant's residence to identify the offensive noise source. » A complaint register is to be kept detailing all complaints made.	
Reporting	» If a valid noise complaint is received, a report outlining the complaint, corrective action, and any monitoring undertaken is to be prepared. Details of valid noise complaints and how they are addressed are to be included in monthly environmental reports.	
Corrective Action	» In the event that unreasonable noise is caused by machinery, appropriate repairs will be undertaken and the maintenance schedule reviewed. » In the event that monitoring confirms non-compliance of the performance criteria, the Construction Contractor Site Supervisor or delegated personnel shall undertake any necessary measures to achieve compliance. Corrective actions may include: – repairs to exhaust silencers; – relocation of the relevant activity; and	

– alteration to the hours of operation of the specific machinery.
– Where prolonged noise will impact a nearby sensitive receptor the Contractor shall instigate mitigation measures to ensure noise levels are reduced to acceptable levels.

» **Note**: Due to the remote area of the construction project, which is well away from residents, it is expected that construction work may be undertaken outside of normal hours of work for which approval will be sought by DN. In such circumstances, should a noise complaint be received, the work will be stopped immediately.

Table 46 Typical Sound Power Levels from Construction Equipment at 10m from Equipment

Equipment Type	Noise Level Range at 10m dB(A)
Scrapers	86-91
Excavators	84-88
Dump trucks	72-84
Bulldozers	85-88
Rollers	80-89
Graders	84-88
Crane, truck mounted	88-90
Rotary bored piles	82-94
Trucks	73-78
Saw cutting equipment	75-88

5.6 Air Quality Management Plan

Air Quality Management Plan	
Performance Objectives	To undertake all reasonable and practicable measures to prevent or minimise air and dust nuisance to local residents and landholders. To comply with all statutory and approval requirements.
Performance Indicators	» Receive no complaints from residences or community in relation to air emissions.
Issues and Impacts	Management of air emissions from: » Dust from traffic movement on access roads, bulk earthworks, construction of structure footings, vegetation clearing or helicopter stringing of lines; » Exhaust fumes from vehicles, plant and equipment; » Complaints from residents and other sensitive receptors.

Construction	
» **Control Measures**	» **Responsibility**
» Watering of construction sites and access roads will be undertaken regularly, particularly where there is high usage of access roads located in close proximity to residents (i.e. 150 m).	» Construction Contractor
» A speed limit of 40 km/hr shall apply to access roads and tracks to minimise the potential for dust generation.	» Construction Contractor
» Clearing during wind conditions exceeding 15 knots will be avoided in areas closest to residences where the wind is predominantly blowing towards the residence.	» Construction Contractor
» Any long term spoil stockpiles required (i.e. greater than 2 weeks) will be covered or stabilised with native grass species or sterile annual (eg millet).	» Construction Contractor
» Any vehicles carrying loads with the potential to create dust shall cover their loads.	» Construction Contractor
» Cleared vegetation should be retained onsite where possible to reduce exposed soil.	» Construction Contractor
» Vehicles, plant and equipment should be regularly serviced and comply with Australian Design Standard.	» Construction Contractor
» No vegetation or waste is to be burned onsite.	» Construction Contractor

Air Quality Management Plan		
The following mitigation measures will be used where possible to reduce the Greenhouse Gas Emissions from the project, including: » Schedule deliveries of construction materials and/or disposal of waste materials to minimise length and number of trips required, by ensuring full loads and sourcing materials locally where practicable; » Ensure that vehicles are maintained and operated according to manufacturers instructions to maximise efficiency; » Program works to minimise double handling and materials transfer; » Ensure that vehicles are turned off when not in use; » Where possible, select vehicles and equipment that are efficient (eg avoid using older, less energy efficient vehicles); » Where possible, dispose of wastes to local disposal facilities; » Ensure that equipment is appropriately sized for the task; » Turn electrical equipment off when not in use; » Where practicable, purchase electricity from a renewable or lower emissions source; » Ensure that equipment is well maintained; » The sewage/wastewater treatment system should be designed and operated in such a way as to minimise methane emissions; and » Identify options for replacement of any trees cleared in the construction phase. These plantings can include plantations, boundary plantings, or other plantings, including plantings at a separate site.	» Construction Contractor	
Monitoring	» Visual monitoring of dust and emissions on site will be undertaken at all times; » If a valid air quality complaint is received, air quality monitoring may be undertaken by a qualified professional; » Maintain an inventory of GHG emissions for the project once construction starts, by monitoring the use of electricity, liquid and gaseous fuels and other direct and indirect emissions.	

Air Quality Management Plan	
Reporting	» If a valid complaint is received, a report outlining the complaint, corrective action and any monitoring undertaken will be prepared. Details of valid air quality complaints and how they are addressed are to be included in monthly environmental reports.
Corrective Action	» The Construction Contractor Environmental Representative through consultation with the DN Construction Manager shall determine corrective action. The Contractor will be responsible for delegating control measure works. Corrective actions will include a review of existing control measures for inadequacies; » Implement water spraying if dust levels exceed nuisance levels; » Speed limits may be reduced in areas where dust is a problem; » Halt works until climatic conditions are more favourable.

5.7 Waste Management Plan

Waste Management Plan	
Performance Objectives	To take all reasonable and practicable measures to reduce and recycle waste during the construction phase, and to dispose of it in an appropriate manner.
Performance Indicators	» Contamination incident has not occurred as a result of waste disposal.
Issues and Impacts	» Potential contamination of soil and water; » Wastage of resources by not minimising waste.

Construction	
» **Control Measures**	» **Responsibility**
» No personal litter will be left at any work site or access track.	» Construction Contractor
» Suitable bins and skips will be provided for waste streams.	» Construction Contractor
» All construction waste left on site will be secured, stacked and if possible collected on a daily basis.	» Construction Contractor
» Construction waste will be collected from construction sites along the easement on a regular basis and deposited in collection bins located in the contractor's camps and laydown areas. Collection bins should each be clearly defined as 'Conventional Waste', 'Recyclables' and 'Regulated Waste'. Recyclables may include metals, wires, glass etc.	» Construction Contractor
» Waste will be treated, stored and disposed of to a licensed waste disposal location (see Table 47).	» Construction Contractor
» Regulated wastes (eg hydrocarbons) will be stored in appropriately sealed containers suitably marked identifying their contents. Regulated wastes will be transferred to a waste contractor licensed to receive such waste. Collection bins will be removed from construction sites, as required, and consigned to a local contractor licensed to receive such waste.	» Construction Contractor
» Regulated waste may only be transported in quantities under 250 kg or by a licensed transporter.	» Construction Contractor
» Vegetation waste should be used onsite where possible, including bunds, mulch and in erosion and sediment control.	» Construction Contractor

Waste Management Plan		
» Treated effluent discharge to be positioned away from drainage lines and sewage system regularly maintained by a licensed operator.		» Construction Contractor
» Provide portable toilets on the site for use of workers and arrange for de-sludging/cleaning by contractor.		» Construction Contractor
Monitoring	» Construction Contractor Environmental Representative shall undertake visual observations of construction sites and access roads; » Waste audits may be undertaken by DN staff to ensure waste is being managed appropriately; » The Construction Contractor Project Manager will maintain Material Safety Data Sheets for all potentially hazardous substances used on site; » Materials, wastes and spills records will be reported to the Construction Contractor Project Manager; » Monthly inspections will be undertaken of waste facilities and compounds.	
Reporting	» All waste dockets will be kept and recorded in the monthly environmental report; » At completion of the project, a waste report should be prepared summarising all known waste quantities and types of the project; » Material re-use on site will be monitored and recorded (eg topsoil, and spoil reuse); » Spills will be documented by the Construction Contractor; » Daily or weekly reports (as appropriate) will be completed on site and reviewed by the Construction Contractor Site Supervisor.	
Corrective Action	» The Construction Contractor Site Supervisor will delegate clean up works; » If environmental nuisance or harm is caused by waste onsite, waste management procedures are to be reviewed and changed where practicable; » Investigations/corrective actions undertaken as a result of a complaint will be documented and complied within the complaints register. Corrective actions will be closed out by senior management according to an agreed responsibility and timescale.	

Table 47 Waste Disposal Locations

Type	Nature	Treatment	Destination	Records
Solid	General refuse	Placed in wheelie or industrial bin, collected by licensed waste contractor	Moranbah landfill	Removal contractor
	Putrescible	Placed in wheelie or industrial bin, collected by licensed waste contractor.	Moranbah landfill	Removal contractor records
	Paper	Separated and placed in designated area, collected by licensed waste contractor	Recycled	Collection dockets kept onsite
	Metal	Separated and placed in designated area, collected by licensed waste contractor	Recycled	Removal contractor records
	Plastics	Separated and placed in designated area, collected by licensed waste contractor	Recycled if possible, otherwise disposed of as landfill	Removal contractor records
	Glass	Separated to be recycled, collected by licensed waste contractor	Recycled	Removal contractor records
	Green	Mulched, reused onsite for landscaping and erosion and sediment control	Site	Stockpile locations
	Contaminated	Develop a plan for testing, assessment and if required remediation of the site	N/A	Reports as per regulatory requirements

Type	Nature	Treatment	Destination	Records
Regulated waste	Batteries, chemical containers, oily rags	Placed in a designated covered and bunded area, collected by a licensed waste contractor	Disposed of as required by BSC	Waste tracking requirements
	Tyres	Placed into designated industrial bins	Regulated Waste	Waste tracking requirements
	Fuels oils and grease	Placed into designated tanks or industrial bins	Regulated waste	Waste tracking requirements
Liquid	Oil, oily waters	Placed in designated covered area which is to be bunded, collected by licensed waste contractor	Recycled if possible, otherwise disposed of as required by BSC	Waste tracking requirements
	Paints, oily mixtures, noxious liquids	Placed in designated covered area which is to be bunded, collected by licensed waste contractor	Recycled if possible, otherwise disposed of as required by BSC	Waste tracking requirements

5.8 Transport/Traffic Management Plan

Transport / Traffic Management Plan	
Performance Objectives	To ensure that transportation occurs without compromise to safety and environmental management.
Performance Indicators	» No significant disruption occurs for the community to normal traffic flow as a result of the construction phase.
Issues and Impacts	» Traffic volumes associated with construction activities: » Heavy vehicles; » Over-dimensioned vehicles; » Degradation to private, Council and DMR managed roads.

Construction	
» **Control Measures**	» **Responsibility**
» Prepare a Traffic Management Plan for the construction of the project to identify traffic issues.	» Construction Contractor
» Notify Queensland Transport, Police and the community of date, type and duration of heavy/over-dimensioned vehicle transport that may impede traffic on the Peaks Down highway.	» Construction Contractor
» Site safety collection points are to be agreed with local Emergency Service groups for the aerial removal of injured personnel in case of vehicle traffic incident.	» Construction Contractor
» Acquisition of all required permits from DMR, Queensland Railways, local Council's and other statutory authorities as required.	» Construction Contractor
» Transport of hazardous or dangerous goods will be in accordance with 'The Sixth Code of Carriage of Dangerous Goods' (Federal) and Transport Operations (Road Use Management) Regulation 1995 Incorporating Dangerous Goods' (State). Advice from Queensland Transport will be obtained prior to transport.	» Construction Contractor
» The appropriate signage will be provided on road vehicles in accordance with the DMR Traffic and Road Use Manual (TRUM) will be used to inform road users of the change in road conditions.	» Construction Contractor

Transport / Traffic Management Plan	
Monitoring	» Construction Contractor Environmental Representative to keep a record of all complaints regarding traffic; » Construction contractor and Construction Contractor Environmental Representative to visually monitor vehicle movement's onsite; » Regular audits in accordance with this EMP, with implementation of the recommendations and corrective actions.
Reporting	» If a valid complaint is received, a report outlining the complaint, corrective action and any monitoring undertaken is to be prepared. Details of valid traffic complaints and how they are addressed are to be included in monthly environmental reports; » Daily or Weekly reports (as appropriate) will be completed on site and reviewed by the DN Construction Manager.
Corrective Action	» Consultation with Department of Transport, Police and the community; » Corrective actions will include a review of existing procedures; » Incident or non-compliance corrective action will be closed out by senior management according to an agreed responsibility and timescale.

5.9 Aboriginal Cultural Heritage Management Plan

Aboriginal Cultural Heritage Management Plan	
Performance Objectives	All works to comply with the *Aboriginal Cultural Heritage Act 2003*, including the Duty of Care Guidelines and the CHMP.
Performance Indicators	» Areas identified or unknown as culturally significant are not harmed as part of project.
Issues and Impacts	» Potential disturbance to Aboriginal cultural heritage.

Construction	
» **Control Measures**	» **Responsibility**
» All works are to be undertaken in accordance with the approved Cultural Heritage Management Plan (CHMP), avoiding all areas identified during the archaeological survey as cultural heritage sites.	» Construction Contractor
» All reasonable and practicable measures are to be taken to ensure that Aboriginal cultural heritage is not harmed	» Construction Contractor

Monitoring	» Monitoring requirements will be known on completion of the Aboriginal cultural heritage survey and CHMP.
Reporting	» If any Aboriginal cultural heritage is found then reporting requirements as found in the CHMP must be undertaken.
Corrective Action	» Corrective action requirements are outlined in the CHMP. In the case of an incident, work must cease immediately, Project Manager notified and then the appropriate authorities.

5.10 Weed Management Plan

Weed Management Plan	
Performance Objectives	To minimise the introduction and/or spread of weeds; To promptly identify areas requiring weed control; To eliminate infestation of noxious weed species; To effectively control weed species.
Performance Indicators	» There has not been an outbreak of a declared or noxious weed.
Issues and Impacts	» Introduction and/or spread of weeds; » Adverse impact upon agricultural activities.

Construction	
» **Control Measures**	» **Responsibility**
» Temporary weed washdown bays are to be established at the construction camp and construction site office.	» Construction Contractor
» Prior to arrival at the project area, all vehicles, equipment and portable infrastructure (including trailers, generators, workshop and accommodation huts etc) will be washed down (spray-cleaned).	» Construction Contractor
» Cleaning procedures need to remove soil and organic matter from the surface of vehicles, equipment and portable infrastructure, including undercarriage and running gear.	» Construction Contractor
» Maintenance contractors to ensure they remain on the designated maintenance track and do not disturb surrounding vegetation, including areas replanted.	» Construction Contractor
» Vehicles and machinery certified weed free will be noted in the project Weed Register to be updated regularly and located at the Site Office.	» Construction Contractor
» The definition of a “weed” for the purposes of management is based on that of ‘environmental weed,’ namely a species that by virtue of fecundity and growth habit has the potential to establish large infestations that dominate and eventually exclude the native vegetation.	» Construction Contractor
» Control programs to be carried out by personnel qualified in the recognition of target weeds and potential weed species.	» Construction Contractor

Weed Management Plan		
	» Where possible maintain weed control over the easement to reduce competition to new revegetation for approximately 2 years (as per requirements in the OEMP).	» Construction Contractor
Monitoring	» During construction, work areas will be regularly inspected to assess the implementation of the CEMP; » Daily or weekly reports (as appropriate) will be completed on site and reviewed by the Construction Contractor Site Supervisor; » Weed Management Audit to be conducted monthly by the Construction Contractor Environmental Representative reviewing initial weed control and potential infestations; » Photo-monitoring of selected sites will be instigated prior to construction and continue through the construction period. These sites will be photographed on a regular basis and collated into a Site Photo Register.	
Reporting	» Presence of noxious weeds will be reported to the appropriate local authorities by the DN Construction Manager; » Daily herbicide application sheet and weed removal works records from weed removal contractor to be recorded and submitted to Construction Contractor Environmental Representative daily.	
Corrective Action	» Investigations/corrective actions undertaken as a result of the complaint will be documented and compiled within the Complaints Register. Corrective actions will be closed out by senior management according to an agreed responsibility and timescale; » If a substantial outbreak of a declared noxious weed is found on the site corrective measures will be taken in accordance with the CEMP.	

5.11 Bushfire Prevention and Management Plan

Bushfire Prevention and Management Plan	
Performance Objectives	To minimise the risk of bushfire; To protect the public and personnel; To protect property and minimise damage or loss; To protect flora, fauna and habitats and minimise damage or loss; To protect the spread of bushfire in the event of ignition; To provide adequate response in the event of ignition.
Performance Indicators	» Bushfire has not been started as a result of construction works; » External bushfire threatening the plant has been controlled.
Issues and Impacts	» Adverse impact upon agricultural activities; » Loss of/and damage to habitat and directly fauna; » Introduction and/or spread of weeds.

Construction	
» **Control Measures**	» **Responsibility**
» Plant operations shall adhere to regulatory and local fire authorities and comply with fire restrictions, notification requirements and permitting procedures.	» Construction Contractor
» All vehicles will be equipped with appropriate vehicle fire extinguishers.	» Construction Contractor
» Regular vehicle checks to ensure there is no build up of debris or vegetation matter in areas of the vehicle, which could cause an ignition.	» Construction Contractor
» Where combustible or flammable chemicals are required to be stored on site, appropriate fire fighting equipment will be available. Incompatible chemicals should not be stored together, and where possible flammable liquids should be stored in a flammable liquids cabinet.	» Construction Contractor
Monitoring	» Any fire outbreaks at or surrounding the site are to be reported to the DN Construction Manager.

Bushfire Prevention and Management Plan	
Reporting	» The site will be regularly inspected to assess the implementation of this CEMP; » Daily or weekly reports (as appropriate) will be completed on site and reviewed by the Construction Contractor Site Supervisor; » Construction contractor will conduct regular site inspections to ensure flammable materials are stored safely and to identify and mitigate fire hazards.
Corrective Action	» Investigations/corrective actions undertaken as a result of the complaint will be documented and compiled within the Complaints Register. Corrective actions will be closed out by senior management according to an agreed responsibility and timescale.

5.12 Chemicals and Fuels Management Plan

Chemicals and Fuels Management Plan		
Objective	To undertake all reasonable and practicable measures to minimise contamination of land or waters.	
Issues and Impacts	Potential for spillage or leakage of chemical and petroleum products and regulated wastes to waters.	
Relevant Legislation and other guidelines	*Environmental Protection Act 1999* *Dangerous Goods Safety Management Act 2001* AS 1940-1993 The Storage and Handling of Flammable and Combustible Liquids	
Construction		
» **Control Measures**		» **Responsibility**
» Only the minimal required quantities of chemicals, fuels, oils etc. should be retained at construction sites or contractor laydown areas at any particular time. Purchase the products on an 'as required' basis in accordance with the provisions of the *Workplace Health & Safety Act, 1995*.		» Construction Contractor
» Chemicals, fuels and oils etc should be stored at a minimum separation distance of 100 m from the nearest waterway (Grosvenor Creek is located approximately 1.3 km from the site).		» Construction Contractor
» Chemicals and fuels should be stored in accordance with AS1940 – The storage and handling of flammable and combustible liquids.		» Construction Contractor
» Maintenance and servicing of vehicles will be undertaken away from the project site at appropriate facilities. Daily servicing only may be undertaken on site. Such activity will be undertaken at a minimum separation distance of 100 m from drainage lines.		» Construction Contractor
» Temporary chemical storage will be in accordance with Material Safety Data Sheets (MSDS) while non-compatible chemicals will be stored separately.		» Construction Contractor
» Safe handling techniques during refuelling such as via use of pumps, funnels or syphons to prevent spillage.		» Construction Contractor
» Petroleum product spillages will be immediately cleaned up by dry absorbent materials or sand or the area tined up and remediated with a series of liquid fertilisers over a		» Construction Contractor

period of at least 7 to 14 days or until remediation is achieved.	
Absorbent materials used in the clean up of hydrocarbons or other chemicals will be placed and sealed in an appropriate container marked 'regulated waste' and consigned to a waste contractor licensed to receive such waste.	» Construction Contractor
Monitoring	In the case of a spill or other accident, monitoring of the receiving environment willbe undertaken by an experienced professional. The Construction Contractor Site Supervisor or Contractor Workplace Health & Safety Officer will regularly inspect all temporary chemical and petroleum product storage areas for leakages and release any clean stormwater accumulated in temporary bunded areas, after each rainfall event. An environmental officer representing DN will conduct a monthly audit of the contractor's procedures and performance to check for compliance.
Reporting	In the case of environmental nuisance or harm, the Environmental officer will report the incident to EPA and local council. If a spill occurs, a report detailing corrective actions and monitoring requirements will be prepared.
Corrective Action	Immediately clean up any spilt chemicals and fuels and replace any spills kits In the event of contaminant release to land or water that has the potential to cause environmental harm, the Construction Manager will immediately arrange for any necessary works to contain the contaminant and control/stop the source of the release. The Construction Manager will notify DN's Environmental officer and Project Manager. The Environmental officer will advise the EPA if notification triggers are exceeded. The containment, including absorbent materials, should be recovered and placed into a sealed container suitable to hold such materials. The wastes will be consigned to a contractor licensed to receive such wastes. Spills will be cleaned up in accordance with relevant Material Safety Data Sheets and Australian Standard AS1940. A copy of the MSDS for all chemicals will be maintained at all contractors lay down areas and contractor's project office on construction sites.

5.13 Handling and Disposal of Dangerous Goods Plan

Handling and disposal of Dangerous Goods Plan		
Performance Objectives	To minimise the risk of spills and land contamination; To ensure all hazardous waste is disposed of appropriately.	
Performance Indicators	» Contamination of soil and/or water has not occurred as the result of the handling and disposal of dangerous goods.	
Issues and Impacts	» Land contamination from treatment, storage of disposal of fuels, oils and hazardous waste.	
Construction		
» **Control Measures**		» **Responsibility**
» Dangerous goods will be stored, handled and signed as per AS-1940 and relevant legislation.		» Construction Contractor
» Material Safety Data Sheets (MSDS) will be located at the Site Office for all hazardous and dangerous goods stored and used during construction.		» Construction Contractor
» Spills of hazardous materials will be contained and collected for treatment at a licensed waste disposal facility.		» Construction Contractor
» Spill containment and treatment equipment and materials will be available near storage areas of hazardous materials.		» Construction Contractor
» Stockpile reusable and recyclable products for collection or reuse.		» Construction Contractor
» Collect and store hazardous wastes for disposal according to the regulations e.g. timber pallets, drums, scrap metal, glass etc.		» Construction Contractor
» Supply recycling bins at work sites for glass, aluminium cans, paper for collection and transport to a recycling facility.		» Construction Contractor
» Persons handling dangerous chemicals shall wear appropriate Personnel Protective Equipment (PPE) and receive appropriate training in it's use.		» Construction Contractor
» Fuels, lubricants and chemicals will be stored in appropriate containment facilities, not in the vicinity of natural or built waterways or water storage areas.		» Construction Contractor
Monitoring	» During construction, the works will be regularly inspected to assess the implementation of Management actions.	

Handling and disposal of Dangerous Goods Plan	
Reporting	» Daily or weekly reports (as appropriate) will be completed on site and reviewed by each Supervisor and/or Superintendent.
Corrective Action	» Investigations/corrective actions undertaken as a result of complaints will be documented and compiled within the Complaints Register. Corrective actions will be closed out by senior management according to an agreed responsibility and timescale. » Construction Contractor Project Manager to identify sources of contamination and arrange for affected areas to be re-mediated in consultation with EPA.

5.14 Clean-up and Rehabilitation Plan

Clean-up and Rehabilitation	
Performance Objectives	To minimise the introduction and/or spread of weeds; To promptly identify areas requiring weed control; To eliminate infestation of noxious weed species; To effectively control weed species; To minimise the modification of drainage patterns; To maximise the revegetation plant survival rates above 90%.
Performance Indicators	» Site not directly impacted by the plant is rehabilitated to a natural state with normal function of the ecosystem.
Issues and Impacts	» Prevention of soil erosion with the stabilisation of slopes and ground; » Land and/or water contamination; » Introduction and/or spread of declared and/or noxious weeds; » Adverse impact upon surrounding agricultural activities.

Construction	
» **Control Measures**	» **Responsibility**
» Contractors to ensure they remain on the designated construction track and do not disturb surrounding vegetation, including areas replanted.	» Construction Contractor
» Watercourses, terraces and levees disturbed by construction are to be restored to their original contours unless shown otherwise on the construction drawings. Banks of watercourses will be restored in a manner that will resist erosion.	» Construction Contractor
» Clean-up operations shall not be undertaken during adverse weather or in wet ground conditions. Such clean-up will be re-done in order to meet the required standard of normal dry weather clean-up.	» Construction Contractor
» Areas where construction or site works have been finished will be stabilised and returned to original condition (i.e. grazing paddock, vegetation), no rubbish or construction materials are to remain on site.	» Construction Contractor

Clean-up and Rehabilitation	
» Where deemed necessary a plough or scarifier will be used to relieve any unduly compacted surfaces on project areas such as access roads, camp sites and stockpile sites. Scarifying of areas where topsoil has been conserved will be carried out prior to replacement of topsoil.	» Construction Contractor
» Plant berms/gullies (particular the gully in far north-eastern of the property should be stabilised and re-planted with tube stock and hydro mulched immediately construction activities have finished. Sterile rapid growth grasses such as Japanese Millet or Rye Grass can be added to native seed mix to reduce potential for soil erosion.	» Construction Contractor
» Following initial seeding and stabilisation, secondary plantings for revegetation should use endemic species to the area.	» Construction Contractor
» Signs, fences or other barriers will be installed where appropriate to prevent unauthorised easement access.	» Construction Contractor
» Disturbed areas should be re-contoured to be similar to original landscape.	» Construction Contractor
» Where possible seed should be collected prior to areas being cleared.	» Construction Contractor
» Where possible retain large hollow logs from the clearing process and redistribute randomly among the retained vegetation in order to increase available habitat.	» Construction Contractor
» Direct planting is preferred over direct seeding methods and should be applied where possible to revegetation areas at 500 plants/ha to be the minimum coverage.	» Construction Contractor
» Permanent (restored) batters, construction sites and banks shall have topsoil spread evenly and shall then undergo hydraulic seeding/mulching (hydro-mulching). This includes down slope fill batters, if these have been cleared of vegetation, even if parts of these are almost flat.	» Construction Contractor
» Mulched vegetation is to be re-spread over cleared areas at 10 cm thickness. An access track to mulched areas is to be retained to allow regular access to maintain areas. Logs at least 3 m in length are to be placed every 100 m^2. To provide habitat for reptiles and insects.	» Construction Contractor

Clean-up and Rehabilitation	
» The use of fertilisers during revegetation works at the site will be the minimum necessary to promote establishment and will be incorporated to minimise the likelihood of fertiliser being carried offsite to watercourses.	» Construction Contractor

» The components of the hydro-mulch will be as follows:

Mulch	Mulched cleared vegetation.
Seedstock	Primary growth species: annual grass species which can include Winter Rye (planted in cooler months), Japanese Millet (planted in warmer months), or other appropriate seeds (Rocket Grass). Perennial Grass species such as Couch varieties; To ensure seeds are STERILE; Native seeds.
Binder / Stabiliser	Biodegradable, to be proposed by Contractor.
Fertiliser	One suitable for native plants proposed.

» Direct Seeding should also incorporate seeds of the vulnerable species to be used in rehabilitation activities within revegetation areas at a rate of 30 KG/Ha (3 g/m^2).	» Construction Contractor
» Revegetation is likely to occur in late winter or early spring and therefore rainfall may be adequate. However, if sufficient rainfall has not occurred water should be applied to the hydro-mulched and respread areas at regular times following revegetation. Particular care should be taken in the first 2 months to ensure the hydro-mulch does not dry out.	» Construction Contractor
» Pest animals and plants should be actively controlled by a coordinated peter management approach in accordance with the Moranbah Shire Pest Management Strategy.	» Construction Contractor
Monitoring	» To aid in evaluating the success of the rehabilitation a number of photo points can be established throughout the site. Every six months for the first two years photos are to be taken to provide an indication of the survival and growth of vegetation and establishment of weeds; » Audits will be conducted in accordance with this CEMP, with implementation of the recommendations and corrective actions.

Clean-up and Rehabilitation	
Reporting	» Annual rejuvenation management review including monitoring results of planting plots to be undertaken against existing guidelines and project out comes with new action plans to be recorded and submitted to DN Site Supervisor. » Daily or Weekly reports (as appropriate) will be completed on site and reviewed by the Construction Contractor Project Manager.
Corrective Action	» Investigations/corrective actions undertaken as a result of the complaint will be documented and complied within the Complaints Register. Corrective actions will be closed out by senior management according to an agreed responsibility and timescale; » Investigate complaints and take all steps to restore area according to land holder requirements.

5.15 Draft Operations Environmental Management Plan

5.15.1 Overview

The following section contains environmental management strategies that have been developed to detail the minimum requirements to provide for an acceptable level of environmental management during operation, maintenance and decommissioning activities.

Under the *Environment Protection Act 1994*, an Integrated Environmental Management System (IEMS) is required for the operational phase of the project when making a single application for multiple ERAs, referred to as an Integrated Licence.

5.15.2 Draft Operations Environmental Management Plan

The following section includes environmental mitigation strategies for managing environmental aspects and impacts as identified in the EIS. These mitigation strategies are related to the following elements:

- Erosion and Sediment;
- Flora, Fauna and Weeds;
- Water;
- Air and Noise;
- Waste;
- Traffic / Transport.
- Community;
- Cultural Heritage;
- Bushfire;
- Dangerous Goods, Chemical and Fuels;
- Decommissioning and Rehabilitation.

This OEMP applies to the operational phase of the project. The environmental elements to be managed comprise the structure as per the CEMP.

At the time of writing, engineering design was continuing for the project. Therefore specific details of the operation of the plant are yet to be finalised. Therefore this OEMP provides an outline of general management strategies known at this stage. The OEMP will be developed during detailed design and construction for finalisation prior to commissioning of the plant.

Erosion and Sediment

Mitigation strategies for operations will be updated from the CEMP to reflect the designed and constructed stormwater management systems on site. Further strategies will be developed for ongoing monitoring of erosion potential and water quality of areas within the site.

Flora, Fauna and Weeds

The following mitigation strategies were recommended in the flora and fauna specialist study and should be included in the OEMP:

- A program of ongoing ecological monitoring should be implemented, to determine whether the condition of the lot on which the plant is situated changes from the

baseline condition. Baseline condition is defined as the condition described in the flora and fauna reports undertaken for the EIS.

The ongoing ecological monitoring program should have the following objectives:

» To document over time the health of the flora and fauna populations and ecological communities in the woodland on the lot;

» To gather data that can be used to make effective management decisions on environmental issues for the land;

» To determine whether gully erosion to the stream in the east of the property is ongoing or has stabilised;

» To determine whether any pest or weed species declared under the *Land Protection (Pest and Stock Route Management) Act 2002* or controlled under the Belyando Shire weed and pest management strategy are present on the lot; and,

» To determine the effects, if any, of the plant on Grosvenor Creek.

» The health of the adjoining woodland should be monitored over four days within two years of the cessation of construction activities. Ongoing monitoring should then be implemented every three years. The following indicators of woodland community health should be measured:

  – Abundance of key woodland bird species: grey-crowned babbler (*Pomatostomus temporalis*), brown treecreeper (*Climacteris picumnus*), varied sitella (*Daphoenositta chrysoptera*) – counts should be undertaken over 16 person-hours both at sunrise and throughout the day by suitably qualified zoologists or ecologists during clement weather, with the data compared against observations made in the EIS fauna report;

  – Abundance of 'increaser' bird species: magpie (*Gymnorhina tibicen*), galah (*Cacutua roseicapilla*), sulphur crested cockatoo (*Cacatua galerita*), magpie lark (*Grallina cyanoleuca*) and masked lapwing (*Vanellus miles*), myna (*Acridotheres tristis*). Counts should be undertaken over 16 person-hours both at sunrise and throughout the day by suitably qualified zoologists or ecologists during clement weather, with the data compared against observations made in the EIS fauna report;

  – Small to medium mammal abundance, to be measured by a suitably qualified and experienced zoologist or ecologist (with the appropriate ethics permits). Survey design is to incorporate the following requirements:

    – at least three trapping lines of 20 mixed type A and B Elliot traps per line should be set over four nights, with one cage trap at the extremity of each line;

    – three pitfall trap lines with drift fences should be established for four trapping nights, with a minimum of four pits per line set at least 10 m apart; and,

    – all species trapped should be identified to species level and marked in the event of re-capture.

- Reptile abundance to be measured by a suitably qualified and experienced zoologist or ecologist – targeted habitat searches should be conducted over at least 16 hours;
- Presence of bat species: northern freetail bat (*Chaerephon jobensis*), eastern freetail bat (*Mormopterus* species 2), Gould's wattled bat (*Chalinolobus gouldii*), hoary wattled bat (*Chalinolobus nigrogriseus*), eastern cave bat (*Vespadelus troughtoni*) and especially the little pied bat (*Chalinolobus picatus*). Presence should be measured using an ultrasonic call recording device such as the Anabat II over at least 10 recording hours, and preferably 20. The recordings must be analysed by a suitably qualified technician or zoologist;
- Presence of weed and pest species is to be noted. In particular, the presence and abundance of weeds or pests declared under the *Land Protection (Pest and Stock Route Management) Act 2002* or listed in the Belyando Shire weed and pest management strategy should be noted and reported where required;
- Presence of die-back in woodland vegetation layers: tree layers (layer one and two) and shrub layer. This should be a visual check conducted by a suitably qualified botanist or ecologist, and should aim to identify patterns of mortality or ill-health in mature plants, especially dominant species such as poplar box (*Eucalyptus populnea*) and Clarkson's bloodwood (*Corymbia clarksoniana*) in the tree layers, and false sandalwood (*Eremophila mitchellii*), *Flindersia dissosperma* and *Carissa ovata* in the shrub layers. If die-back is observed, further investigation into the cause will be required; and,
- Confirmation that vegetation community canopy cover is being retained within a range of 15% to 35% using the Queensland Herbarium methodology for stratifying vegetation at a site, established by Nelder and Wilson (EPA 2005). Should the woodland have thickened or thinned, the cause should be investigated and discussed in the report.

The background data to be used as a baseline is that reported in the EIS Flora and Fauna reports. It is noted that the measurements taken during the field investigation for these reports represent only one point in time, and are a reflection of factors such as the weather and season at the time, as well as stochastic or chance factors. Variables such as these should be taken into account when considering the results of any monitoring effort.

A report outlining the results of each study should be generated by a suitably qualified ecologist. Results should be examined for patterns of change, such as an increase or decrease in a pest or indicator species. An action list should be generated where further investigation or action is warranted. Reports should be collated and considered where management decisions concerning land use are made.

Water

The following mitigation strategies were recommended in the flora and fauna specialist study and should be included in the OEMP:

» The eroded gully in the north eastern corner of the lot should be monitored at least annually, preferably after the wet season, to determine whether gully erosion is

increasing or has stabilised. Every effort should be made to arrest any erosion should an ongoing process of soil loss be detected. Landscaping and engineering measures should be considered as part of the annual inspection report, which should be compiled by a suitably qualified hydrologist or engineer.

Air and Noise

The following mitigation strategies were recommended in the air and GHG studies and should be included in the OEMP:

» Emissions to air from the project discharge points are tested in accordance with the Queensland EPA Air Quality Sampling manual Queensland EPA, November 1997. Emission tests should be conducted upon commissioning and thereafter at a frequency denoted in the terms and conditions within the development approval documentation (this may be in the order of every twelve months).

» All emission testing and sample analysis should be conducted by National Association of Testing Authorities (NATA) accredited laboratories and consultants. Comparison of recorded emissions will be made against the in-stack concentrations listed in Table 8 of Appendix 7.8.

» Maintain an inventory of GHG emissions for the project once construction starts, by monitoring the use of electricity, liquid and gaseous fuels and other direct and indirect emissions.

» Publicly report greenhouse emissions and progress on greenhouse mitigation measures.

» Obtain and maintain membership of the Commonwealth Government Greenhouse Challenge Program.

» Noise mitigation strategies will be adopted from the CEMP.

Waste

Specific mitigation strategies will be developed to manage the operational wastes and a focus on the minimisation of waste produced.

Traffic / Transport

The following mitigation strategies were recommended in the traffic specialist study and should be included in the OEMP:

» All materials will be transported according to QLD Transport's *Transporting Dangerous Goods Requirement*, where appropriate;

» Projected haulage routes will be discussed with the local Council and State Government authorities.

Community

The following mitigation strategies were recommended in the social impact and community consultation studies and should be included in the OEMP:

» Ensure that adequate housing and associated infrastructure are provided within the existing constraints of the BSC, the State and community aspirations.

- Source where possible goods and services from Moranbah to ensure a positive economic impact from the construction phase of the project.
- Ensure that the medical, emergency and educational service providers, are aware of the potential impact on the services they provide.
- Ensure that wages and conditions are similar or an improvement on the coal mining experience when people live permanently in Moranbah.
- Promote local employment to people looking for work in Moranbah. Advertise available positions locally.
- Support the employment and training of local people who want to work in the proposed plant.
- Ensure there is minimal road traffic during the hours of 5am-9am and 5pm-9pm due to high volumes of traffic for shift change over and school bus operating times.
- Source where possible goods and services from Moranbah to ensure a positive economic impact from the construction phase of the project.
- Provide the permanent housing for workers to live in Moranbah and participate in the community.
- Provide permanent housing for workers to live in Moranbah and participate in the community.

Cultural Heritage

The CHMP for construction will be updated for operations to reflect the continued protection of known cultural areas within the site.

Bushfire

Mitigation strategies included in the CEMP will be updated for relevance during ongoing operation of the plant.

Dangerous Goods, Chemical and Fuels

Mitigation strategies for the transport, handling, storage and use of dangerous goods, chemicals and fuels will be a key section of the OEMP. Specific operational procedures will be developed to comply with DN's HSE policies and all legislative requirements.

Decommissioning and Rehabilitation

Dyno Nobel Asia Pacific Limited shall develop a decommissioning and rehabilitation plan for the site during operations, at least 2 years prior to the start of decommissioning.

Conclusions and Recommendations

Conclusions

The Dyno Nobel Asia Pacific Limited proposed AN Plant (The Project) will be a major provider of AN on the east coast of Queensland and Australia if approved. The resources boom has created a significant increase in the extraction of coal resources in central Queensland and inturn the requirement for AN for explosives production.

The location of the site is in the northern section of the Bowen Basin which allows for access to and from significant coal mining activities located in this area. The Project was declared a significant project under the Queensland *SDPWO Act* on the 31st of March 2006. The EIS has been prepared to addresses all of the requirements specified under the final Terms of Reference (ToR) provided in Appendix 7.1.

The site of the AN Plant was selected on the basis of reliable and accessible supplies of water and coal seam methane gas (feedstock for production) as well as locating on relatively flat land with enough separation distance between the proposed AN Plant and the sensitive receptors within the township of Moranbah.

The site has been designed to minimise the potential offsite impacts from the project. The evaporation ponds for the facility are designed to be zero discharge. The clearing of the site will be restricted to the plant layout area access roads and the laydown area, for the construction of the project. The remaining vegetation will remain in place for the site and will assist in minimising the potential erosion that may occur on site. The major issues and potential impacts from the project include the following:

- Increased potential risks from the operation of a major industrial facility;
- Increased need for housing and infrastructure;
- Benefits to local, regional and state economy;
- Temporary increase of traffic on road infrastructure;
- Minor impacts on the air quality of the area during construction and operation.

A list of the proponent commitments for the project is provided in Appendix 7.15 and addresses the actions that will be undertaken by the proponent. The measures to minimise impacts from the project are provided below:

Measures have been incorporated in the design of the AN Plant to minimise the potential impacts from the facility on the surrounding environment. This includes the provision of an adequate buffer around the site, installation of plant and equipment around the site to reduce risk and hazards.

To increase housing infrastructure DN is in discussions to provide accommodation for its operational workforce. Dyno Nobel Asia Pacific Limited will also provide a self contained construction camp to mitigate impacts on the township of Moranbah.

There are a number of benefits to the project that will potentially enhance the township when the operational workforce locates in the township of Moranbah in the accommodation provided for them. Benefits are discussed in Section 1 of the EIS.

The impacts on the existing road infrastructure have been modelled and assessed with regards to the heavy vehicle traffic from the AN Plant and from the construction camp. The assessment is provided in Appendix 7.6 of the EIS. The existing infrastructure will be able to support the increased traffic loads from the operation of the plant. Dyno Nobel Asia Pacific Limited will provide contributions for the use and maintenance of the transport infrastructure by the heavy vehicles used during construction and operation.

The modelling for the Air Quality assessment has shown that the impacts meet the National Environmental Pollution Measure (NEPM) requirements for the operational and construction phases of the project.

Provided these mitigation measures and those provided in the proponent commitments register (Appendix 7.5) and EMP for the project are implemented the project will not adversely affect areas of conservation value and cultural heritage sites or have a detrimental impact on the local community and public.

Recommendations

The recommendation of this EIS is that the potential impacts of an AN Plant in Moranbah have been adequately addressed and that the project should be approved provided the mitigation measures, proponent commitments and EMP management actions described throughout the document and provided in Appendix 7.15 are implemented in full.

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