INITIAL ADVICE STATEMENT

Australian FutureEnergy

Gladstone Energy and Ammonia Project

August 2018

SES Gasification Plant

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EXECUTIVE SUMMARY

The purpose of this IAS is to provide sufficient information to:

- Enable the Coordinator-General to determine if the Project meets at least one of the criteria for declaration as a coordinated project under Section 27(2)(b) of the SDPWO Act.
- Provide sufficient detail to enable the Coordinator-General to determine if the project will require an Environmental Impact Statement (EIS) or an Impact Assessment Report (IAR) under Section 26(1)(a) or Section 26 (1)(b) of the SDPWO Act.
- Provide sufficient detail to enable the Office of the Coordinator-General (OCG), advisory agencies and other stakeholders to have effective input into establishing the Terms of Reference (ToR) if an EIS is to be developed for the Project.
- Inform stakeholders and the general public about the nature, scope and location of the Project, and key environmental issues that will be investigated through the EIS process.

Project Description

Australian Future Energy Pty Ltd (AFE), will develop and operate the Project using gasification technology provided by Synthesis Energy Systems (SES).

AFE will use coal as the main feedstock to an SES Gasification Technology coal gasification plant to generate synthesis gas. The plant will then convert the syngas which consists of mainly CO + H_2 + CH_4 to produce ammonia and SNG, using conventional state of the art technology. Waste fuel gases will be combusted to generate heat energy in a Gas Turbine Generator (GTG) to generate Electrical Power.

The project is currently sized to convert 1.5 million tonnes per annum (mtpa) of coal to produce 330,000 tonnes per annum (~1000 tonnes per day) of ammonia and 6 PJ of Synthetic Natural Gas (SNG). This product mix is based on the forecasted market demand and offtake discussions with major industrial users. Allowing for market adjustments, the plant may be run to produce up to 8 PJ of SNG with reduced ammonia production. In addition, excess syngas will be utilised with waste heat from the ammonia production process to drive a combined cycle gas power plant that will produce approximately 96 MW, which will not only self-contain the Project's electricity requirement but offer up to 24 MW to neighbouring industrial plants and/or the central Queensland electricity grid.

Infrastructure Requirements

The Project will require:

- Rail offloading facility and a conveyer belt system to deliver coal to site;
- An electrical substation and connection to the grid for power export;
- Export pipeline for SNG to existing QGP radial pipeline on eastern boundary of property;
- Export pipeline for ammonia to nearby production facility;
- Connection to Gladstone Area Water Board water pipeline on eastern boundary of property; and
- Connection to existing sewer on eastern boundary of property.

Project Location

The Project Plant is proposed to be built on lot 57CP902700 within the GSDA, north-west of the city of Gladstone. Offsite infrastructure such as the gas pipeline will utilise the existing easement which runs through the property and the existing electricity easement which run

along Landing Road. The proposed plant and off-site infrastructure are all located within the GSDA.

The proposed project appears consistent with the intent of the GSDA Development Scheme (2015) with the subject land located in the 'medium to high impact and port related industry' precinct. AFE is currently in negotiations with the owner of the land, the Minister for Economic Development, to progress a purchase agreement for the property.

Key Findings of the IAS

Ecology

The project site is highly disturbed from past quarrying and LNG construction laydown activities. Baseline terrestrial flora and fauna surveys on lot 57CP902700 were undertaken in April 2018. The surveys adopted methods consistent with relevant State and Commonwealth flora and fauna survey guidelines, and timing meets requirements for an autumn seasonal survey.

Vegetation across the site was found to be disturbed with significant populations of exotic weed species and widespread anthropogenic disturbance, including previous clearing, excavations and the dumping of rubbish. No threatened flora species were detected during the surveys. Rainbow bee-eater, white-bellied sea eagle and whistling kite were observed which are listed as 'marine' species under the EPBC Act. The species may use the site for foraging or dispersal. These marine species are not 'migratory' species therefore are not formally matters of national environmental significance (MNES). No threatened fauna species were observed, including no observations of Koala scats or scratches.

Stormwater

The project is in the Great Barrier Reef World Heritage Area and impacts of the project, in particular run off which could increase the sediment load or carry pollution to the waters feeding the Great Barrier Reef need to be assessed. Although erosion is currently occurring on the site, there is minimal evidence of any sediment reaching the waters of Curtis Bay. A stormwater management plan will ensure mitigation measures are implemented in design, during construction and operations to minimise erosion and sedimentation impacts.

A stormwater environmental overlay is proposed to protect the existing ephemeral drainage channel from the Targinie forest lands to the west and north.

Air Quality

The cumulative air quality impact assessment for Gladstone identified four priority pollutants to be used as proxy indicators for air quality as Nitrogen Oxides (NOx), Sulphur Oxides (SOx), PM10 and PM2.5. As pure oxygen and not air is fed to the gasifier, the potential for NOx formation is minimal. Nitrogen Oxides generated as by-product in the combustion of fuel gases in the Gas Turbine Generator are minimised by use of low NOx burners.

The hydrogen sulphide is removed from the syngas in the Acid Gas Removal Unit and over 97% of the sulphur in the coal is recovered as useful product.

Unreacted coal dust is recovered from the Synthesis gas stream leaving the gasifier by using hot gas cyclones and recycled to the coal gasification process via a proprietary Fines Management System. Any dust still remaining in the synthesis gas is scrubbed by contact with a circulating water stream such that the Synthesis gas is particulate free and can be fed

to process units downstream. The gasification process does not emit particulates. Particulates may be generated in handling coal on the project site.

Cultural Heritage

The proposed Project is located predominantly on lot 57 CP902700, a freehold property used for cultivation and quarrying. There are no known federally listed heritage places in the study area, and Project works will not directly impact any National Heritage List (NHL) or Commonwealth Heritage List (CHL) places. The potential for additional Aboriginal and historical heritage places within the study area is low, and it is considered very unlikely that any such sites would be of sufficient historical, rarity, research, representativeness, aesthetic, creative or social value to meet the thresholds for inclusion on either the NHL or CHL.

Greenhouse Gas Emissions

This project will generate approximately 2 million tonnes of carbon dioxide of which 1.8 million tonnes will be separated in the process as high purity carbon dioxide which can be captured, sequestered or sold directly to available markets.

Groundwater

There are no identified Groundwater Dependent Ecosystems (GDEs) including aquatic, terrestrial or subterranean on the subject properties based on review of the Groundwater Dependent Ecosystems Atlas (BOM 2018). The Project area is outside the Great Artesian Basin area.

The Project meets at least one of the criteria for declaration as a coordinated project under Section 27(2)(b) and is expected to trigger the requirements for an Environmental Impact Statement under Section 26(1)(a) of the SDPWO Act.

1 INTRODUCTION

1.1 Background

Project Description

The Gladstone Energy and Ammonia Project (the Project) consists of a coal gasification plant designed to convert coal to synthesis gas (syngas) consisting mainly of CO + H_2 + CH_4 for:

- The production of anhydrous ammonia;
- Further processing to synthesis natural gas (SNG) as a substitute for natural gas in industrial processes; and
- Combination with process waste heat in an onsite combined cycle gas-fired power plant.

AFE will use coal as the main feedstock to an SES Gasification Technology coal gasification plant to generate synthesis gas. The plant will then convert the syngas which consists of mainly CO + H_2 + CH_4 to produce ammonia and SNG, using conventional state of the art technology. Waste fuel gases will be combusted to generate heat energy in a Gas Turbine Generator (GTG) to generate Electrical Power. The process waste heat will be used to produce steam required for the plant process and a Steam Turbine Generator (STG) along with the GTG as part of a combined cycle generating plant.

Coal is to be sourced from the Callide Mine, located in the Callide Basin in Central Queensland, approximately 20 kilometres north of the rural town of Biloela and 85 kilometres south-west of the Port of Gladstone. The Callide Mine currently produces 11.5 million tonnes per annum (mtpa). There is more than sufficient coal to allow for operation of the Coal Gasification Plant, Power Plant, SNG and Ammonia plant for more than 40 years. Raw coal may also be sourced from other coal mines along the Moura Railway line.

Coal may also be sourced from other coal mines located along the Moura Railway line. Coal will be railed to the site on the existing Moura rail line which runs to the Port of Gladstone.

Project water requirements estimated at approximately 1.0GL/annum will be purchased from the Gladstone Area Water Board.

1.1.1 Scope of this IAS

The project is currently sized to convert 1.5 million tonnes per annum (mtpa) of coal to produce 330,000 tonnes per annum (~1000 tonnes per day) of ammonia and 6 PJ of Synthetic Natural Gas (SNG). This product mix is based on the existing market demand and the plant may be run to produce up to 8 PJ of SNG with reduced ammonia production. In addition, excess syngas will be utilised with waste heat from the ammonia production process to drive a combined cycle gas power plant to produce a total of approximately 96 MW, which will not only self-contain the Project's electricity requirement but offer up to 24 MW to neighbouring industrial plants and/or the central Queensland electricity grid.
This IAS covers the development of the following project components:

- the coal supply system (which includes rail unloading facility conveyer system to the GEAP site, coal stock pile area, crusher and dryer);
- the coal gasification plant;
- the gas processing plant;
- ammonia processing plant;

- the Combined Cycle Gas power generation plant; and
- Utilities and ancillaries including:
  - Substation and connection to the grid for transmission for import/export power;
  - Connection to Gladstone Area Water Board raw water main.
  - Water treatment plant.
  - Connection to sewer on site.
  - 20,000 tonne Ammonia tank.
  - High pressure synthetic natural gas (SNG) will be exported from the plant by underground pipeline. This will run from the plant site and tie into the Queensland Gas Pipeline at Yarwun.
  - Ammonia storage and delivery (which includes an ammonia tank and delivery pipeline connection); and
  - roads and administration offices.

Ammonia will be delivered by pipeline to a user of a large quantity of ammonia and related products located in general proximity to the State Development Area in Gladstone. The pipeline route will be determined once off take agreements are finalised. The route selection and approvals for the ammonia pipeline are outside the scope of this IAS and will be pursued independently.

This IAS does not cover any upgrades of the rail line, to allow the coal to be transported from the mine to the coal loading site or port upgrades and load out facilities. The project site is to be connected to the raw water supply system of the GSDA. This project does not include the extraction of coal or water.

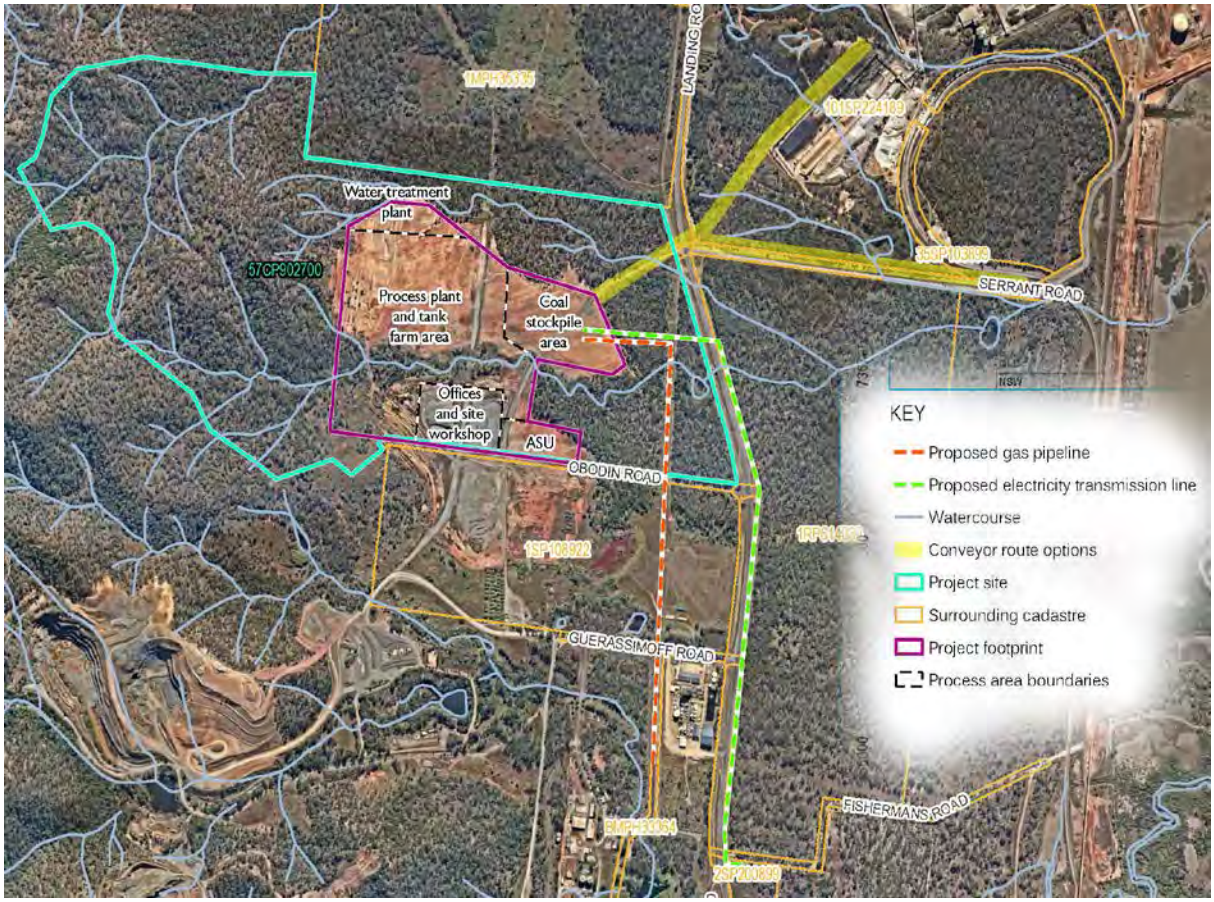

Figure 1-1: Gladstone Energy and Ammonia Project Footprint

1.2 Purpose of this IAS

This document is an Initial Advice Statement (IAS) which supports an application to the Coordinator-General for declaration of the Project as a Coordinated Project under Part 4 of the Queensland SDPWO Act. This IAS provides an overview of the Project to stakeholders and the general public.

The purpose of this IAS is to provide sufficient information to:

- Enable the Coordinator-General to determine if the Project meets at least one of the criteria for declaration as a coordinated project under Section 27(2)(b) of the SDPWO Act.
- Provide sufficient detail to enable the Coordinator-General to determine if the project will require an Environmental Impact Statement (EIS) or an Impact Assessment Report (IAR) under Section 26(1)(a) or Section 26 (1)(b) of the SDPWO Act.
- Provide sufficient detail to enable the Office of the Coordinator-General (OCG), advisory agencies and other stakeholders to have effective input into establishing the Terms of Reference (ToR) if an EIS is to be developed for the Project.
- Inform stakeholders and the general public about the nature, scope and location of the Project, and key environmental issues that will be investigated through the EIS process.

1.2.1 Why the Project should be declared a 'Coordinated Project'

AFE seeks advice from the OCG on whether the declaration for 'Coordinated Project' status is appropriate under Section 27(2)(b) of the SDPWO Act. This IAS confirms that the Project will:

Require complex State or Commonwealth government approval requirements

The project will involve a petroleum facilities licence for all four components (Coal Gasification Plant, SNG plant, Power Plant and Ammonia Plant) of the Project, which will also jointly be classified as a Major Hazard Facility (MHF). The project will require a Petroleum Pipeline Licence for the export of SNG. Based on the size and complexity of the Project, the Project would require multi-agency input. A number of approvals from local, State and the Commonwealth government will be required for the Project. This will require coordination of the input of a number of regulatory agencies, which are likely to include:

- Department of Natural Resources, Mines and Energy (DNRME);
- Department of Environment and Science (DES);
- Department of Agriculture and Fisheries (DAF);
- Workplace Health and Safety, Queensland (WHSQ);
- Department of Transport and Main Roads (DTMR);
- Hazardous Industries and Chemicals Branch (HICB);
- Gladstone Regional Council (GRC); and
- Department of Environment and Energy (DoEE).

The project will also be classified as a major hazard facility (MHF).

Be of Strategic significance to the locality, region or the State

As a major manufacturing project requiring an investment of approximately A$1 billion, the Project is expected to deliver a range of positive socio-economic impacts targeting the Gladstone region but extending to other population centres in central Queensland and beyond. These include:

- Creation of employment opportunities during the planning, design, construction and operation of the Project – with current estimates of 800 direct jobs during construction and 200 direct jobs in operations;
- During operation the Project is forecast to generate more than 1,280 sustainable, indirect supply chain jobs (i.e. 1 FT job = 6.4 indirect jobs using QRC employment multiplier);
- the Project will assist the retention of jobs in the Gladstone LGA as a result of new investment and economic activity;
- Facilitate retention of hundreds of additional local jobs in the local manufacturing industry and coal mining industry;
- Flow-on employment opportunities will extend to supply chain businesses across central Queensland (e.g. transport, utilities, agriculture, mining) where unemployment stands currently at 6.7% (Fitzroy);
- the Project is a strategically significant development for Gladstone in terms of supporting the city's industrial diversification;
- Generation of additional domestic revenue by import replacement and significant value adding to the available feedstocks;
- the Project provides a new market for 1.5 mtpa of coal, strengthening long-term employment security at the Callide mine; and
- Supply base load power to the domestic market.

Have significant environmental effects; or

Although environmental impacts are not expected to be significant, the project is within the Great Barrier Reef World Heritage Area and any offsite impacts need to be carefully managed.

The Coordinator- General has an-established process for evaluating cumulative impacts for industrial projects developed in this region and the project will be required to undergo a detailed development application process.

Have significant infrastructure requirements

The Project is expected to require:

- Offloading and conveyer systems for transport of 1.5 mtpa coal from existing rail system to the coal gasification plant.
- A power line from the power station to the plant to supply the projects power needs; and a substation and connection to the grid for export.
- An export underground SNG pipeline to tie into the Queensland Gas Pipeline at Yarwun.
- Infrastructure to source water requirements (e.g. a purpose-built pipeline) and to store water primarily for boiler and cooling estimated at approximately 1.0 GL/annum.

1.2.2 Community Consultation and Stakeholder Engagement

A community consultation and stakeholder engagement plan will be completed and implemented to ensure that relevant stakeholders and the general public are appropriately engaged during the development of this project.

2 THE PROPONENT

Australian Future Energy Pty Ltd (AFE), ABN 56 168160 067 will develop and operate the Project using gasification technology provided by Synthesis Energy Systems (SES). AFE has the exclusive Australian rights to commercially-proven coal gasification technology developed in the United States of America (USA) by SES, a NASDAQ listed company, which holds approximately 40% of the shareholding in AFE.

2.1 Relevant History

SES is a global energy and gasification technology company that provides products and solutions to the energy and chemicals industries. SES proven gasification technology originated in the USA at the Gas Technology Institute (GTI) over 40 years ago.

Since 2003, SES have built 12 coal gasifier trains at five industrial plant sites in China, converting coal into methanol and/or fuel gas for industrial use. These plants have been operating successfully on a range of coal qualities.

AFE has been operating since 2014. The management team of AFE bring a wealth of project and financial management experience to steer this project through the approvals, design, construction and operations phases.

2.2 Principal Consultants

The EIS will be compiled by a specialist Tier 1 Environmental Contractor.

2.3 Contact Details

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3 NATURE OF THE PROPOSAL

3.1 Description of Project Objectives

The Project is expected to utilise two gasifiers (and one spare) to produce approximately 330,000 tonnes per annum of anhydrous ammonia, 6 PJ per annum of SNG and 96 MW of power (including 24 MW for export) for 30 years.

3.1.1 Project Pre- feasibility Assessment

The capital cost of the project is estimated at AUD$1 billion generating Net Present Value of AUD$420 million generating total life of project revenue (undiscounted) estimated at AUD$6.2 billion.

3.2 Land Use

The Project (including all associated infrastructure such as coal conveyer, electricity, gas pipeline) is proposed to be built within the Gladstone State Development Area (GSDA). The Gladstone Energy and Ammonia Plant is to be located on lot 57CP902700 in the Medium-High Impact and Port Related Industry Precinct, which allows for heavy industry and chemical manufacturing as shown in Figure 3-1 below.

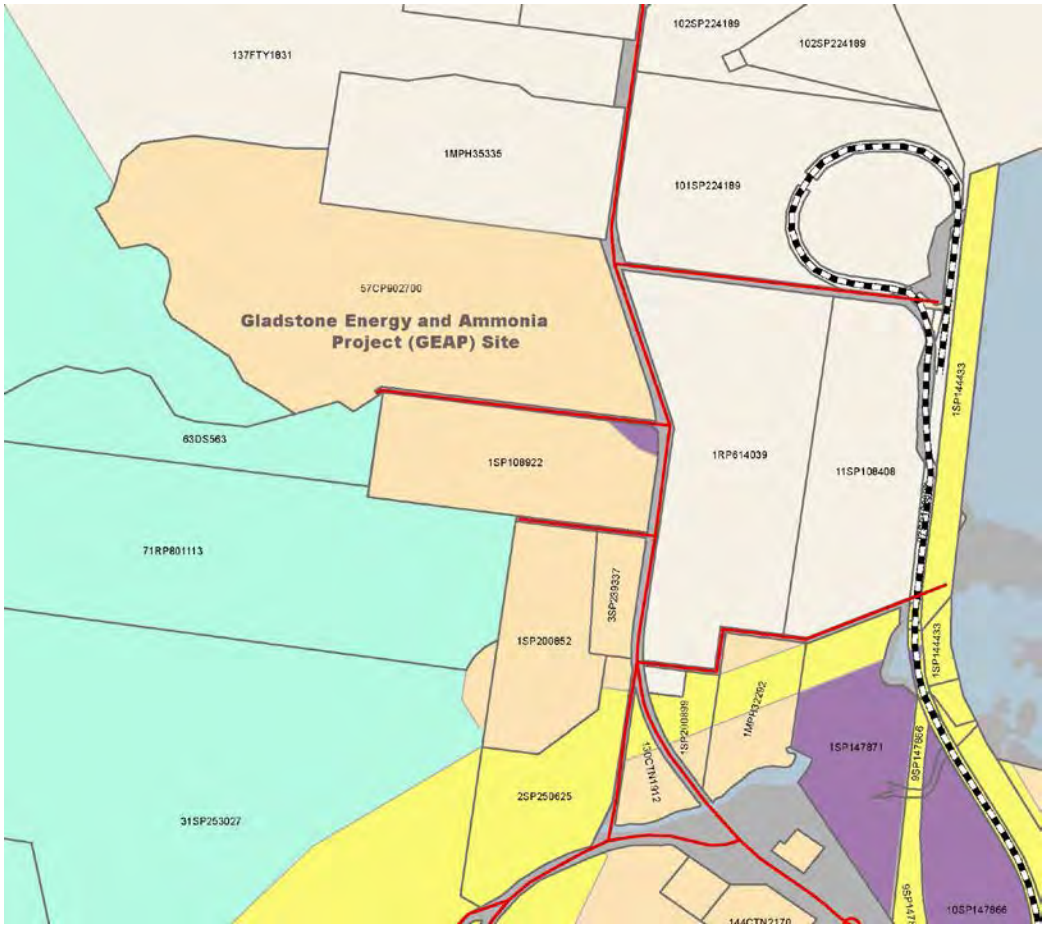

Figure 3-1: Gladstone Energy and Ammonia Project Site in the Gladstone State Development Area

There are a number of existing large industrial developments surrounding the site which include; Cement Australia's Fisherman Landing Plant to the north-east, Queensland Energy Resources to the north, Fisherman's Landing port facility to north-east and Northern Oil Refinery to the south.

GSDA is also home to:

- Orica chemical manufacturing complex.
- Cleanaway Waste Management (including recycling facility).
- Australia Pacific LNG (APLNG).
- Santos Gladstone LNG (GLNG).
- Queensland Curtis LNG (QCLNG).

Declared in 1993, the GSDA located north-west of the city of Gladstone contains a defined area of land dedicated for industrial development and materials transportation infrastructure, given its strategic connectivity to road and rail infrastructure and the port of Gladstone, and position away from incompatible land uses, including significant residential areas. Development on land within the GSDA is regulated by the Coordinator-General and is located outside the State's Strategic Cropping Land areas.

3.3 Project Need

According to the McKinsey Report dated March 2017, "Ammonia production is one of east Australia's largest natural gas consuming industries, providing fertiliser for Australia's large agricultural sector. Natural gas is used as a feedstock for ammonia production, with ~31 GJ of natural gas required per tonne of ammonia produced. The economics of ammonia production are highly dependent on natural gas prices, with 80 percent of the total cost typically coming from the natural gas feedstock." [1]

Ammonia producers operate plants in Queensland and New South Wales and employ ~2,500 people.[2] With a combined production capacity of ~2,400 kt per year,[3] the ammonia industry consumes ~70 PJ of natural gas per year, or about 30 percent of industrial demand.

[1] IHS Markit (PEP 2016)
[2] Office of the Chief Economist, Australian Energy Statistics, 2016.
[3] International Plant Nutrition Institute, Nitrogen Fertilizers, Supply and Demand, 2015.

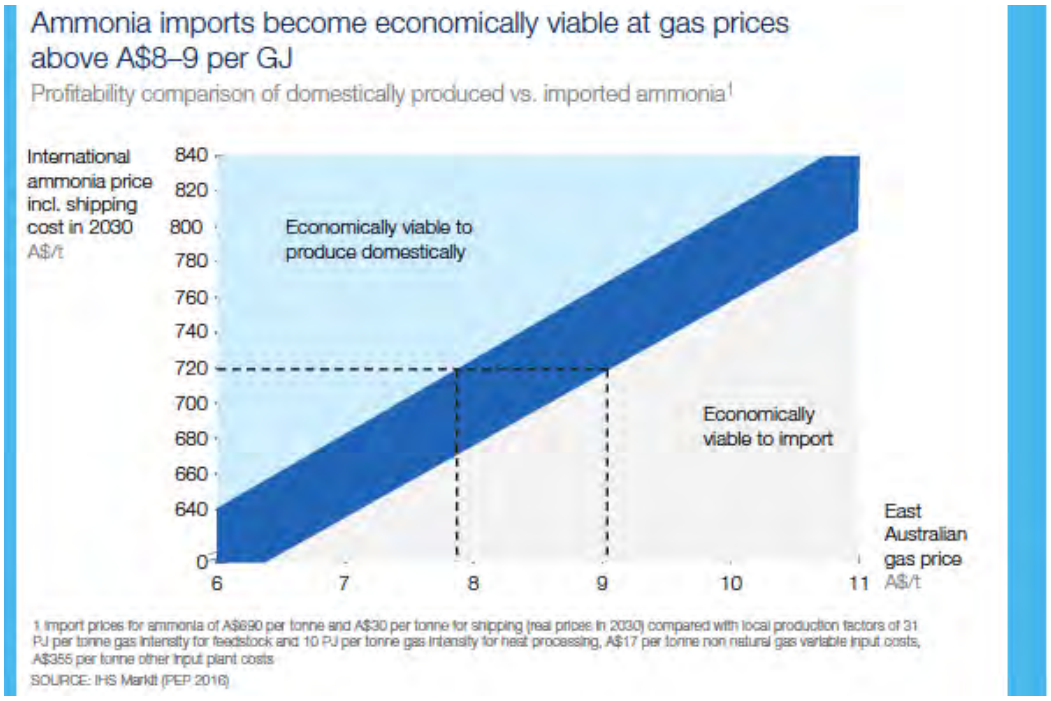

Figure 3-2: Ammonia Production and Natural Gas Price

Ammonia is also the main raw material for the production of ammonium nitrate used as an explosive in the coal mining industry. Each year as coal extraction in existing mines progresses, the demand for ammonia nitrate will only grow as more explosives are required as the coal seams dip deeper.

Future international ammonia prices are uncertain but assuming an ammonia price of A$690/tonne, Australia's ammonia producers start to lose international competitiveness at gas prices consistently above A$8-9 per gigajoule (GJ).

In the extreme, persistent high gas prices could result in the shutdown of east Australia's ammonia industry, reducing gas demand by ~70 PJ. The Project uses coal gasification to produce hydrogen which is then used to produce ammonia. This will ensure that ammonia production will continue in Australia and future proof the industry from gas prices which are expected to rise.

The Project will generate economic and social benefits to the Australian economy. Coal gasification allows for the conversion of coal to syngas, SNG or raw materials used in the manufacture of urea, methanol and ammonia. The project ensures that the manufacture of ammonia can continue in Australia even with rising gas prices.

3.3.1 Alternatives to the Project

Ammonia is currently produced in Australia using natural gas. As discussed, should the price of natural gas rise above $8 - $9 / GJ, it becomes more viable to import ammonia. This situation has already occurred, and the price of natural gas is expected to increase further.

The alternatives to the project are all dependent on the availability of natural gas at low prices, failing which the local manufacture of both ammonia-based fertilisers and ammonium nitrate will struggle to compete with imports in to Australia.

3.3.2 Government Policies and Strategies

The proposed development of the Project reflects the State Government's commitment to Queensland's advanced manufacturing sector.

In December 2016, the Palaszczuk Government released a 10-Year Roadmap and Action Plan for advanced manufacturing, with the following vision for the future of the State's $20 billion a year manufacturing sector:

"Capitalising on its competitive strengths in existing and emerging sectors, Queensland will be a recognised leader, nationally and internationally, by 2026 for its advanced manufacturing technologies, products, systems and services that are innovative, sustainable, and embedded in local and global supply chains."

Relevant Government Policies and Planning Instruments are discussed in detail in Section 5.12 below.

3.4 Components, developments, activities and infrastructure

The key components of the project are shown in Figure 3-3 and include:

- Coal Gasification Island.
- Syngas Processing Island and Ammonia Plant.
- SNG Plant.
- Power Island.
- Coal Delivery - Offloading facility and conveyer to GEAP site.
- Utilities and Ancillaries.

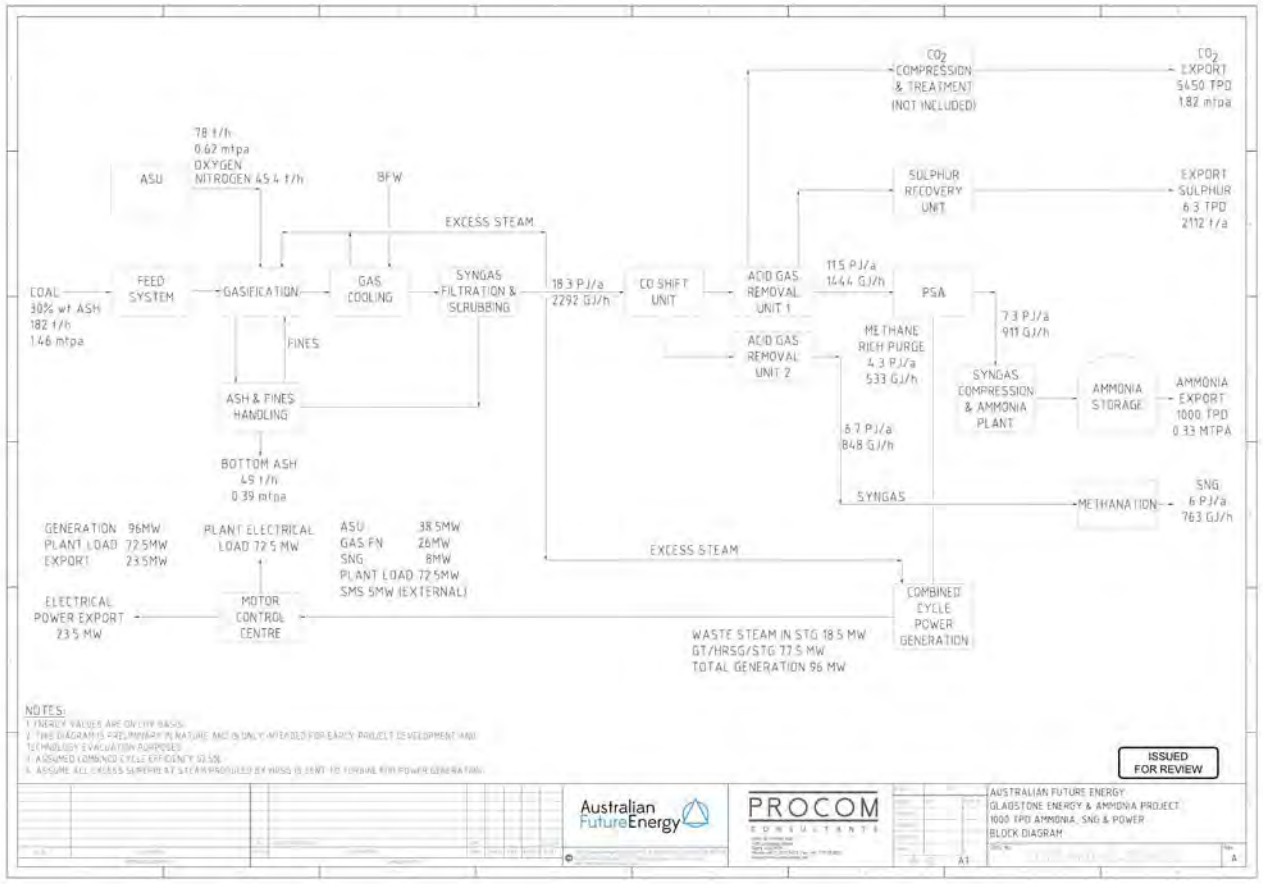

Figure 3-3: Schematic of Plant

3.4.1 Coal Gasification Island

The coal gasification island is based on aboveground SES Gasification Technology converting coal to gas in a pressure vessel. The proposed gasifier configuration is for two operating gasifiers with one spare gasifier each operating at 50 bar_g and approximately 1000^oC.

The SES gasifier is a jet-enhanced fluidized-bed reactor. Steam and oxygen are used to fluidize the solid particles as well as react with the coal feedstock within the fluidized bed.

Any fine solids carried over from the gasifier are separated from the syngas and returned to the gasifier using SES's proprietary Fines Management System (FMS) to improve carbon conversion. The gasification temperature is selected to maintain high carbon conversion without causing slagging conditions for the ash present in the coal feedstock. High quality bottom ash is removed from the gasifier by gravity and is discharged into a system for cooling and re-use as a saleable product.

The coal feedstock for this project is Callide 30% ash (wet basis) coal adjusted for a slightly higher sulphur content of 0.4%wt. The Higher Heating Value of the coal is 4,868 kcal/kg (dry basis). The Coal Gasification plant will consume approximately 182/h (4368 tpd or 1.46 mtpa) coal in the 2 operating gasifiers to produce the required amount of synthesis gas to feed the downstream systems.

The Coal Gasification Island includes the following systems:

Coal Handling System

Coal from the Callide mine will be transported by rail to a new loadout facility adjacent to the Cement Australia site and unloaded. The project proposes to build a bottom loading tippler. The coal will be loaded directly onto a conveyer system which will then transport the coal by overland covered conveyer to a stockpile on the Project site. Another option for the conveyer route is to follow on the north side easement of Serrant Road. After it crosses Landing Road, it is proposed the conveyer will utilise the easement formed by an unnamed existing cleared dirt road easement from Landing Road to the coal stockpile area. Alternatively, there may be an opportunity to upgrade the existing Cement Australia coal load out system and convey from the existing coal stockpile area. (See Figure 3-4 below). This option is under investigation with CA and Aurizon as it may have benefits to relieve rail congestion upstream.

The onsite system consists of Coal Receiving, Handling, Preparation, Drying and Conveying. The coal stockpile is expected to store up to 44,000 tonnes of as received coal which represents 10 days consumption at nominal rates. It is expected that this coal will be conveyed to coal feed hoppers at the gasification plant.

The coal handling system is designed to receive, store, and prepare the coal to the required moisture limit of 8% wt and particle size of 100% less than 8mm for gasification.

Figure 3-4: Coal Conveyer Routes

Gasifier Feed System

The gasifier feed system consists of storage bins, conveyors, transporters and a lock hopper system that supplies each gasifier with coal at gasifier operating pressure. The coal feed is pressurised in a lock-hopper system and metered into the gasifier using a screw or roto-feeder and pneumatic conveying with carbon dioxide used as the transport gas. The process feed gases (steam and oxygen) enter the gasifier through the grid and the centre jet at the bottom of the gasifier; steam also enters through the annular region between the centre jet and the bottom ash classifier.

Coal Gasification Reactors

The gasification system consists of the gasifier, ash discharge and ash cooling systems. Within the fluidized bed, the coal reacts with steam and oxygen. The process accomplishes four important functions in a single-stage fluidized-bed gasifier: it de-cakes, devolatilizes, and gasifies the feedstock, and if necessary, agglomerates and separates ash from the reacting coal. At the specified operating conditions, coal is gasified rapidly to produce a synthesis gas product consisting of hydrogen, carbon monoxide, carbon dioxide, methane and water vapour, in addition to small amounts of ammonia, hydrogen sulphide and other trace impurities.

The temperature and pressure of the coarse ash from the gasifier is reduced as ash flows out through the ash classifier and bottom ash handling system. The primary fines recovery

and recycle system consists of two cyclones in series, designated as the primary cyclone and the secondary cyclone, which collect nearly all fines from the gas stream leaving the gasifier. The primary cyclone is designed to efficiently recover entrained fines with a relatively small gas pressure drop. The product gas exits at the top of the gasifier through a refractory-lined pipe to the inlet of the primary cyclone. The primary cyclone is also refractory lined to keep the outer shell of the cyclone from overheating. The fines collected in the primary cyclone are returned to the gasifier by means of a dip-leg.

Syngas leaving the primary cyclone enters the secondary cyclone. As with the primary cyclone, the secondary cyclone is refractory-lined. The fines collected in the secondary cyclone are also returned to the gasifier for further conversion.

Waste Heat Recovery

Energy is recovered from the hot exhaust gases from the Gasifier in the Heat Recovery Steam Generator (HRSG) which serves to increase the energy efficiency of the gasification system. The HRSG is a natural circulation boiler which has a single steam drum and steel structure. The cooled gas leaving the HRSG then enters a high-efficiency cyclone downstream. Steam generated in the HRSG is used in the gasification reaction, and excess steam is added to the plant steam system where it would be used for power generation.

Syngas Filtration & Scrubbing

The cooled raw product syngas is then sent to a third cyclone and ceramic /metal filters for further removal of dust. The collected fines are recycled into the gasifier through a fines management system designed to increase overall carbon conversion of the plant. Syngas from the filters is then sent to the Raw Syngas Scrubber to remove any residual solids and all halides in the gas.

Fines and Ash Handling

Additional fines that are collected from the third cyclone and filters are routed to a fines silo through a lock-hopper system, where they are collected in the baghouse and returned to the gasifier for further conversion. This proprietary SES system is the Fines Management System (FMS) for optimizing carbon conversion.

The bottom ash, upon leaving the ash classifier, is cooled and removed from the plant via a high temperature ash cooler, lock-hopper system, and a low temperature, low pressure screw cooler before being transported outside by a belt conveyor for truck unloading. In the high temperature ash cooler, steam is generated through direct contact with the hot ash and directed through the ash classifier annulus back into the gasifier.

Bottom ash by-product is produced at a rate of 49 t/h (1176 tpd or 0.39 mtpa) from all operating gasifiers. The unburnt Carbon content of the ash is less than 1%wt and the ash is suitable as a material substitute or filler for construction applications.

An area for storage of ash has also been allocated to allow for ash to be safely stored. Ash is expected to be transferred to a hopper and loaded onto trucks for re- use or sale off- site.

Air Separation Unit (ASU)

The ASU will use cryogenic distillation of air to produce 78 t/h (1875 tpd or 0.62 mtpa) of high purity liquid oxygen for the gasification process. High purity nitrogen is also generated, and

this is used as a feedstock for the ammonia plant. Nitrogen is also available for other inerting and purge gas uses in the plant.

Both high purity oxygen and nitrogen can also be made available for external merchant sales should there be a demand. An Oxygen Storage Vessel and a Nitrogen Storage Vessel will be provided onsite for surge capacity to support the plant operations.

3.4.2 Syngas Processing Island

This system is primarily designed to adjust, remove, or reduce specific components in the syngas stream to meet the specification requirement in downstream units.

Gas Treating System

- CO Shift Reactor - The raw solids-free wet syngas flows to the CO Shift reactor to convert the carbon monoxide in the syngas to hydrogen and carbon dioxide via the water gas shift reaction. Heat is recovered from the shifted syngas stream.

- Low Temperature Gas Cooling (LTGC) – This lowers the syngas temperature and removes most of the water in the syngas. It primarily consists of heat exchangers, knock-out drums, and pumps.

- Acid Gas Removal (AGR) – This is a process system package where a circulating solvent is fed to Contactor Columns to selectively absorb acid gases primarily H_2S and CO_2 from the shifted syngas. H_2S is first selectively removed in H_2S Absorber Column. The solvent, rich in H_2S acid gas is stripped to provide a H_2S lean solvent to be returned to the H_2S Absorber Column. The stripped concentrated acid gas stream is fed to the Sulphur Recovery Unit. The sulphur free synthesis gas is then sent to a CO_2 Absorber Column. The solvent, rich in CO_2 is flashed and then stripped to provide a CO_2 lean solvent to be returned to the CO_2 Absorber Column. The recovered CO_2 is compressed and used for transport gas in the gasifier.

- Sulphur Recovery Unit (SRU) – This process system package recovers sulphur from the acid gas stream leaving the AGR. The scrubbed H_2S rich gases are sent to a sulphur recovery unit (SRU) to produce saleable elemental sulphur. 264 kg/h (6.3 tpd or 2112 tpa) of sulphur is contained in the coal feedstock and is produced as elemental sulphur.

- Tail Gas Treating Unit (TGTU) – This system package may be used to convert the small amount of sulphur compounds that were not converted in the SRU to H_2S and returns it back to the SRU.

PSA for Hydrogen Recovery

The pressure swing adsorption (PSA) process is used for the recovery of high purity hydrogen. The process is based on the physical binding of molecules to adsorbent material. Highly volatile materials such as hydrogen are less adsorbable; therefore, impurities can be adsorbed leaving very high purity hydrogen.

Ammonia Synthesis

Clean dry syngas from the PSA unit (7.3 PJ/a or 911 GJ/h) which is mostly hydrogen, is mixed with nitrogen and converted into ammonia at high pressure over a catalyst in the ammonia reactor. The source of hydrogen is the shifted, cooled, and cleaned syngas.

Nitrogen is generated in the ASU. The reaction is exothermic, and heat is recovered by producing steam. The primary equipment in this system include the syngas makeup and recycle compressors, and the ammonia reactor which converts hydrogen and nitrogen into ammonia at high pressure over a catalyst, and the reactor feed-product heat interchanger.

There are various commercial ammonia process technologies available which can be licensed and would be suitable for this complex.

The synthesis gas is converted into 41.7t/h (1000 tpd or 0.33 mtpa) of liquid anhydrous ammonia which is an intermediate in the fertilizer industry. It is also planned to install a 20,000-tonne capacity refrigerated, atmospheric pressure liquid ammonia storage tank onsite to provide surge storage for external sales of anhydrous ammonia product.

3.4.3 Power Island

Two gasifiers will be operated to produce 18.3 PJ/a (2292 GJ/h) of synthesis fuel gas most of which (11.6 PJ/a or 1444 GJ/h) is fed to the PSA/ammonia plant. The remaining synthesis fuel gas 6.7 PJ/a (848 GJ/h) is directed to the gas turbine. A methane rich purge gas (4.3 PJ/a or 533 GJ/h) is generated from the PSA unit upstream of the Ammonia loop. This is mixed with the excess synthesis fuel gas and sent to the gas turbine which generates electrical power.

The hot turbine exhaust gases pass to a Heat Recovery Steam Generator (HRSG) to generate superheated high-pressure steam. This HP steam is combined with superheated steam produced by waste process heat recovery (syngas cooler and ammonia reactor) and forwarded to a condensing steam turbine generator. A total of 96 MW is generated from this combined cycle power generation unit. The power generated supplies the power needed to support the gasification plant complex (about 72 MW) and excess power of 24 MW, is available for export to the Grid.

3.4.4 Utilities and Ancillaries

This plant includes Interconnecting Piping, Pipe Rack and electrical distribution to connect these facilities as well as other Balance of Plant (BOP) scope to account for utilities, buildings, site development, roads, etc.

The Balance of Plant (BOP) typically includes the following Utility systems:

- Flare
- Steam, Boiler Feed Water, Demineralized Water, Condensate Return
- Auxiliary Boiler / Auxiliary Steam Supply
- Cooling Water System (including Cooling Tower, chemical dosing system)
- Raw Water, Service Water, Potable Water
- Fuel Gas, Start-up Fuel
- Plant & Instrument Air, Nitrogen
- Oily Wastewater Treatment System, Storm Water Management, Site Drainage System, Sanitary Sewer
- Fire Water Storage and Fire Protection System
- Electrical Transformers, switch-rooms and motor control centres
- Powerline connection to grid
- Buildings
- Operations Control Room
- First Aid facility
- Chemical Laboratory for Quality Control

- Maintenance Workshop (mechanical, instrument and electrical)
- Operator Change-rooms and mess facilities
- Administration offices
- Ammonia Storage Vessel (nominally 20 days production say up to 20,000 tonne) and export loadout facilities
- Rail Offloading Facility and conveyers for coal supply
- Security and Gatehouse
- Weighbridge
- Ash storage area
- SNG export facility

3.4.5 Accommodation and offices

The Gladstone Energy and Ammonia Project area is located within the Gladstone State Development Area, located approximately 7 kilometres from the centre of Gladstone. In 2016, Gladstone had a population of 61,620 people (Census Quickstats, 2016)[4].

The workforce is expected to be sourced from the Gladstone region. A large construction workforce migrated to the area to build the Curtis Island Gas Plants. It is expected that some of this construction workforce will be re-employed by this project. A site office is expected to be built on site but no on- site accommodation will be required.

3.5 External Infrastructure Requirements

3.5.1 Road Infrastructure

The Project site is well serviced by Serrant Road and Obodin Road which may need some minor upgrades to accommodate heavy vehicle traffic. Appropriate road entry and exits to the site will be designed and developed in consultation with the Department of Transport and Main Roads (DTMR). Service roads and haul roads on site will need to be developed as well.

3.5.2 Rail link and Conveyer for coal delivery

Coal will be transported to the existing Aurizon owned ‘Cement Australia’ spur line where it will be offloaded. Figure 3-4 above shows the two potential coal conveyer routes.

3.5.3 Corridor to Ports

Although, road and rail connections exist to the Port of Gladstone, there is no direct international export of ammonia proposed by the project. Ammonia will be produced and delivered by pipeline to a producer of ammonia products and fertilisers located near the site.

The export of SNG is to a pipeline connection near the site.

The project has no direct impacts or requirements for corridors to the Port except for the importation of Pre-Assembled Modules (PAMs) during the construction phase.

[4] http://www.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/30805?opendocument

Figure 3-5: Proposed Gas Pipeline and Electricity Transmission Line

3.5.4 Connection for Power export and Gas export pipeline

The GEAP proposes to initially connect to the existing 11kV or 66 kV Ergon owned power lines near Fisherman's Landing. The project will develop its own power. A power line easement to connect the power station to the nearby Ergon sub-station will be required. High pressure synthetic natural gas (SNG) will be exported from the plant by underground pipeline. This will run from the plant site and tie into the Queensland Gas Pipeline at Yarwun. (See Figure 3-5 above).

3.5.5 Water Supply and Sewerage

The water requirements for the project are estimated at 1.0 GL/annum. Negotiations with the Gladstone Area Water Board (GAWB) have been initiated to access raw or treated water supply from the existing pipelines along Landing Road bordering the project site.

The Project site has an existing line connecting it to sewer. Process waters will be treated on site for re-use and wastes will be disposed/ discharged in accordance with licence conditions obtained as part of the EIS process.

3.6 Timeframes for the Project

Timeframes for the Project are listed in Table 1 below.

Component	Indicative Start date	Indicative Timeframe	Indicative End date
Environmental and Social studies for IAS and EPBC referral	March 2018	4 months	31 August 2018
Coordinator-General consideration to declare project a coordinated project and if declared, preparation of Terms of Reference.	September 2018	2 -3 weeks	End September 2018
EIS drafted and submitted for Coordinator-General Evaluation	October 2018	15 months	January 2020
Coordinator-General's Evaluation Report including Public Notification.	February 2020	3 months	May 2020
Federal Approval	June 2020	1 months	July 2020
Detail Design	July 2020	6 months	Dec 2020
Material change of use (MCU) and Environmental Authority (EA) approvals from the relevant authorities	August 2020	6 months	Jan 2021
Construction	Jan 2021	1.5 years (18 months)	July 2022
Commissioning	May 2022	6 months	October 2022
First Ammonia and Power Production	October 2022		

Table 1: Timeframes for the Project

3.7 Construction and Operational Processes

The project development will be progressive dependent upon the likely offtake of partners and final design of operations. Typical construction and operational activities will be in accordance with the Construction Environment Management Plan and include the following:

- Mobilisation of personnel and equipment to site for initial works;
- Clear vegetation and strip topsoil and subsoil from designated construction areas;
- Build pad, temporary workshop, warehouse, office, and initial site roads;
- In accordance with the Storm Water Management Plan, construct diversion drains and bunds to keep clean water off the site; and construct drains, sumps, sedimentation ponds, and silt traps to manage water on the site;
- Initial earthworks would include the installation of sediment and erosion controls and stormwater drainage diversions, development of lay down areas and soil management areas;
- Excavated topsoil would be managed appropriately;
- Access to the site will use existing roads where practicable but additional roads may also be built where needed;
- Clear vegetation and strip topsoil and subsoil from the construction site;
- Construct laydown pads, and roads;
- Implement noise mitigation and construct noise bunds where required;
- Commission production equipment and ramp-up of plant activity;
- Operations, cut back, capital advancements;
- Implement progressive rehabilitation programs and remediation;
- Demolition, decommissioning and rehabilitation of temporary infrastructure and disturbed areas; and
- Mobilisation and advancement of transport corridor outcomes and solutions.

3.8 Workforce Requirements during Construction and Operations

During peak construction of the project, the estimated workforce for the 1.5 year period would be 800 persons. Over the 30-year life of the project, the operational workforce is estimated to be 200 persons. During operations, it is estimated that the project will generate over 1,520 indirect sustainable jobs in the supply chain (1 job equivalent to creation of 7.6 jobs indirectly as per the ABS employment multiplier).

3.9 Economic Indicators

A conceptual plant operations study has been conducted, specifically focussing on associated economics that verify a commercial operation at 330,000 tonnes per annum of ammonia, 6 PJ of SNG and 24 MW of export power for 30 years. Information on the Economic Indicators is summarised in Table 2 below. Further studies into other mining options and production rates will be completed during the definitive feasibility study.

Modelled Results*	Output
NPV (Real, after tax)	$420 million
IRR	% 26
Payback Period (undiscounted)	8 years
Total Life Of Project (LOP) Revenue (undiscounted)	$6.2 Billion
LOP Average Annual EBITDA	$ 118 million
LOP Average Annual NPAT	$ 85 million
LOP Average Operating Margin	$ 118 million
First 15 years full production rate	6 PJ of SNG and 330,000 tonnes of ammonia
Final 15 years of full production	6 PJ of SNG and 330,000 tonnes of ammonia
LOP Total Operating Expenditure	$ 2.85 Billion
PFS Assumptions	**Input**
Annual Production Rate (17% (av) ash)	16 PJ of SNG and 330,000 tonnes of ammonia
30% ash coal	1.5 mtpa
LOP Production of ammonia	10.2 million tonnes
Project Life	30 years
Coal Price (Delivered)	$ 35/ metric tonne
Exchange Rate (AUD/USD)	0.77
Discount Rate	10 %
Development Capital Expenditure	$ 1,000 million
Sustaining Capital Expenditure	$ 15 million / annum
Total NPAT Revenues (Undiscounted)	$2.4 Billion

Total NPAT of 20 years full production	$1.6 Billion

Table 2: Economic Indicators for the Project

3.10 Financing requirements and implications

The projects will be financed via a combination of:

1. securing of strategic partnership with appropriate offtakers for gas and ammonia, with the intent of one or more of those partners taking an ownership interest in the project;

2. securing of selected Engineering Procurement Construction Management (EPCM) contractor to provide EPCM services to the project, and associated finance;

3. equity contributions from current and new shareholders, with the likelihood of a listing of the company on Australian Stock Exchange; and

4. project finance in the form of debt finance (likely to the extent of 65% of total project development costs).

4 LOCATIONS OF KEY PROJECT ELEMENTS

4.1 Location

The Project is owned by AFE and is to be located within the GSDA. The proposed site is approximately 15 kilometres north-west from the centre of Gladstone town and 550 kilometres north of Brisbane. Figure 4 -1 shows the Plant Location with respect to neighbouring urban centres.

Figure 4-1: Plant Location and Gladstone Urban Centre

4.2 Tenure

The GEAP Plant is to be based on Lot 57CP902700 within the GSDA. The land in question is owned freehold by the Minister for Economic Development Queensland (EDQ) and regulated by the Queensland Coordinator-General. A suitable lease or purchase agreement will be negotiated with the Minister for EDQ.

The project site is located over mining tenure MLA 80081, for the purpose of Clay-Kaolin / Kaolinite, Clay-Pottery / White Ware, Iron Ore, Oil Shale and is held by QUEENSLAND ENERGY RESOURCES LIMITED, GPO Box 5214 Brisbane QLD 4001, and has an expiry of 31/10/2021.

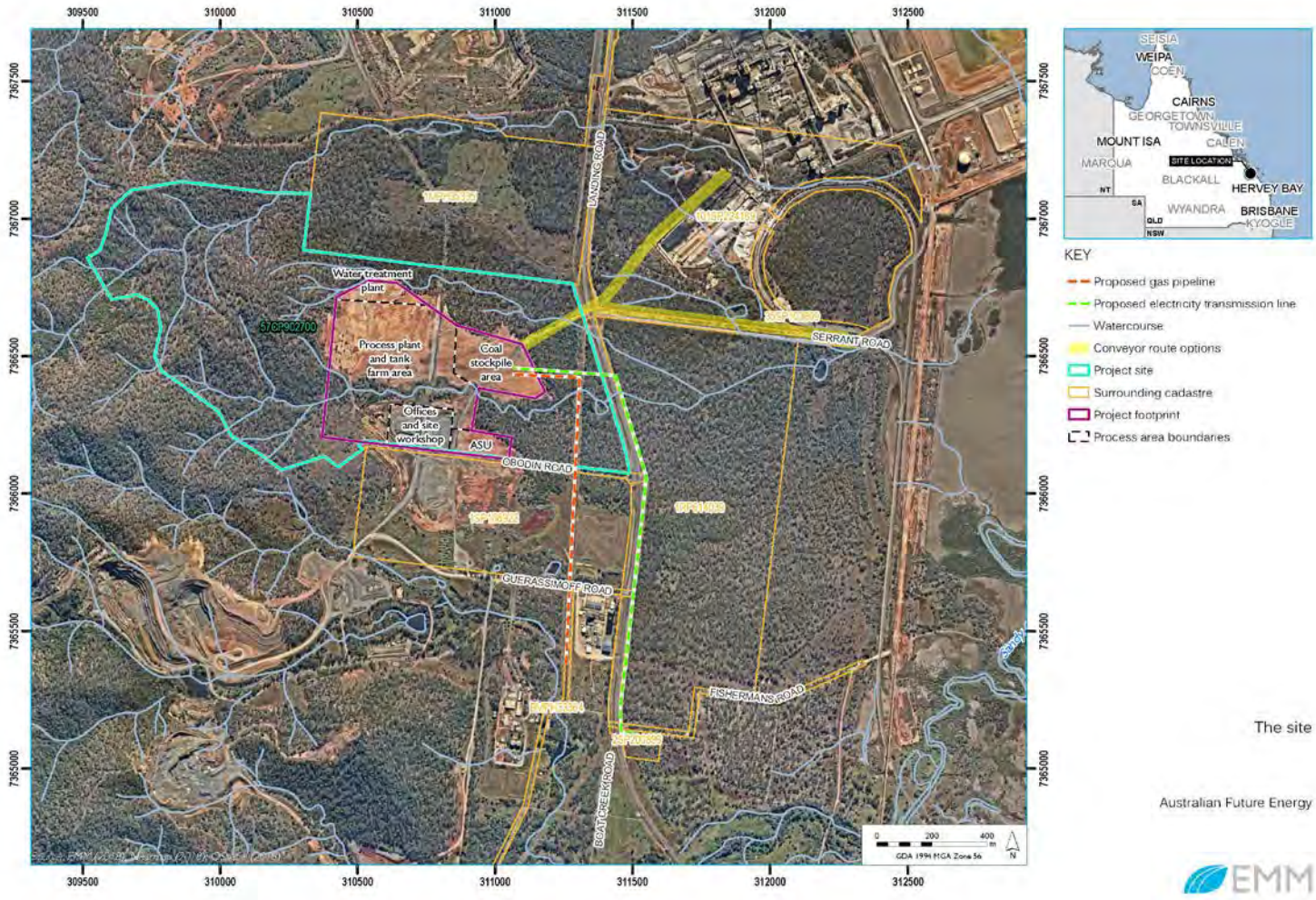

Figure 4-2: Lot and Plan and Easements

The external infrastructure includes:

1. The Coal conveyer which runs on Lot 57 CP902700 to Landing Road. After crossing Landing Road one option travels along Serrant Road, in the road reserve owned by the Gladstone Regional Council or on the adjacent Cement Australia Land (101SP244189). The second option runs directly to the Cement Australia coal stockpile area on Cement Australia land. See Figure 4-2 above.
2. The high-pressure gas pipeline is expected to use the existing infrastructure easement which runs parallel to Landing Road. It crosses Lot 1 of SP108922 and then Guerassimoff Road before continuing on Cleanaway's Northern Oil Refinery site. (BMPH33364).
3. The electricity line will follow the existing electricity line easement to the substation at the junction of Fisherman's Road and Landing Road.

4.2.1 Lot and plan

Table 3 below details the lot and plan for the various project components.

	Lot and Plan Description	Ownership
Gladstone Energy and Ammonia Plant	Lot 57CP902700	Minister for Economic Development Queensland (EDQ)
Coal Conveyer Options	Lot 57CP902700 Road Reserve 101 SP 244189 (Cement Australia site)	
High Pressure Gas Pipeline	Lot 57CP902700 Lot 1 of SP108922 Guerassimoff Road (Road Reserve) Northern Oil Refinery. (BMPH33364)	
Electricity Line Easement	Lot 57CP902700 Landing Road Crossing QER land (1 RP614039) or road reserve. Fisherman Road crossing (GRC/ Ergon)	Tie-in location under investigation with Ergon

Table 3: Lot and Plan Description

The Project Site will be subject of freehold purchase or long-term lease arrangements subject to the Project achieving financing conditions and regulatory approval.

4.2.2 Easements and Lease Arrangements

There are three easements on the property:

Easement C on SP137062 to QCL Limited (Cement Australia);
Easement D on SP116555 to Alinta DQP Pty Ltd (Jemena); and
Easement B on SP137062 to Ticor Chemical Company.

Other matters of interest

Queensland Energy Resources Mining Lease
The project is proposed on land with a current mining lease application (ML(A) 80081) held by Queensland Energy Resources (QER). A suitable agreement with QER has been reached to allow for the development of the Project on this site.

Figure 4-2 above shows easements in favour of Cement Australia, Jemena and Ticor have been granted on the lots proposed for the GEAP Project. The project design will ensure that

it is compatible with these easements (eg. electrical lines will have sufficient buffer from gas pipelines) and access agreements will need to be negotiated with the relevant stakeholders.

Negotiations with Aurizon are in progress to finalise the rail offloading facility and its connection with the conveyer system for delivery of coal to site. An easement with an overhead crossing will be required from the rail offloading facility to the GEAP site. It is expected that this easement may be required on land held by Cement Australia, QER and DTMR (Landing Road crossing).

Gas pipeline
Currently, there is a QGP radial gas pipeline running across the east side of the property operated by Jemena. Jemena is assessing the best gas tie-in point located nearest to the Project Plant including 2 potential locations on the plant property.

Native Title and ILUA's
Native Title has been wholly extinguished on the proposed Project Plant (Lot 57CP902700) site. Further investigations will be conducted for all off site infrastructure as part of the EIS process.

4.2.3 Regulatory Planning Framework

The project is located within the GSDA. Figure 4-3 below details the zoning within the GSDA. The site is within the lands zoned for Medium – High Impact Industry. According to the Queensland Department of State Development, Manufacturing, Infrastructure and Planning, the GSDA is "ready to accommodate":

- large-scale, large-footprint industrial development;
- industrial development requiring access to strategic port logistics and maritime facilities;
- port-related activities;
- liquefied natural gas processing, storage and export facilities;
- industries to support major industrial development;
- materials transportation infrastructure and utility and service infrastructure; and
- gas transportation infrastructure and other compatible infrastructure.[5]

Development that is not regulated by this GSDA development scheme may be regulated by other legislation and planning instruments, including the *Planning Act 2016* and the Gladstone Regional Council planning scheme.

[5] https://www.statedevelopment.qld.gov.au/coordinator-general/the-gladstone-sda-is-open-for-business.html

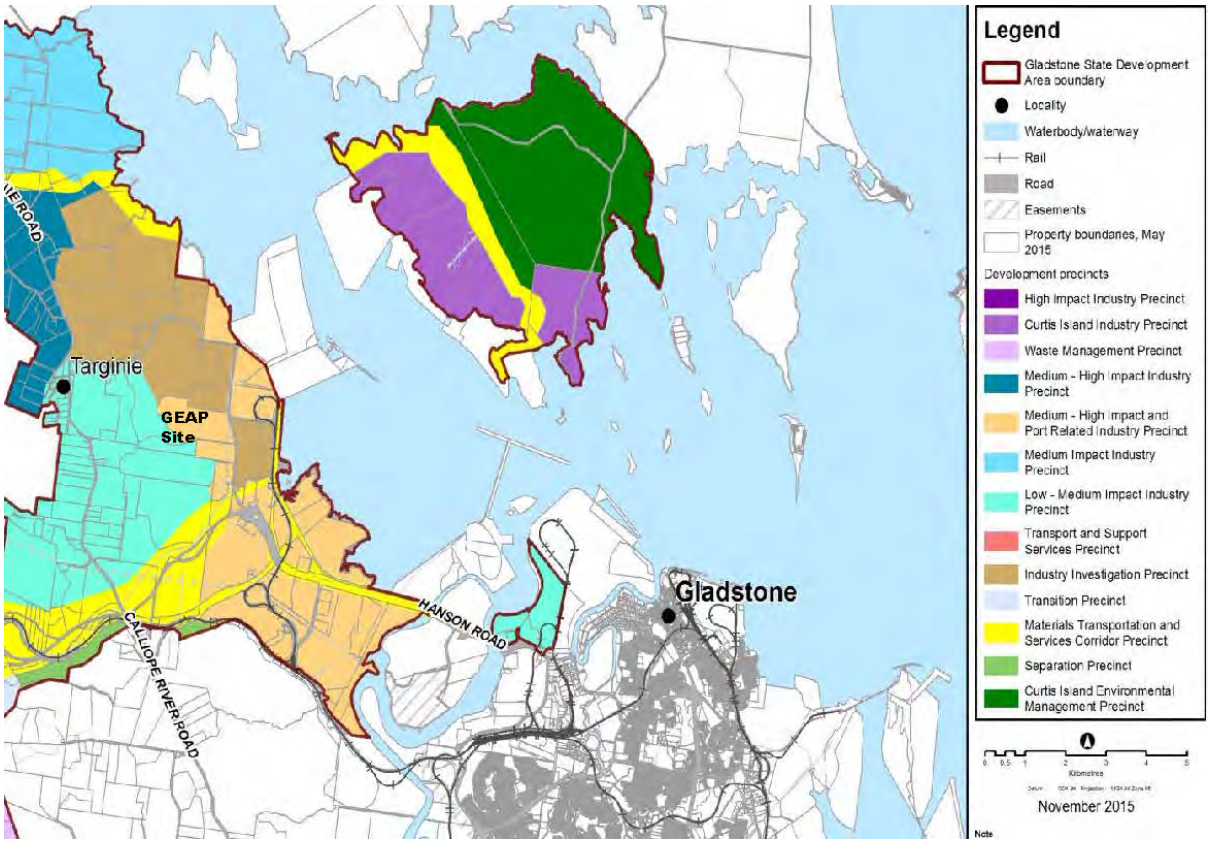

Figure 4-3: Gladstone State Development Scheme with Gladstone Ammonia Plant Site

The project does not include the export of ammonia or SNG which will be delivered to the network and on sold either to an existing gas supplier or to local industry. Accordingly, the interaction with Gladstone Port is expected to be limited to the import of Pre-Assembled Modules (PAM's) during the construction phase only.

5 DESCRIPTION OF THE EXISTING ENVIRONMENT

5.1 Natural environment

The project site is located on Landing Road, Gladstone approximately 15 km to the north-west of the township. The property where the process plant is to be sited, (Lot 57 CP902700) contains a large cleared area in the central part of the site, and many areas are highly disturbed as a result of a previous quarry and construction laydown activities located on the property. Disturbed areas include those cleared for the establishment of dirt access roads to facilitate the quarry resources being transported off site and a powerline easement also runs through the property on its eastern boundary parallel to Landing Road.

The land is generally flat with steeper topography to the west forming part of a ridgeline. There are two minor ephemeral drainage lines on the property with larger watercourses being Boat Creek to the south and Targinie Creek to the north of the property.

5.1.1 Climate

The proposed Project Site is located within the Gladstone Regional Council Area. Gladstone is located in Central Queensland and experiences a sub-tropical, coastal climate. The region experiences average annual rainfall of approximately 1,000mm.

The daily temperature variation in summer months is an average of 22.4 °C to 31.1 °C (January), with the coldest month of the year showing an average temperature range of 13.2 °C to 22.6 °C (July). The highest temperature recorded at the Gladstone Radar site is 40.1 °C, and the region has a mean number of 3.9 days per year when the temperature is over 35 °C. The lowest recorded temperature is 4.4 °C. The mean annual minimum temperature is 18.5 ^{0}C and mean annual maximum is 27.7 ^{0}C.

Gladstone experiences a wet season in the summer months, with the highest rainfall received from December to February. The region experiences an average annual rainfall of 918 mm, with an average of 97.5 rain days per year. Both the highest monthly rainfall (709.8 mm) and the highest daily rainfall (229.4 mm) were recorded in the month of February. The summer months, November through to March, have high average monthly rainfalls, ranging from 78 to 154 mm per month. Rainfall during these months typically represents two-thirds of the annual total rainfall. Almost no rainfall is recorded in the months of May to September in some years. Average annual rainfall is 876.8 mm.

The prevailing wind direction is from the east and southeast, with a mean wind speed of 20.7 km/hr at 3pm. (WeatherZone 2008). Evaporation is highest from November through to February, with a mean daily evaporation rate of between 5.9 to 6.4 mm. The winter months have an evaporation rate of about 3 mm. Table 4 and Table 5 below summarise the existing meteorological conditions for Gladstone.

Table 4: Gladstone Post Office – Meteorological Records (1872-1958)[6]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Mean Daily Max Temp (°C)	29.9	29.7	29.1	27.8	25.1	22.8	22.2	23.1	24.8	26.7	28.3	29.6	26.6
Mean Daily Min Temp (°C)	22.2	22.1	21.0	18.2	15.0	12.6	11.4	12.2	15.0	17.9	20.1	21.6	17.4
Mean Rainfall (mm)	181.6	191.1	129.6	61.0	46.1	63.1	47.3	23.7	30.9	15.9	75.1	118.7	1,020.1
Highest Daily Rainfall (mm)	371.3	478.3	215.6	109.5	156.0	221.5	203.2	57.4	52.3	136.9	110.5	260.4	478.3

Table 5: Gladstone Radar – Meteorological Records (1957-2017)[7]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Mean Daily Max Temp (°C)	31.4	31.0	30.2	28.4	25.7	23.3	22.9	24.2	26.6	28.5	30.0	31.1	27.8
Highest Max Temp (°C)	38.3	40.1	37.0	34.1	31.3	29.3	28.7	30.4	33.8	40.0	40.1	39.8	40.1
Mean Daily Min Temp (°C)	22.4	22.3	21.4	19.6	16.9	14.1	13.2	14.1	16.3	18.6	20.5	21.8	18.5
Lowest Min Temp (°C)	12.8	17.2	16.2	11.0	8.5	6.1	4.4	4.7	9.6	10.9	14.7	12.4	4.4
Mean Rainfall (mm)	150.3	141.7	105.4	47.3	56.4	38.1	35.0	31.5	27.0	60.3	68.6	125.0	893.8
Highest Daily Rainfall (mm)	254.4	248.0	156.0	97.8	178.0	94.8	92.7	78.2	75.0	149.4	88.0	196.0	229.4
Mean Daily Evaporation (mm)	6.4	5.9	5.4	4.5	3.4	3.0	3.1	3.5	4.3	5.4	6.0	6.3	4.8

5.2 Topography, Geology and Soils

The project site is characterised by level coastal plain which has been heavily disturbed by previous quarrying activity. Much of the project site has now been quarried away, creating an artificial, flat land surface on which the Project will be located. Elevations across this artificial surface range from 20 m AHD in the east to 40 m AHD at the base of the quarry face in the west. Elevations then increase sharply to 50 m AHD at the top of the quarry face and continue to rise to 100 m AHD at peak of the hill. The proposed project site is within the flat land which lies at 20m – 40 m AHD. Further, to the west about 5 kilometres away, the land rises to Mount Larcom at 632 m AHD.

[6] Source; Gladstone Nickel SEIS, Air Quality Assessment URS Feb 2007. http://eisdocs.dsdip.qld.gov.au/Gladstone%20Nickel/eis/Appendices/appendix-m-air-quality-and-greenhouse-gas-assessment.pdf

[7] Bureau of Meteorology http://www.bom.gov.au/qld/forecasts/gladstone.shtml

5.2.1 Geology

Geoscience (2011) described the geology in the project area as follows:

- Holocene – sandy mud with minor gravel, alluvial deposits of gravel, sand, silt and clay, supratidal flats and coastal grasslands.
- Quaternary – sand and subordinate, silt and clay, residual soil and colluvium.
- Late Tertiary/Quaternary – clay, sand, silt, gravel, colluvial and residual deposits.
- Devionian/ Carboniferous - red green and white chert, mudstone, siltstone, lithic sandstone, limestone and basalt.

At the project site, the geology to a depth of approximately 45 metres consists of surficial deposits which extend to 30 metres below the surface consisting of alluvial gravel, sand silt, clay and mud ridge sand. Below this is a layer of colluvial deposits which extend for a maximum of 15 metres consisting of colluvial gravel sand, soil and sandstone.

5.2.2 Soils

The major soils are red, structured gradational clay loams and uniform clays; shallow, bleached sandy and loamy surface, and red duplex soil. CSIRO (2014) classify the soils in the project area as chromosols, sodosols and tenosols. The predominant soils in the project site are chromosols, which are not strongly acidic or sodic. At this stage it is not known whether acid sulphate soils are present onsite. Prior to plant construction, an investigation will need to be undertaken to determine the presence of acid sulphate soils within the site.

The soils that have been identified in the area largely reflect the geological regimes in which they occur. The main soil types within the area comprise:

Soil Class	Soil Type
Uniform or gradational medium – textured soils, loams, gravely loam soils	Shallow to medium deep uniform or gradational gravely clay loam to gravely light to medium clay soils over HW rock between 0.5 – 1.2 m
	Medium to deep gravely clay loam- loamy gravelly surface gradational red earth soils with massive apedal tending to weak to mod structured gravelly light to medium clay subsoils over HW rock or gravelly colluvium between about 0.6 – 1.5m+.
Sandy to silty loamy surface duplex soils with acidic to alkaline non-sodic, non-saline clay or sandy clay subsoils.	Shallow to medium deep, gravelly loam or hardset loamy surface, weak duplex soils with brown or reddish brown medium heavy clay or gravelly clay subsoils over HW rock.
	Medium deep gravely loam and clay loamy surface duplex soils with weak to moderate strongly structured brown and reddish-brown medium to heavy acidic clay and locally gravelly clay subsoils over HW rock between 0.8 – 1.4 m.
Silty or clay loamy surface duplex soils with strong acidic or strong alkaline, sodic and often saline clay subsoils	Shallow clay loam to gravelly loam surface duplex soils with a pale or bleached sub- surface (A2) horizon over red- brown, structured acidic, locally strongly acidic dispersive, medium to heavy clay or gravelly clay subsoils.
	Medium deep hardset sandy to silty loamy, locally gravelly surface duplex soils with a pale or bleached (A2) horizon over brown or yellow brown diffusely mottled moderate saline, sodic or dispersive heavy clay subsoils.
Uniform or weakly gradational (non-cracking) clay or silty clay	Shallow uniform clay soils with dark coloured organic rich friable well-structured medium clay surface soils over strong fine to medium structured heavy clay subsoils over HW rock.

soils (incipient cracking clays).	Medium to deep uniform clay soils, locally gravelly clays of high plasticity, often slightly to moderately saline, sodic and dispersive in the deeper subsoil layers.
Uniform (cracking) grey, brown or red clay soils.	Uniform dark grey brown (cracking) clay soils.

Table 6: Soil Class and Types

The soils and geology are considered suitable for the development of the Project. Additional site-specific geotechnical studies will be undertaken during the EIS process.

5.3 Flora and Fauna

Key biodiversity values identified on lot 57 CP902700 from the desktop assessment [8] included:

- areas of mapped essential habitat for Greater Glider (*Petauroides volans*);
- watercourse vegetation;
- potential for presence of threatened[9] fauna species including Koala (*Phascolarctos cinereus*), Coastal Sheath-tail Bat (*Taphozous australis*), Powerful Owl (*Ninox strenua*) and Squatter Pigeon (southern) (*Geophaps scripta scripta*); and
- potential for presence of threatened flora species including *Cycas megacarpa* and Quassia (*Samadera bidwillii*).

Based on results of the desktop assessment the following threatened fauna and flora species were targeted during field ecology surveys:

- Greater Glider;
- Koala;
- Squatter Pigeon (Southern);
- Powerful Owl;
- Coastal sheath-tail Bat;
- *Cycas megacarpa*; and
- Quassia (*Samadera bidwillii*).

Baseline terrestrial flora and fauna surveys on Lot 57 CP902700 were undertaken in April 2018. The surveys adopted methods consistent with relevant State and Commonwealth flora and fauna survey guidelines, and timing meets requirements for an autumn seasonal survey.

On site vegetation surveys confirmed the presence of remnant vegetation in the study area which is dominated by Least Concern RE12.11.6, Corymbia citriodora, E. crebra woodland. The eastern portion of the study area adjacent to Landing Road was also found to support predominantly RE12.11.6, with the Least Concern regional ecosystem RE11.3.29 present where the geology consisted of quaternary alluvium.

Lot 57 CP902700 is mapped as containing approximately 78 ha of remnant vegetation dominated by Least Concern Regional Ecosystem (RE) 12.11.6 Corymbia citriodora subsp. variegata, Eucalyptus crebra woodland on metamorphics +/- interbedded volcanic. Largest patches of remnant vegetation are found in the western section of the property connected with Targinie State Forest, and narrower patches exist along the eastern boundary adjacent to Landing Road. The central portion of the property has been cleared however along the watercourses there are areas of mapped high value regrowth (HVR). Findings were relatively

[8] EMM Consulting (2018) Desktop Ecology Assessment Report on Lot 57 CP902700 and Lot 1 SP108922. Prepared for Australia Future Energy and Solar Mining Services Pty Ltd.

[9] Threatened species refers to species listed as critically endangered, endangered, vulnerable and near threatened under the Nature Conservation Act 1992 and Environment Protection and Biodiversity Conservation Act 1999

consistent with Qld Government regulated vegetation mapping for the site, with changes including remnant boundary adjustments, remapping of heterogeneous communities (RE12.11.6/12.11.7) to homogeneous community (RE12.11.6), addition of some regrowth vegetation, and refinements around tracks and easements. See Figure 5-1 below.

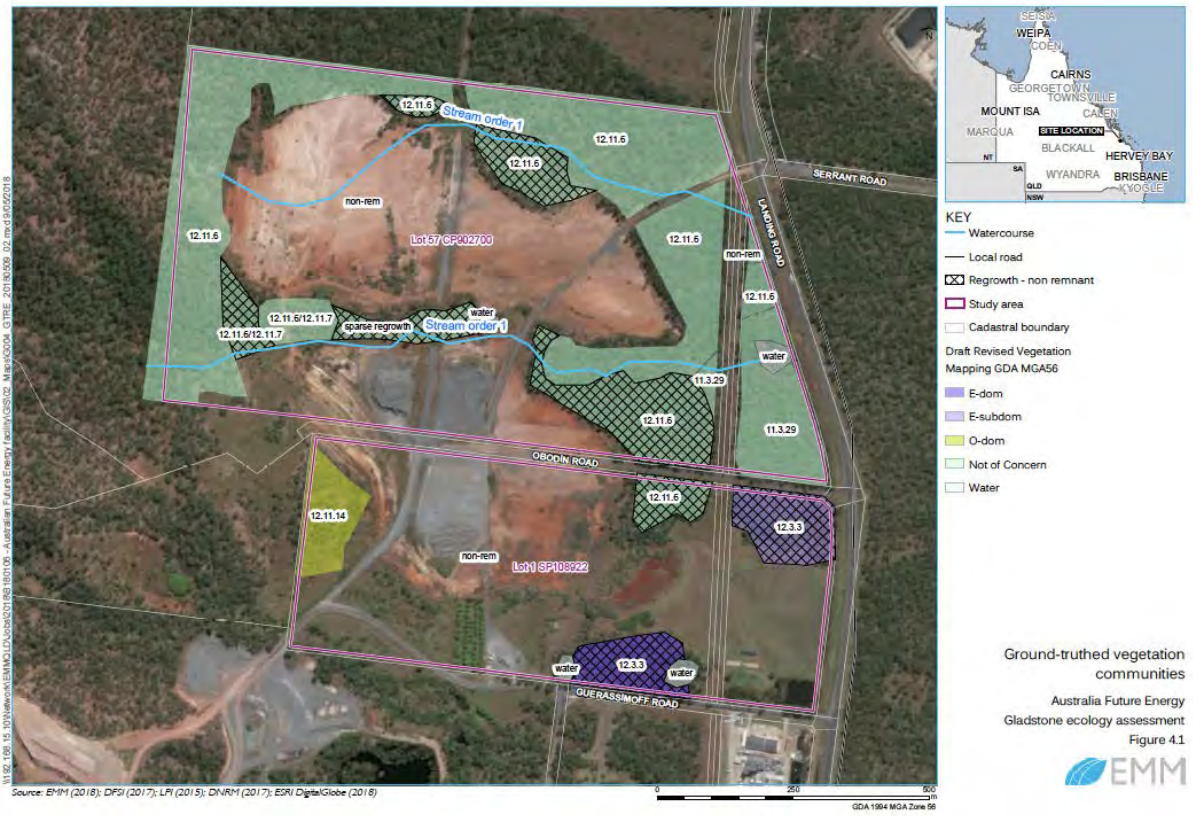

Figure 5-1: Ground truthed – Vegetation Communities

Vegetation across the site was found to be disturbed with significant populations of exotic weed species and widespread anthropogenic disturbance, including previous clearing, excavations and the dumping of rubbish. The western portions of the study area were found to support relatively intact vegetation with minimal anthropogenic disturbance visible, though the exotic weed species Hyparrhenia rufa (thatch grass) and Lantana camara (Lantana) were wide spread. In the eastern (and north eastern) parts of the site the disturbance was more wide spread and whilst some areas had relatively intact ground layers in many areas exotic pasture species dominated.

No threatened flora species were detected during surveys.

A total of 54 vertebrate species were recorded during surveys including 39 bird species, 7 reptile species, 5 mammal species and 3 amphibian species.

A number of bird species were observed due to presence of food sources including nectar for honeyeaters and lorikeets, grass seeds for finches, and water sources on site and in adjacent property from areas of standing water in drainage line and dams that have been built. The majority of bird species observed are commonly found in disturbed and urbanised environments. Rainbow bee-eater, white-bellied sea eagle and whistling kite were observed which are listed as 'marine' species under EPBC Act. The species may use the site for foraging or dispersal. These marine species are not 'migratory' species therefore are not

formally matters of national environmental significance (MNES). No threatened fauna species were observed, including no observations of Koala scats or scratches.

Bat calls were recorded over five consecutive nights using three Anabat detectors. Five species of bat were positively identified being; *Chalinolobus gouldii, Miniopterus australis, Miniopterus orianae, Austronomus australis* and *Chaerephon jobensis*.

5.3.1 Pest Species

A large number of cane toads were caught in pitfall and Elliott traps and a feral pig (*Sus scrofa*) was observed during spotlighting. Feral pigs are a restricted invasive animal under the Biosecurity Act 2015, which requires that all reasonable and practical steps to minimise the risks associated with this pest animal are taken.

5.4 Surface Water

Surface water and drainage

The site is bounded by Landing Road to the east and Obodin Road to the south. Abutting the Project site to the west is the Targinie State Forest, and approximately 1 km to the east are the waters of Port Curtis and the Fishermans Landing Wharves. The closest permanent or semi-permanent watercourse is most likely the third order Boat Creek, approximately 2 km to the south and, beyond this, the sixth order Calliope River, 7 km to the south.

The Project footprint is to be located predominantly within the cleared area of the existing site as shown in Figure 5-2 below. This area is heavily disturbed from past quarrying activities and highly prone to erosion.

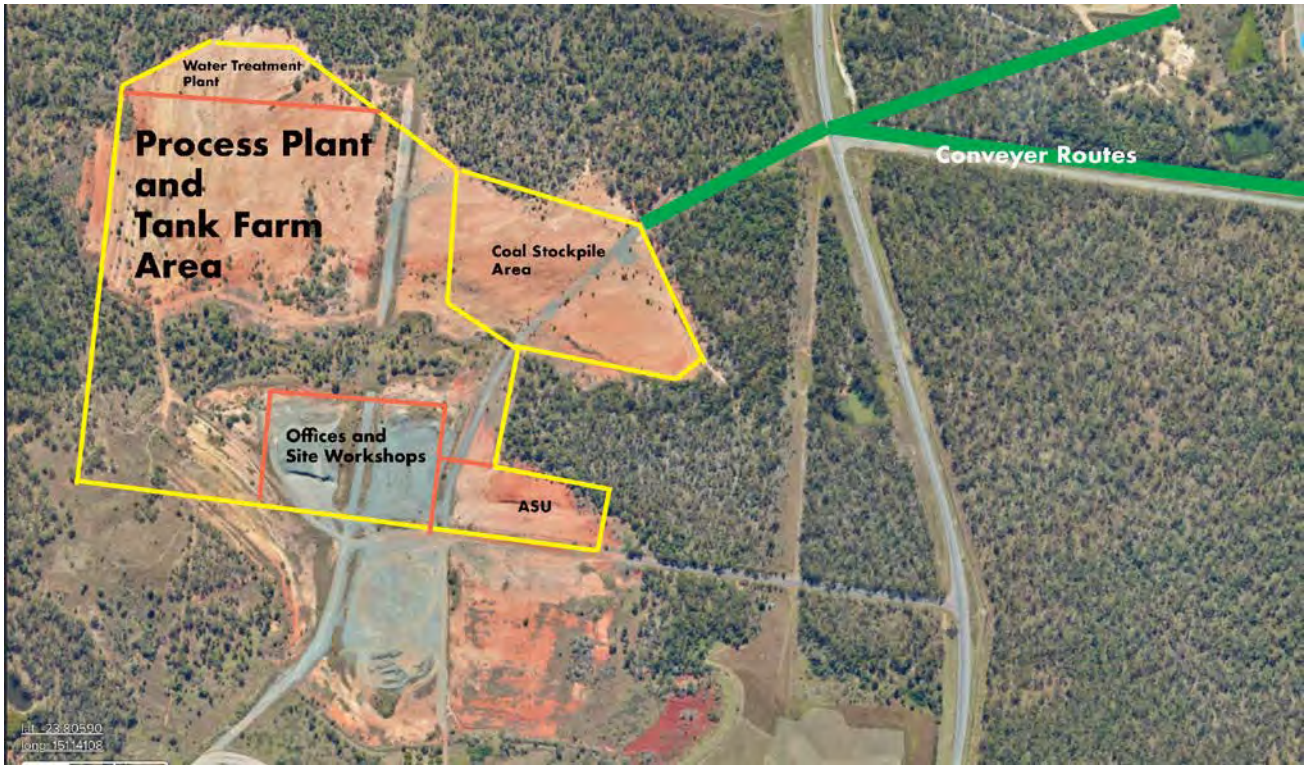

Figure 5-2: Overlay of Project plant footprint

The relatively impervious red fine gravel surface has been riddled with erosion gullies from past rainfall events as seen in Photograph 5-5 below. Pest weed species provide some erosion protection.

Figure 5-3: Erosion gullies in red fine gravel site surface

Figure 5-4 below shows the drainage lines in the project site area. The water flows from the Targinie State Forest located to the west, via three first order minor ephemeral drainage lines to the waters of Port Curtis some 1.5 km away. The catchment is highly disturbed in some areas, particularly in the lower reaches where a number of industries exist, and urbanisation has occurred. The main drainage line is located in the northwest corner of the site, a second, is minor and cuts through the southern boundary of the site just north of Obodin Road. The third drainage line runs to the south of the project and drains to the south of Guerisimoff Road.

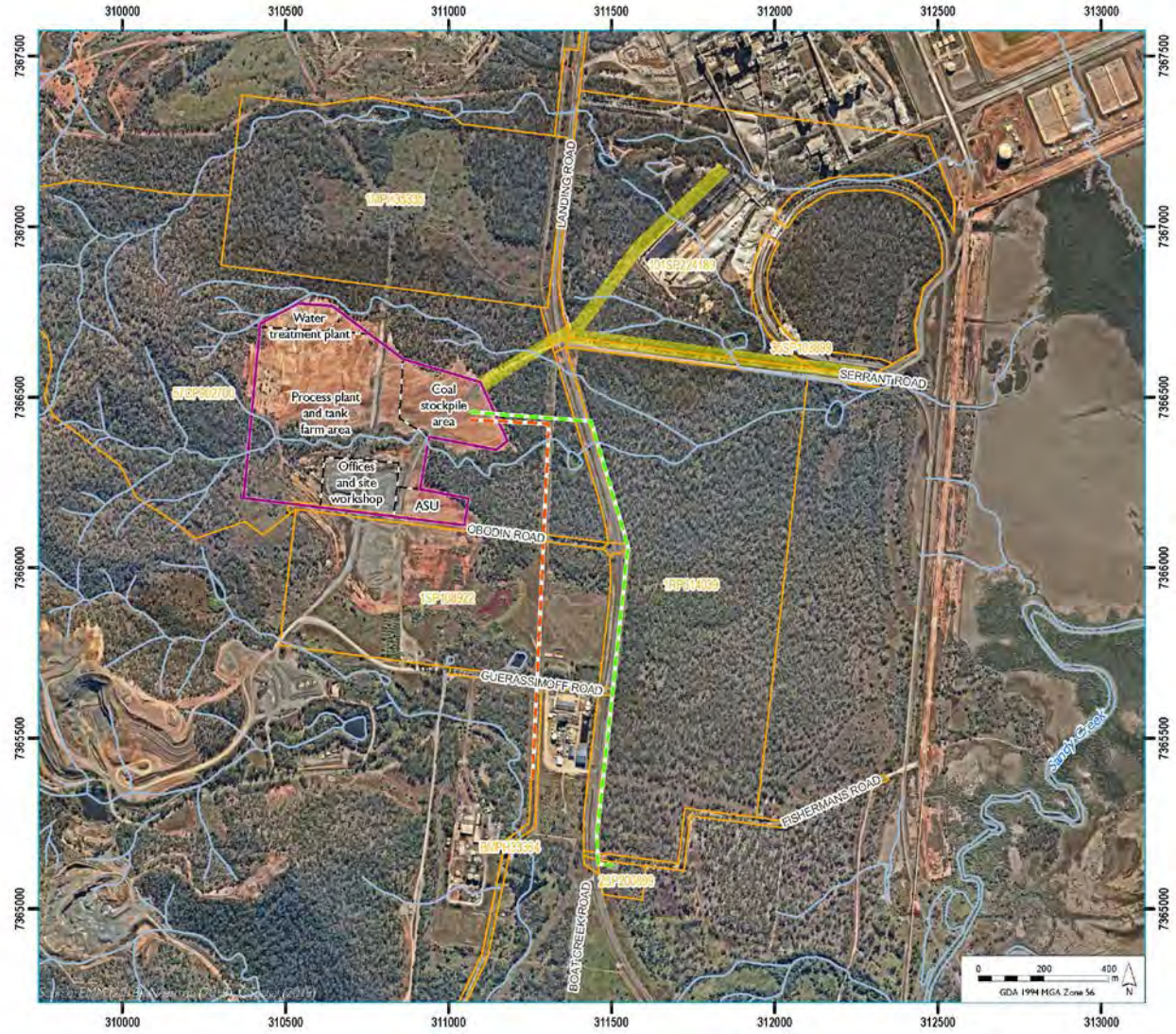

Figure 5-4: Map showing drainage in Project Site Area

The first two drainage lines which run through the Project site flow into depressions or natural basins on the adjacent Queensland Energy Resources site. These natural basins overflow to another large basin near the rail line at the end of Serrant Road which overflows via culverts (see Figure 5-5) to Sandy Creek which flows into the bay.

Existing impacts on Great Barrier Reef World Heritage Area

Although erosion is currently occurring on the site, there is minimal evidence of any sediment reaching this basin near Sandy Creek.

Figure 5-5: Project site drains to a natural basin before it overflows through the culverts

5.5 Groundwater

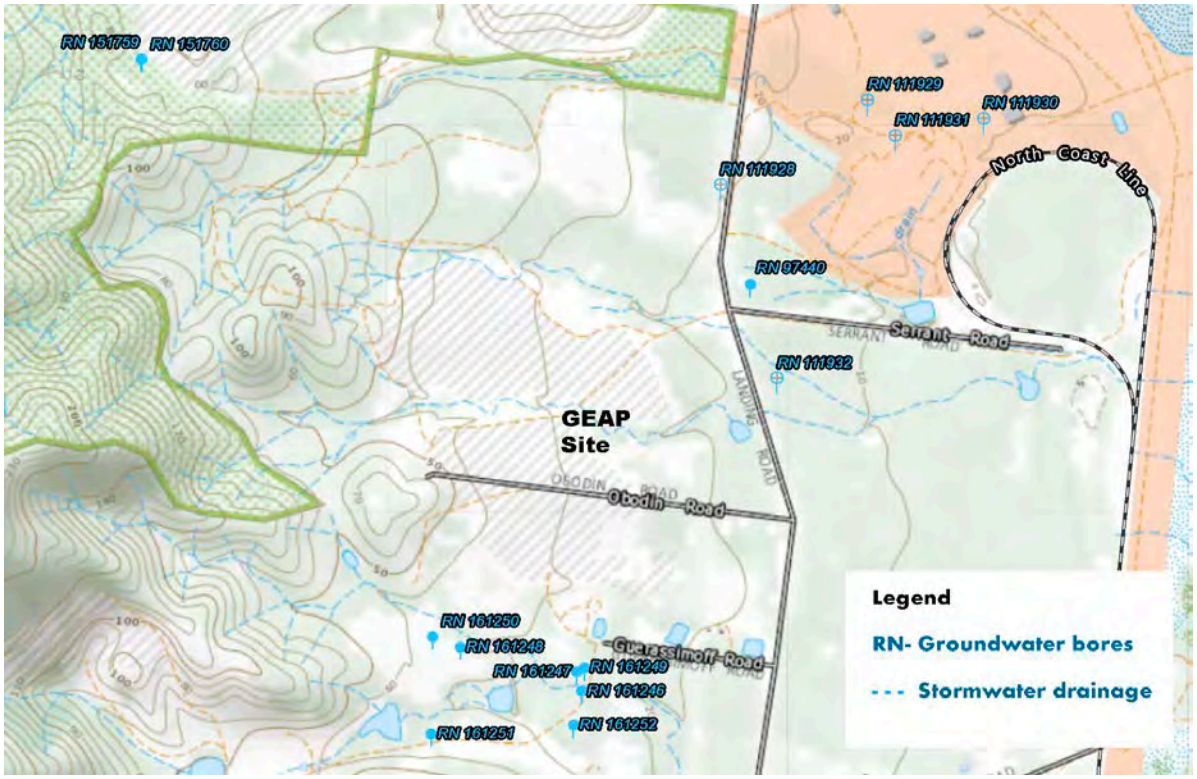

Figure 5-6: Drainage lines and Water bores near the Project Site[10]

[10] Queensland Globe – Topographic Overlay

The Project Area is mapped as being within the Bondoola groundwater chemistry zones within the Calliope groundwater area and has been characterised as having moderate salinity, with levels of water hardness (calcium and magnesium) in the water. [11]

Groundwater in the vicinity of the project is associated with the unconfined Quaternary alluvial aquifer and the deeper confined, low transmissivity, Rundle formation groundwater system. [12]

Groundwater is expected to flow towards the Calliope River located to the south of the project site, with saltwater intrusion expected as groundwater reaches near the tidal flats and the river.

A number of registered monitoring bores exist on the neighbouring Queensland Energy Resources site to the East and the Southern Oil Refinery and Cleanaway sites to the south.

These have been shown in Figure 5-6. Additional bores are also present on the Cement Australia site which is located further to the north.

Great Artesian Basin

The Project area is outside the Great Artesian Basin area.

Groundwater Dependent Ecosystems

There are no identified Groundwater Dependent Ecosystems (GDEs) including aquatic, terrestrial or subterranean on the subject properties based on review of the Groundwater Dependent Ecosystems Atlas (BOM 2018). Some minor areas adjacent to Sandy Creek in the south are mapped as potential aquatic and terrestrial GDEs. These potential GDEs will not be impacted by the proposed developments [13] .

5.6 Air

The existing Gladstone air shed environment, both locally and in a regional context, has been described by records of temperature, rainfall and wind speed and direction in Section 5.1.1.

Gladstone is an industrial town currently providing a home to major industry. The site's closest neighbours include Cement Australia, North Oil's waste oil refinery, Transpacific Industries waste management facility, Rio Tinto's Yarwun Alumina Plant and Orica's chemical manufacturing complex.

Other major industries in the Gladstone area which release emissions into the air shed include:

- Australia Pacific LNG;
- Santos Gladstone LNG;
- Queensland Curtis LNG;
- Queensland Alumina refinery;

[11] Department of Environment and Heritage Protection, 2014, WQ1312 Gladstone Harbour and the Narrows: Parts of Basins 131, 132 and 133: Environment Protection (Water) Policy 2009: Central Queensland Map Series.
[12] Gladstone New Fuels Development Project- Stage 2A Project Description to support Draft Terms of Reference. – Queensland Energy Resources as lodged with Department of Environment and Heritage Protection (2014).
[13] Desktop Ecology Study for GEAP, EMM, April 2018.

- Boyne Island Alumina smelter; and
- NRG Gladstone's coal fired power plant.

The prevailing winds carry emissions from the State Development Area (SDA) on which the proposed GEAP is to be built, away from the city. New industries developing in the Gladstone area have accordingly been encouraged to locate downwind of the township and in this area.

Annual wind roses developed for the proposed Gladstone Nickel project located within the SDA, approximately 2 kilometres south west of the proposed Project site have been included in Figure 5-7 below.

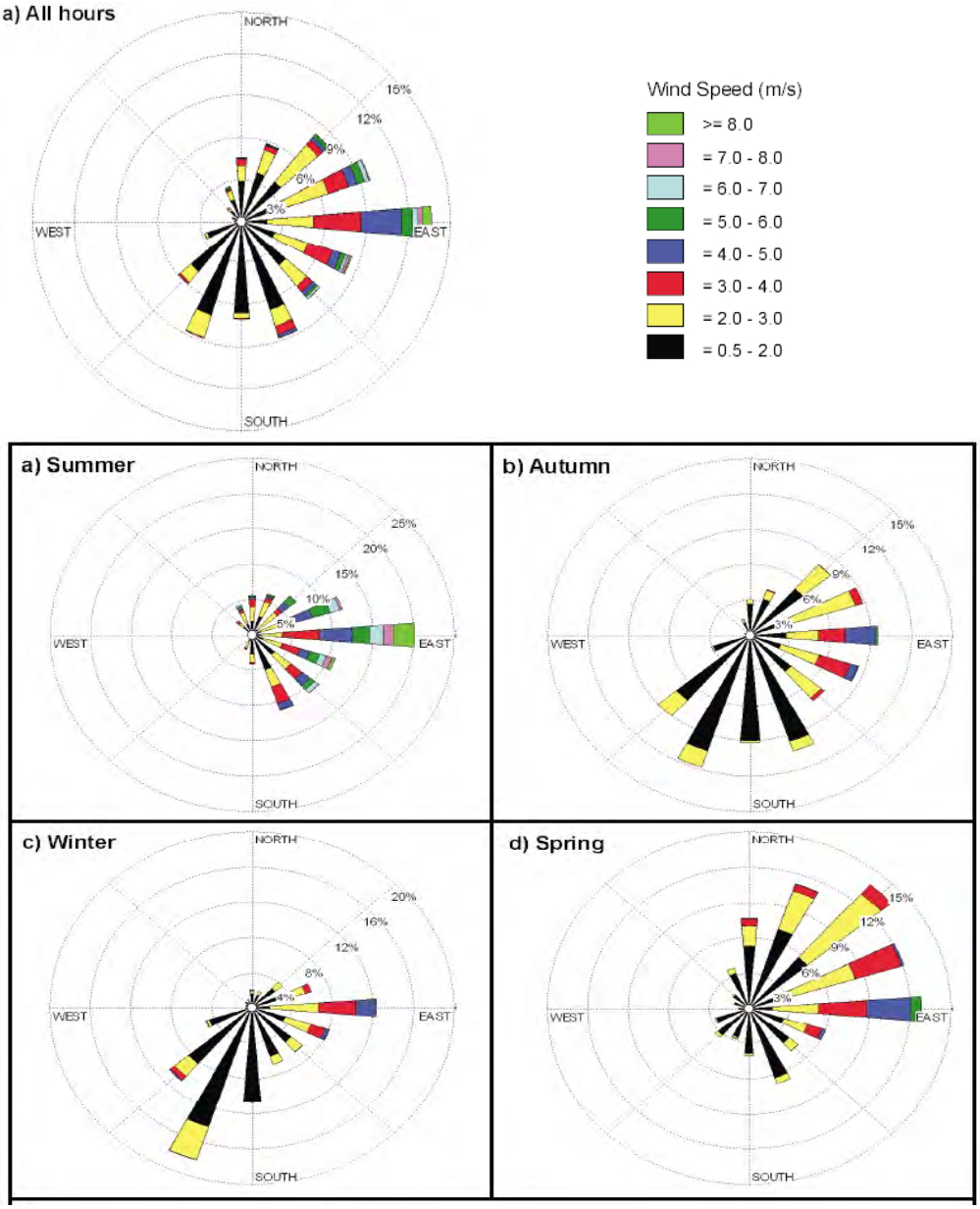

Figure 5-7: Annual Wind Roses near Project Site[14]

[14] Gladstone Pacific Nickel EIS, Appendix M – Air and Greenhouse Gas Assessment, URS, Feb 2007.

5.6.1 Priority Air Emissions

A study[15] determining the cumulative air quality impact assessment for Gladstone identified four priority pollutants to be used as proxy indicators for air quality as Nitrogen Oxides (NO_x), Sulphur Oxides (SO_x), PM_{10} and $PM_{2.5}$.

Industrial and non-industrial sources both contribute to the total emissions in the Gladstone air shed, but industry clearly dominate total emission levels contributing approximately 92-97% for each of these four priority pollutants. The main contributors to non-industry emissions are shipping, motor vehicles and area-based sources.

These four pollutants are generally most critical from an air quality perspective and show correlation with other toxic air pollutants. More importantly, updated and extensive emissions information is available for these pollutants for the Gladstone region. The study determined that NO_x emissions, which is the sum of NO and NO_2, double from the current situation to the future scenario, mainly due to the development of basic chemical and chemical product manufacturing industries, which include liquefied natural gas plants. Emissions of PM_{10}, and $PM_{2.5}$ and SO_2 increase by factors of 1.8, 1.7 and 1.3, respectively.

For NO_2 and SO_2 no short term or long-term air quality standards are exceeded at any receptor point in the current or future scenarios, even if the more stringent World Health Organisation (WHO) standards are applied.

The short term and long term PM_{10} air quality standards are exceeded at about one third of the receptor points in the current and future scenarios and the short term and long term $PM_{2.5}$ air quality standards are exceeded at about 15- 20% of the receptor points in the current and future scenarios.

Existing air quality has been described below with respect to these four priority air emissions.

Existing Air Quality

In 2011, the Department of Environment and Resource Management, Queensland (now DES) published the finding of an enhanced air quality monitoring program for Gladstone [16], which was one of the most comprehensive monitoring programs undertaken in Australia. The overview of findings from the expanded monitoring program summarised below is based on the results of ambient air monitoring in the Gladstone region performed between June 2008 and July 2010.

Air quality is a high public priority in an industrial city and Gladstone currently hosts real-time air monitoring stations managed by the Queensland Department of Environment and Heritage Protection. They record hourly emissions of CO, NOx/SOx and levels of ozone and particulates at eight (8) key locations.

PM10

Between June 2008 and July 2010 there were 68 exceedances of the NEPM (Air Quality) 24-hour average PM_{10} standard of 50 µg/m^3 across the Gladstone air-monitoring network, with most occurring between August and October 2009. All of these exceedances were

[15] Cumulative Air Quality Impact for Gladstone (2013) Department of Science, Information, Technology Innovation and the Arts (DSITIA).
[16] Clean and Healthy Air for Gladstone; DERM 2011.

associated with the presence of transient sources of PM_{10} in the region including dust storms and/or smoke from bushfires.

PM2.5

Between June 2008 and July 2010, the NEPM (Air Quality) 24-hour average advisory $PM_{2.5}$ standard of 25 µg/m^3 was exceeded on 43 occasions across the Gladstone air-monitoring network, with most occurring between July and October 2009. The NEPM (Air Quality) annual average advisory $PM_{2.5}$ standard was also exceeded at the Boat Creek and South Gladstone monitoring sites from September 2009 to July 2010, and at the Clinton monitoring site from September 2009 to February 2010. As was the case for PM_{10}, all of the 24-hour exceedances could be associated with the presence of additional sources of $PM_{2.5}$ in the region from dust storms and/or smoke from bushfires.

Analysis of the $PM_{2.5}$ data suggests that annual average $PM_{2.5}$ concentrations are likely to be in the range of 4 µg/m^3 to 6 µg/m^3 at most monitoring site locations in the absence of the impacts of bushfire smoke and major dust storms.

NO_x and SO_x

Table 7: Maximum measured concentrations of Criteria Gaseous Contaminants [17] below details the National Environment Protection Measure for four key criteria gaseous contaminants including NO_x and SO_x. It can be seen that the maximum recorded concentrations were below the threshold levels specified.

Contaminant	NEPM (Air Quality) Standard (ppm)	Averaging Period	Maximum recorded concentration	Site
Nitrogen dioxide	0.03	12 months	0.006	Boat Creek
	0.12	1 hour	0.059	Boat Creek
Sulphur dioxide	0.2	12 months	0.03	Central Gladstone
	0.08	24 hours	0.09	Boyne Island
	0.02	1 hour	0.155	Clinton
Ozone	0.08	4 hours	0.043	Central Gladstone
	0.1	1 hour	0.048	Central Gladstone
Carbon monoxide	9.0	8 hours	2.1	Boyne Island

Table 7: Maximum measured concentrations of Criteria Gaseous Contaminants

5.7 Cultural Heritage

The proposed Project plant is located on Lot 57 CP902700, a freehold property used for cultivation and quarrying. Further investigations will be conducted for all off site infrastructure as part of the EIS process.

[17] Clean and Healthy Air for Gladstone, Department of Environment and Resource Management (DERM) Nov 2011.

There are no known federally listed heritage places in the study area, and Project works will not directly impact any National Heritage List (NHL) or Commonwealth Heritage List (CHL) places. The potential for additional Aboriginal and historical heritage places within the study area is low, and it is considered very unlikely that any such sites would be of sufficient historical, rarity, research, representativeness, aesthetic, creative or social value to meet the thresholds for inclusion on either the NHL or CHL.

The desktop due diligence Cultural Heritage study[18] conducted identified one Department of Aboriginal and Torres Strait Islander Partnership (DATSIP) site (JF:D17) is recorded within 25 m of the one proposed conveyor belt location option and may extend into the study area. Consequently, an inspection should be conducted to confirm the location and nature of this site before works in this area are considered.

Table 8: DATSIP sites recorded with 25m of the Project (GDA94)

Site ID	Latitude	Longitude	Record Date	Attribute	Aboriginal Party
REDACTED			Sep 1, 1995	Shell Midden(s)	Port Curtis Coral Coast Claim

While direct impacts to matters of national environmental significance (MNES) are unlikely, indirect impacts to the nearby World and National heritage listed Great Barrier Reef (WHL#105060, NHL#105709) cannot be excluded based on current information. The Great Barrier Reef is listed primarily for its natural heritage values, but there is a recognition that these natural values are also of cultural significance to Aboriginal people. Consequently, any impacts to the natural heritage values of the Great Barrier Reef - stemming, for example, from changing sedimentation rates, air and water quality or noise pollution - have the potential to also impact Aboriginal cultural heritage values.

5.7.1 Cultural Heritage Management Plan

The Aboriginal Cultural Heritage Act (ACHA) 2003 requires a cultural heritage management plan if an EIS is required. A pre-existing Cultural Heritage Management Plan (CHMP) has been developed between the Aboriginal Party and the Department of State Development (DSD). AFE will develop a cultural heritage management plan in accordance with s87 of the Aboriginal Cultural Heritage Act 2003.

The Act specifies duty of care guidelines, which requires a land user to make an assessment of their particular land use activity and the likelihood that it will cause harm to Aboriginal cultural heritage.

The desktop study also mapped the project site with respect to ACHA Duty of Care Categories as shown in Figure 5-8 below. As can be seen, the project is to be constructed on areas mapped as Categories 2, 4 and 5 respectively as explained below.

Project works within the area of quarrying are assessed as Category 2 activities under the Duty of Care Guidelines. That is, as an activity that will cause No Additional Disturbance, and so is unlikely to cause any additional harm to Aboriginal heritage (s4.4). Category 2 activities can generally proceed without further heritage assessment (s4.5).

Project works in other areas of previous ground disturbance, such as land clearance, road construction or cultivation are assessed as Category 4 activities. That is, activities in areas

[18] Gladstone Energy and Ammonia Project – Due Diligence Cultural Heritage Study – AECOM, April 2018.

previously subject to significant disturbance, and which are unlikely to cause any additional harm to Aboriginal heritage (s5.4). Category 4 activities can generally proceed without further heritage assessment.

Figure 5-8: Aboriginal Cultural Heritage Act 2003 - Duty of Care Categories

Project works in areas that have not been subject to previous disturbance have been assessed as a Category 5 activity. That is, an activity in an area that has not been significantly disturbed, resulting in a high risk that it could harm Aboriginal cultural heritage (s5.14). Where a Category 5 activity is proposed, the Guidelines recommend further assessment with site survey and consultation with the Aboriginal Party (s5.14, 5.16, 7.0, 8.0).

To minimise potential impacts, the plant footprint is predominantly to be placed in the area shaded as green (Category 2) which is highly disturbed from previous quarrying activities. The large Category 5 areas (have a high risk of harming Aboriginal cultural heritage) to the left of the Category 2 area is not expected to be disturbed.

Appendix 1 contains the Desktop Cultural Heritage Due Diligence Study for the GEAP conducted in April 2018.

5.7.2 Indigenous Land Use Agreements

A preliminary search for ILUAS' relevant to the project was conducted as part of the Due Diligence Cultural Heritage study from the National Native Title Tribunal database.

Name	Tribunal No	Status	Lodged	Notified	Registered	Type	Applicant
Port Curtis Coral Coast Tenure Resolution ILUA	QI2017/013	ILUA registered	13 Nov 17	17 Jan 18	3 May 18	Area Agreement	State of Queensland

Table 9: ILUA's in Project Area

There are six ILUA that encompass the project area. Five of these pertain to a specific proponent (Arrow Energy) and are unlikely to pertain to AFE. Table 9 above lists the ILUA, undertaken with the State, and appears to relate to land tenure (and therefore native title status) across the PCCC claim area. The ILUA stipulates the extinguishment of native title over several Lots, in return for revenue sharing over others. The AFE Project areas are amongst those surrendered (that is, native title has been extinguished) rather than identified for revenue sharing.

5.8 Land Use, Social and Economic Environment

Overview

Gladstone is the largest multi-commodity port in Queensland – a far cry from its earliest commercial development – a meat works opened in 1893 at Parsons Point.

Gladstone's industrial growth began with the start of construction on Comalco's alumina refinery (Queensland Alumina Limited aka QAL) in 1963. However, its development as a major coal port began earlier in 1958 following a visit to central Queensland coalfields by representatives of Japan's Mitsui and Co. This relationship set the stage for the State Government's construction of a railway line from Moura to the port some 10 years later.

Today with Orica, Cement Australia, QAL, Rio Tinto, Santos, Shell, APLNG and NRG among its leading industrial markers, Gladstone is in the midst of an adjustment phase following six years of frenetic construction activity associated with development of the world's first coal seam gas (CSG) to liquified natural gas (LNG) export industry.

This industrial cluster has also encouraged a local minerals and chemical processing supply chain that has grown to service the central Queensland region and associated industries including coal, coal seam gas, construction and business services.

The city's subsequent focus on heavy industry was facilitated by successive State Governments through initiatives including construction of the Gladstone Power Station, expansions and priority status for the Port of Gladstone and development of the Gladstone State Development Area.

5.8.1 Land Use and Tenures

As described in Section 4, the proposed GEAP plant is located entirely on one title (lot 57CP902700) with all associated infrastructure located within the Gladstone State Development Area (GSDA).

The GSDA is a defined area of land of approximately 27,000 hectares adjacent to the Port of Gladstone with connections to major rail networks and Australia's national highway. The land in question is owned by the Minister for Economic Development Queensland (EDQ) and regulated by the Queensland Coordinator-General. A suitable lease or purchase agreement will be negotiated with the Minister for EDQ.

Searches of the National Native Title Tribunal on 10 April 2018 indicates that there are no past or current native title claims over the study area, which is held under freehold tenure, or gazetted roadway.

Advice received from the Department of Natural Resources Mines and Energy – Land and Native Title Services on 5th July 2018, confirmed that Native Title on Lot 57 is wholly extinguished.

5.8.2 Key local and regional land tenures

The project is proposed within the Gladstone SDA and specifically set aside by the Queensland Government for such industry. The Project Area is located adjacent to industrial facilities and in close proximity to large coal export terminals, three LNG plants, a coal fired power station, a waste oil refinery, a cement works and other chemical processing operations. The Project is located adjacent to the shale oil development proposed by QER.

The Project Area is freehold land with some offsite infrastructure such as gas pipeline connections and alignments to be confirmed during the EIS process.

The Project plant is proposed to be developed on land with current mineral lease application ML(A) 80081 under the Mineral Resources Development Act 1989 (Qld). An easement granted to Cement Australia, Ticor Chemical Company and a Petroleum Pipeline Licence (PPL) granted to Jemena runs through the site.

5.8.3 Accommodation and Housing

The Gladstone Energy and Ammonia Project (GEAP) is a significant development for Gladstone City and neighbouring communities of Calliope, Boyne Island and Tannum Sands.

Not only are these communities in daily commuting distance of GEAP's proposed site on the Gladstone SDA but they also lay claim to an experienced construction and manufacturing skills base courtesy of the region's historical employment focus (See Table 10 – Skilled workers in Gladstone).

In 2016, the Gladstone LGA's population was reported on census night as 61,640.
Of those people employed in Gladstone, 21.4% reported being Technicians and Trades Workers; 13.6% worked as professionals; 12.9 % as labourers and 12.4 % as machine operators and drivers.

Occupation categories	Gladstone	%	Queensland
Technician and trades	5,789	21.4	305,441
Professionals	3,681	13.6	423,917
Labourers	3,498	12.9	225,268
Machine operators and drivers	3,366	12.4	147,636
Clerical and administrative	2,918	10.8	291,317
Managers	2,580	9.5	258,509
Community and personal service	2,481	9.2	241,956
Sales workers	2,293	8.5	207,795

** 15 years and over*

Table 10: Skilled workers in Gladstone

These four categories make up more than 60% of Gladstone's workforce and reflect the skills base required to construct and operate a major power and ammonia manufacturing facility. Labelled an 'engine room' of the Queensland economy, Gladstone's industrial history is relatively recent, starting in earnest with construction of the Queensland Alumina Ltd (QAL) refinery in the 1960s.

Further afield, Rockhampton City (pop. 79,700) is 90-minutes' drive away and Livingstone Shire (pop. 37,200 centred on Yeppoon) is approximately two hours away by road. GEAP workforce requirements during construction and operations are estimated to be 800 and 200 people respectively.

While it is in GEAP's financial and social licence interests to ensure that employment priority is given to qualified local workers and supply chains, it is also reasonable to expect the construction phase will involve the deployment of suitably qualified personnel from outside the local region.

A range of workforce accommodation facilities developed for the Curtis Island LNG construction phase are still available today (e.g. Home Ground Villages).

In addition to this resource is a legacy of the region's real estate downturn, namely more than 400 vacant rental properties (as at April 2018) ranging in size from single person's quarters to family homes. In the last quarter of 2017, more than 80 percent of Gladstone houses sold at a loss, according to data from real estate analysts *CoreLogic*. It was the highest rate in Queensland with the average house price in Gladstone more than halving in five years. Gladstone was also one of the top 10 postcodes in Australia for people behind on their mortgage payments, according to S&P Global Data.

To refine the proponent's position on accommodation and housing, a Social Impact Assessment study is proposed to form part of the EIS process.

5.8.4 Community Health and Safety

The site is currently unoccupied. The neighbouring land is populated by heavy industry which process chemicals and hydrocarbons termed in some legislations as noxious industries. The area is appropriately located away from residential dwellings, downwind of Gladstone.

There is sub-surface high pressure gas pipelines and above head high voltage electricity lines to service the high energy needs of an industrial hub. In addition, chemicals, chemical wastes and process modules are transported through the existing area.

5.9 Built Environment

Gladstone is an industrial hub. The project is based in the Gladstone State Development Area in the heavy industrial precinct. The nearest residence is located approximately 1.7 kilometres to the west. The nearest residential township Yarwun is located at a distance of four kilometres to the south-west.

5.9.1 Road Access

The site has two street fronts with Landing Road and Obodin Road to the south. Landing Road extends north from Gladstone – Mt Larcom Road in a two-lane undivided form to Fisherman's Landing. The northern section is unsealed. The speed limit is 80km/h throughout.

5.9.2 Moura Railway

The Moura Rail line which services multiple coal mines runs from Moura to Gladstone where it connects to the two export terminals of RG Tanna and Wiggins Island. The line has a spur which feeds Cement Australia's, Fisherman's Landing Plant which is adjacent to the Project site.

5.9.3 Water

The water main for the Gladstone Area Water Board (GAWB) passes along Landing Road past the site boundary. GAWB have confirmed that there is more than 1000 ML per annum of raw water available from Awonga Dam which can be supplied. In addition, this 1000 ML/annum, could include 25 ML/ annum of treated water supply should this be required.

5.9.4 Electricity

A 66KV line operated by Ergon runs along the other side of Landing Road. In addition, there is an existing substation at the corner of Landing Road and Fisherman's Road located approximately 800 metres from the site.

5.9.5 Community Amenities

Discussions will be held with the Gladstone Regional Council to identify practical opportunities to support the community and meet our social obligations. This will include an evaluation of community lifestyles and cultural practices, amenity value, social character, community cohesion, community amenities, social services, facilities and infrastructure.

5.10 Traffic and Transport

The Project is to be located off Landing Road with site access via Obodin Road. Landing Road intersects with the Gladstone – Mount Larcom Road approximately a kilometre away from the Project site. Gladstone – Mount Larcom Road is a major freight road connected to the Australian highway network. It connects to the Bruce Highway at approximately 20 kilometres away. Whilst Obodin Road and Landing Road is managed by the Gladstone Regional Council (GRC), the main highways are managed by the Department of Transport and Main Roads (DTMR).

Upgrade works have been undertaken by DTMR at the intersection of the Gladstone- Mount Larcom Road with Reid and Landing Roads. These two intersections have been upgraded to improve traffic flow and safety. DTMR estimated that approximately 7,400 motorists utilise the Gladstone-Mt Larcom Road completed intersection upgrades at Reid and Landing Roads[19].

The project's location in the Gladstone SDA is supported by existing road and rail networks linked to the Bruce Highway and Port of Gladstone.

5.11 Amenity –Odour, Noise and Vibration and Light Pollution

The site is located in an industrial area away from sensitive receptors. The neighbouring site include Southern Oil's Waste Oil Refinery, Cleanaway's waste treatment facility, Rio Tinto's Yarwun Alumina Plant, Cement Australia's Fisherman's Land plant and the now closed Queensland Energy Resources Shale Oil Pilot plant. The area houses heavy industry which processes chemicals and hydrocarbons and is located downwind of Gladstone township.

[19] DTMR statistics, web search

The area is serviced by rail with an unloading facility at Cement Australia's Fisherman's Landing Plant. Many of the raw materials and products from the industrial sites are also moved by trucks. In addition, construction modules are often unloaded at Fisherman's Landing and moved through the area to their destinations within the SDA or to other end users in the Gladstone area. Gladstone also have large coal offloading facilities including Wiggins Island and RG Tanna.

The nearest residence is located approximately 1.7 kilometres to the west. The nearest residential township Yarwun is located at a distance of four kilometres to the south- west. The site is screened by some vegetation along its boundary with Landing Road. The site's nearest neighbours operate previously approved industrial facilities on the Gladstone SDA. The area is industrial, and in general, the skyline is dotted with large process vessels, exhaust gas stacks, conveyer belts and structures. These numerous industrial structures are illuminated throughout the night, spilling light into the Gladstone sky.

Figure 5-9: Existing Light Pollution in Gladstone

Figure 5-9 above shows the Wiggins Coal Conveyer at night. The background light pollution is very high as can be expected for an industrial hub.

5.12 Planning Instruments, government policies

This section describes the planning instruments and government policies to be addressed by the proposed Gladstone Energy and Ammonia Project.

5.12.1 Commonwealth Government

The following Federal government policies and strategies may apply to the Project and will apply to the EIS:

EPBC Act Environmental Offsets Policy 2012, outlines the Australian Government's approach to the use of environmental offsets ('offsets') under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). An EPBC referral has been submitted as the project is expected 'not to be a controlled action' under the Act.

National Water Quality Management Strategy: is part of the national program for ecologically sustainable development and aims to deliver a nationally consistent approach to water quality management. The Project will align with this strategy.

National Energy Productivity Plan: Designed to deliver a 40 per cent improvement in Australia's energy productivity by 2030 and contribute to Australia's 2030 emissions reduction target. The Project will align with the energy productivity targets and a carbon abatement strategy will be implemented to facilitate alignment with Australia's emission reduction target.

National Clean Air Agreement: Focuses on reducing air pollution and improving air quality through cooperation between industry and government. The Project will align with this Agreement.

Reef 2050 Plan: The overarching framework for protecting and managing the Great Barrier Reef until 2050 including from the impacts of climate change. The Project will align with this Plan.

Safeguard Mechanisms: The Emissions Reduction Fund's safeguard mechanism places limits on the emissions of Australia's largest greenhouse gas emitters and ensures emissions reductions purchased by the Government are not offset by significant increases in emissions above business-as-usual levels elsewhere in the economy. A carbon abatement strategy will be implemented to facilitate alignment with Australia's Safeguard Mechanisms.

Great Barrier Reef Intergovernmental Agreement 2015: reflects the shared vision for the future outlined in the Reef 2050 Plan and renews the Australian and Queensland governments' commitment to protecting the Great Barrier Reef World Heritage Area including its Outstanding Universal Value. The Project will align with this Agreement.

5.12.2 State Government

Gladstone State Development Area Scheme

State development areas (SDAs) are areas declared by regulation under the *State Development and Public Works Organisation Act 1971 (SDPWO Act)*. The Gladstone State Development Area (Gladstone SDA) was declared in 1993. Regulated by the Coordinator-General, the Gladstone SDA supports economic development in a way that considers environmental, cultural and social issues as well as existing industry and surrounding infrastructure within the region.

The proposed Gladstone Energy and Ammonia Plant is located within the Medium – High Impact and Port Related Industry Precinct of the GSDA.

The preferred development intent for the Medium – High Impact and Port Related Industry Precinct is described below.

a) This precinct is to accommodate medium and high impact industrial development such as mineral and resource refining and processing, chemical and industrial material manufacturing, metal product manufacturing and processing, engineering works, storage of dangerous goods that require large land parcels, are difficult to locate in conventional industrial estates outside the Gladstone SDA and require separation from sensitive receptors.
b) Uses in this location have links to the port through the import or export of material and benefit from close proximity to port related infrastructure and services.

c) Defined uses which are generally considered to meet the precinct intent include High Impact Industry, Medium Impact Industry, Special Industry and Warehouse
d) Linear infrastructure and other uses may also be supported where these require co-location with and do not compromise the uses generally considered to meet the precinct intent.
e) Road access to the precinct will be via:
   1. existing intersection – Hanson Road/Reid Road
   2. existing roundabout – Hanson Road/Rio Tinto Private Access and
   3. Landing Road.

Development applications for a material change of use in the GSDA need to demonstrate consistency with the GSDA Development Scheme (2015). As part of the application process, an SDA application is referred to relevant referral entities to consider the consistency with any other relevant legislative requirements that may be required for the development to proceed and operate and to the extent practicable, be consistent with regional plans, the State Planning Policy and the State Development Assessment Provisions where the State interests articulated by these instruments are likely to be affected by the development.

The Gladstone SDA has been specifically set aside by the Queensland Government for such industry.

Central Queensland Regional Plan

The Central Queensland Regional Plan (CQRP) covers the local government areas of Central Highlands Regional Council, Banana Shire Council, Gladstone Regional Council, Rockhampton Regional Council, Woorabinda Aboriginal Shire Council.

The CQRP is one of the Queensland Government's new statutory regional plans providing strategic direction and policies to deliver regional outcomes which align with the state's interests in planning and development.

The Queensland Government recognises that local planning is best undertaken by local governments, and unlike previous regional plans, this regional plan will not set boundaries to instruct local governments where their communities must grow.

The Project is wholly contained within the GSDA. The impacts on Gladstone Regional Council could potentially be on local housing and accommodation, traffic and transport and social infrastructure. This will be addressed during the EIS phase of this project. The Project is consistent with the regional plan's strategic direction.

State Planning Policy July 2017

The State Planning Policy 2017 identifies 17 State interests in Land Use Planning and development and categorises these into five themes relating to:

- Liveable communities and housing.
- Economic growth
- Environment and heritage.
- Safety and resilience to hazards.
- Infrastructure.

The following of the 17 State interests are likely to be relevant to this project.

- Housing supply and diversity

- Development and Construction
- Mining and Extractive Resources
- Biodiversity
- Coastal Environment
- Cultural Heritage
- Water Quality
- Emissions and Hazardous activities.
- Energy and water supply
- Infrastructure Integration
- Transport infrastructure.

The Project is consistent with the State Planning Policy.

5.12.3 Local Government

Gladstone Regional Council Planning Scheme

The entire project as well as all the offsite infrastructure is located within the Gladstone State Development Area (GSDA). Development that is not regulated by the GSDA development scheme may be regulated by other legislation and planning instruments, including the *Planning Act 2016* and the Gladstone Regional Council planning scheme (GRCPS). It is administered by the Gladstone Regional Council. Developments such as housing and accommodation required to service the Project are consistent with the GRCPS.

One Gladstone Regional Council policy relevant for offsite impacts is the Biodiversity Conservation Strategic Plan 2016 – 2025.

6 POTENTIAL IMPACTS OF THE PROJECT

6.1 Design and Construction Impacts

The project plans to commence construction on receipt of environmental approvals. Subject to approvals, construction is currently scheduled to start in late 2020. During the construction phase, access roads, rail facility, coal conveyers, water infrastructure, power lines, the gasification plant, power plant, SNG plant and pipeline and the ammonia plant will be built. The area allocated for coal storage will be used as the laydown area.

The project footprint is expected to be approximately 750 m x 650 m. An Indicative Project Footprint Plan has been attached as Figure 6-1 below.

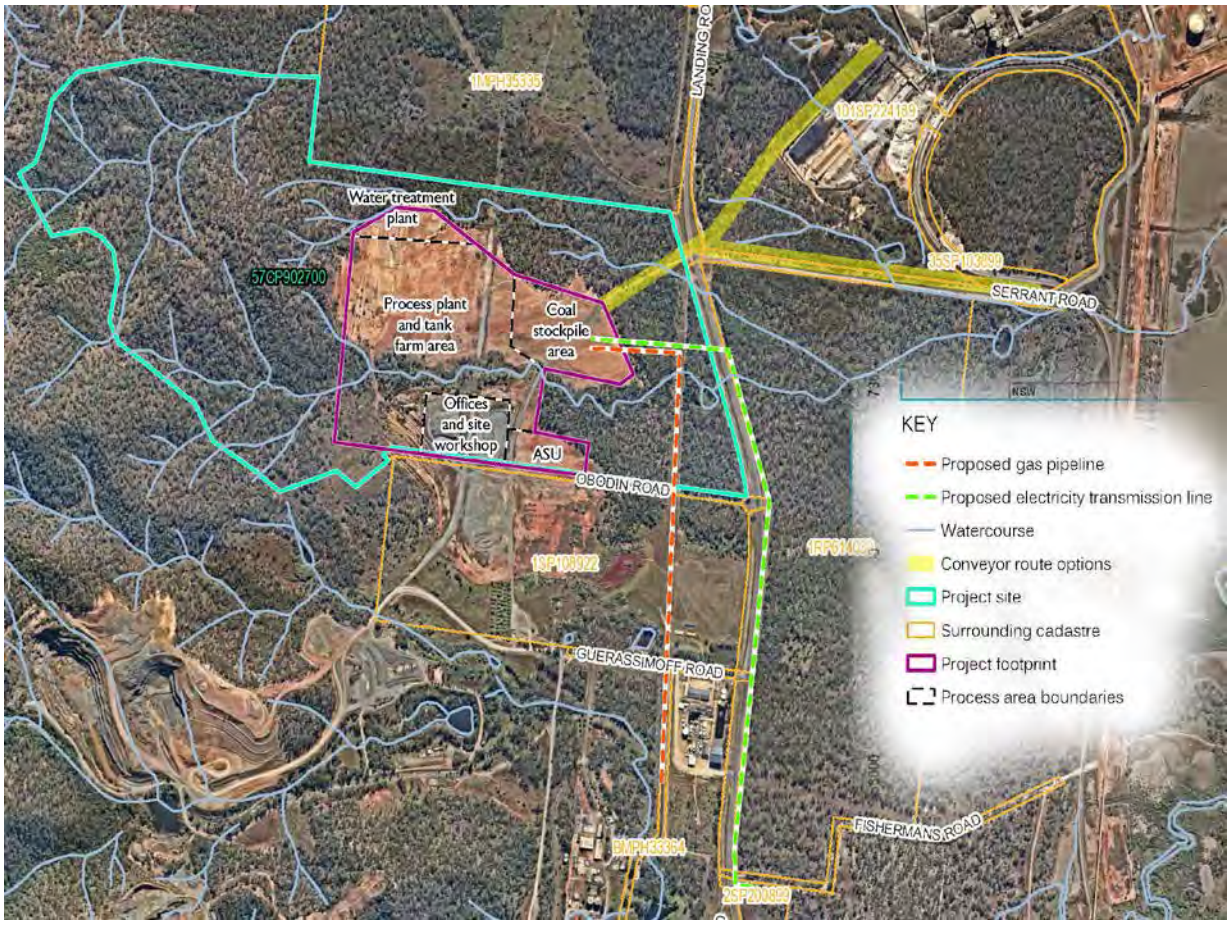

Figure 6-1: Project Footprint Plan of Gladstone Energy and Ammonia Project

The construction phase and commissioning phase is expected to take 1.5 years to 2022. Once complete, the coal will be transported by rail and conveyer to site with oxygen and nitrogen plant located on the property and supplied/operated by a third party. Approximately 1,000 tonnes per day of product ammonia will be piped to nearby facility.

Mitigation

The best way to minimise impacts is to design right to eliminate impacts. As can be seen the Project footprint has been located predominantly within land previously disturbed by quarrying operations. The plant location has been selected to minimise impacts on flora and

fauna and to protect environmental values. The Construction EMP (CEMP) will be prepared well before construction activities Social and Economic Impacts

6.2 Social and Economic Impacts

Social and Economic Impacts have been discussed here as these extend across the entire life of project. The economic and social impacts during the construction phase which will attract a peak work force estimated at 800 persons to the Gladstone region over approximately two years are significantly different from the operational impacts of a workforce likely to be sourced from personnel permanently settled or migrating to Gladstone to service the needs of this project.

Economic impacts have been discussed previously in (reference earlier section which repeats this) and have been summarised here to give context to the associated social impacts.

6.2.1 Social Impact

A rigorous social impact assessment process will analyse potential social impacts in detail, with input from the community through ongoing consultation. This will identify how positive social impacts can be enhanced and negative impacts mitigated and/ or managed.

A Social Impact Management Plan will be developed to ensure that the management of local employment, housing, use of local roads, community amenities etc. are carried out with minimum impacts to Gladstone and to provide a synergistic and beneficial end result. The SIMP will address management measures through all project phases (planning/design, construction and operation.

6.2.2 Economic and Employment Impacts

As a major industrial/manufacturing project, the Project is forecast to deliver a range of positive socio-economic impacts targeting the Gladstone LGA but extending to other population centres in central Queensland and beyond:

- Creation of employment opportunities during the planning, design, construction and operation of the Project – with current estimates of 800 direct jobs peaking during construction and 200 direct jobs in operations;
- During operation GEAP is forecast to generate more than 1,280 sustainable, indirect supply chain jobs (i.e. 1 FT job = 6.4 indirect jobs using QRC employment multiplier);
- The Project will help facilitate the retention of jobs in the Gladstone LGA through new economic activity;
- Flow-on employment opportunities will extend to supply chain business across central Queensland (e.g. transport, utilities, agriculture, mining) where unemployment stands currently at 6.7%;
- The Project is a strategically significant development for Gladstone in terms of supporting the city's industrial diversification;
- The Project is a strategically significant development for Queensland and Australia in terms of a $1 billion capital investment in new manufacturing technology with the proven potential to enhance the utility of coal in an increasingly carbon constrained world; and
- The Project provides a new market for 1.5 mtpa of otherwise unmarketable coal, strengthening long-term employment security at the Callide mine 120km west of Gladstone.

Local Employment

In 2012 – the height of the Queensland onshore gas investment boom – 8,400 people were engaged in constructing three large gas processing plants to export liquefied natural gas (LNG) from Gladstone's Curtis Island.

This construction phase is over, and this project will bring much needed construction work to the area. Over 60% of Gladstone's population consists of technicians, trades workers, professionals, labourers, machine operators and drivers. In the last three years unemployment in Gladstone has risen from less than 5% to approximately 7.5%.[20] This project will provide jobs in the area to retain the skill base many of whom moved here to construct the Coal Seam Gas Processing plants on Curtis Island. Priority will be given by GEAP to utilising local workforces and supply chains to facilitate retention of local jobs.

6.2.3 Built Environment Impacts

Figure 6-1 above shows the project footprint and includes off site infrastructure to be built.

Road Access

The Project's construction may demand the upgrading of some local roads to allow for the efficient transportation of materials to the site. Local traffic movements are expected to increase in view of the commuting distance between the project site and neighbouring population centres. As noted in Section 5.9.1 Road Access above, upgrade works have recently been conducted.

Consultation with DTMR and local councils will be conducted to agree the specific treatment at the access road to the site including an entry exit ramp for traffic to Landing road. The requirement for further upgrades will be evaluated in the Traffic and Transport Study to be conducted as part of the EIS.

Rail

The project will require 1.5 million tonnes of coal to be transported on the Moura line from the Callide Mine or other mines to Gladstone. This coal is anticipated to be low grade coal suitable for gasification and hence will be in addition to the existing freight on the line. The current rail system is underutilised and there is sufficient capacity to accommodate this additional capacity with no rail upgrades.

It is expected that a small spur and coal offloading facility will be built. An overland conveyer will deliver the coal to the coal storage stockpile area on site.

The line has a 26.5 tonne axle load (TAL) limit and is narrow gauge (1067mm). Discussions with Aurizon have confirmed that there is currently available capacity of more than 1.5 million tonnes per annum as required by the Gladstone Energy and Ammonia Plant.

Electricity

During construction, electricity will be imported to the site. An easement will be required to allow connection to the Ergon sub- station at the Landing Road, Fisherman's Road intersection, located approximately 800 metres away from the project site, to allow for export of power and will need to be approved as part of this project.

[20] http://www.communityprofile.com.au/gladstone/trends/unemployment

The transmission line requirements and associated impacts are anticipated to be minimal. Nevertheless, in the areas in which the high voltage transmission line is constructed, impacts are anticipated. These include the following:

- Impacts on flora;
- Impacts on fauna;
- Impacts on aquatic ecology; and
- Land use impacts.

It should be noted that these impacts are anticipated to be temporary and during the construction phase only. The process of evaluation of flora and fauna issues, cultural heritage and native title issues and social issues for selection of the transmission line easement is well established. As the project is expected to utilise existing easements where possible as well as minimise the length of transmission line to be built, the footprint of disturbance will be minimised. Careful route selection and plant site selection is undertaken to minimise ecological, cultural and social impacts.

The GEAP includes a power plant to produce a total of approximately 96 MW, to supply the projects energy requirements. This includes an excess generation of 24 MW which will be supplied to neighbouring industrial plants and/or the central Queensland electricity grid.

Water and Sewer

GEAP's water needs are estimated at 1000 ML/ annum. This water is readily available from the Gladstone Area Water Board. The water main runs parallel to Landing Road adjacent to the site.

The raw water quality is suitable for use as cooling water. A water treatment plant will be developed on site to upgrade some of this water for use in boilers on site. There are no expected impacts on water supply.

The Project site is also connected to sewer. No offsite infrastructure will be required for connection to water supply or sewer.

Gas Pipelines

High pressure synthetic natural gas (SNG) will be exported from the plant by underground pipeline. This will run from the plant site and tie into the Queensland Gas Pipeline near the property at Yarwun.

6.2.4 Land Use and Tenure Impacts

The Gladstone Energy and Ammonia Project is a chemical manufacturing plant and all works associated with it are compliant with the intent of the Gladstone State Development Area Scheme. The GSDA is regulated by the Coordinator-General. Construction of the Gladstone Energy and Ammonia Project could result in long term changes to land use patterns surrounding it.

The project is within the GSDA. An application will be lodged with the Coordinator-General for a material change of use as required by the Development Scheme (2015).

Native title on the Project plant site has been wholly extinguished.

A suitable agreement with Queensland Energy Resources (QER), the holder of a current mining lease application (ML(A) 80081) has been reached to allow for the development of the Project on this site.

6.2.5 Impacts on Traffic and Transport

The project's location in the Gladstone SDA is supported by existing road and rail networks linked to the Bruce Highway and Port of Gladstone.

The large majority of operations work force are likely to be housed in Gladstone with minimal fly-in fly-out requirements. The construction workforce may require some additional fly in fly out personnel depending on local skills availability. Construction and operations workforce will access the work site predominantly by using the Gladstone – Mount Larcom Road to Landing Road.

During construction, the Gladstone Energy and Ammonia Project will result in localised impacts to existing traffic and transport networks as construction progresses. Likely impacts include increased light and heavy vehicle traffic on the Gladstone - Mount Larcom Road and other roads in the local area for the transportation of construction personnel, materials and resources for construction. Local traffic is also anticipated to be increased, especially the use of the road from neighbouring towns to the project site.

It is anticipated that the Air Separation Unit which will be supplied by a third party will be located with a front to Landing Road to keep third party distribution of compressed and liquefied gases, separate from site traffic.

Site traffic other than staff is expected to be minimal as feedstock and produced products will be transported to/from site by rail, conveyor or pipeline.

During operations, transport to and from the site will primarily consist of labour workforce and day to day plant operations of equipment and materials with exception during plant turnarounds. be

The transportation of ash off site will be considered as part of the Traffic and Transport assessment undertaken as part of the EIS.

Mitigation

Every attempt will be made to transport Pre-Assembled Modules (PAMs) during the construction phase from the dock at Fisherman's Landing to site via Serrant Road. Some large equipment may require road transport. During construction, the work force will access the site from Gladstone.

Additional traffic and road use through the town is anticipated during the construction phase in particular and will be addressed in a Road Use Management Plan. A detailed Road Use Management Plan will be prepared as part of the Construction Environmental Management Plan. A detailed traffic and transport study will be conducted a part of the EIS to minimise traffic impacts on Gladstone.

6.2.6 Impacts on Accommodation and Housing

The population in Gladstone in 2016 was recorded as 63,288 people.[21] The Project will bring a much-needed boost to the local economy. Gladstone is only 15 kms away and is expected to have sufficient accommodation capacity to house the construction workforce estimated at 800 persons. Should additional accommodation be required during the construction phase, a fly camp will be built. The fly camp will be decommissioned at the end of construction.

During construction, there is the potential for temporary and localised inflation in property prices owing to an influx of additional workers to the Gladstone area.

Social impacts are expected to be highly beneficial to the Gladstone region and Queensland.

6.2.7 Community health and safety

Increased community health and safety risks during the Project's construction phase are likely to revolve around increased road and vehicle movements.

Increased road traffic – particularly involving heavy vehicles during construction – may increase the risk of road incidents while generating increased noise and dust.

The Project site is located downwind from Gladstone surrounded by heavy industry. Further, the process removes sulphur and dust from air emissions. The Project Plant will be classified a Major Hazard Facility and undergo rigorous assessment by the Hazard Industries and Chemicals Branch of Work Health and Safety Queensland to ensure Community Health and Safety impacts are minimised.

Public perceptions of the project and concerns over the impacts of planning and construction have the potential to contribute to social stress and confusion.

Mitigation

Road and rail interactions with other users, pedestrians and stock, coupled with the nature of materials transported via the Road and Moura Railway will be the subject of a detailed Traffic and Transport Management Plan as part of the EIS.

6.2.8 Coexistence with Major Developments

The project is located in a precinct designated for the development of heavy industry and manufacturing. By selecting a site within the GSDA, it provides numerous opportunities to coordinate with neighbouring industries that may benefit from the development of the Gladstone Energy and Ammonia Project. For example, it there is a potential opportunity for utilisation of waste heat from other plants that could be gathered to generate steam for power in the steam turbine, supply long term contracted electricity to neighbours, supply waste ash to Cement Australia as a raw material or for road base, supply syngas to Queensland Alumina or other industrial users of gas, saleable gases from the ASU.

It is anticipated that cumulative impact studies will be relevant to this project.

Mitigation

Cumulative impact studies relating to emissions from the GEAP will be conducted as part of the EIS.

[21] http://www.communityprofile.com.au/gladstone/trends/population

6.3 Operational Phase Impacts

6.3.1 Coal Gasification and Syngas Use Impacts

The technology of coal gasification is not new and has been commercially operating since the mid-19th century. The coal gasification plant produces syngas. Syngas is transferred to the gas processing plant, where hydrogen, sulphur, carbon dioxide is extracted separately. The processed syngas contains methane and carbon monoxide which is used to generate power. The hydrogen is reacted with nitrogen generated by air separation units to produce ammonia.

The plant will also produce hydrogen sulphide which will be used for the manufacture of sulphur or sulphuric acid. The plant produces pre-combustion carbon dioxide and hence is carbon capture ready. Commercial applications for this resource will be investigated as part of the environmental assessment process.

All solid wastes from the gasifiers are inert ashes which can be reused as a raw material for road base and building materials. No liquid coal residue will be recovered as primarily all volatile compounds will be combusted under high pressure / temperature in the gasifier. Any carry over residue compound will be recovered from the water treatment plant and re-introduced to the combustion process for disposal.

6.3.2 Power Generation

The syngas is fed to gas turbines to generate power. A waste heat recovery boiler (HRSG) will also be installed to generate additional power from the energy remaining in the exhaust gases from the gasification plant and gas turbines.

Emissions

The Project Plant Area will be lined and bunded to ensure any spills and leaks will not result in contamination to land.

<u>Coal Gasification</u>
Only during start up and process upsets is there a need to flare product gas temporarily. Appropriate mitigation measures such as flare sweetening can be implemented to ensure these impacts are minimal.

Surplus nitrogen vented from the air separation units is not considered to be an issue so long as the vent is located at an appropriate height to allow for dispersion. The atmosphere contains 79% nitrogen and nitrogen is not considered to be a pollutant.

Process water generated by the coal gasification process is water contaminated with hydrocarbons. This process water is treated to extract water for reuse in the process and the hydrocarbons can be fed back to the coal gasification plant.

The waste products from the coal gasification plant are limited to:

- Discharge of surplus nitrogen from air separation units.
- Impacts associated with the flaring of syngas during start up and shut down.
- Management of process water wastes.
- Odour impacts from process water wastes.

Likely noise, light, odour and dust emissions are expected to be low. The site is located in the midst of heavy industry and at some distance from sensitive receptors. It is anticipated that these impacts will be manageable in terms of control measures. A visual amenity study will be conducted as part of the EIS.

Power Generation

The syngas is stripped of sulphur and dust particulates in the gas processing plant, hence emissions from the power plant to air will be limited to oxides of nitrogen (NOx) and carbon dioxide. Low NOx burners will be installed to minimise NOx emissions. A Carbon Abatement Plan will be implemented to manage carbon dioxide emissions.

The power plant will periodically have boiler blowdown discharges which will be highly saline waters. This waste stream will be treated and disposed in accordance with the licence conditions obtained as part of the EIS approval process.

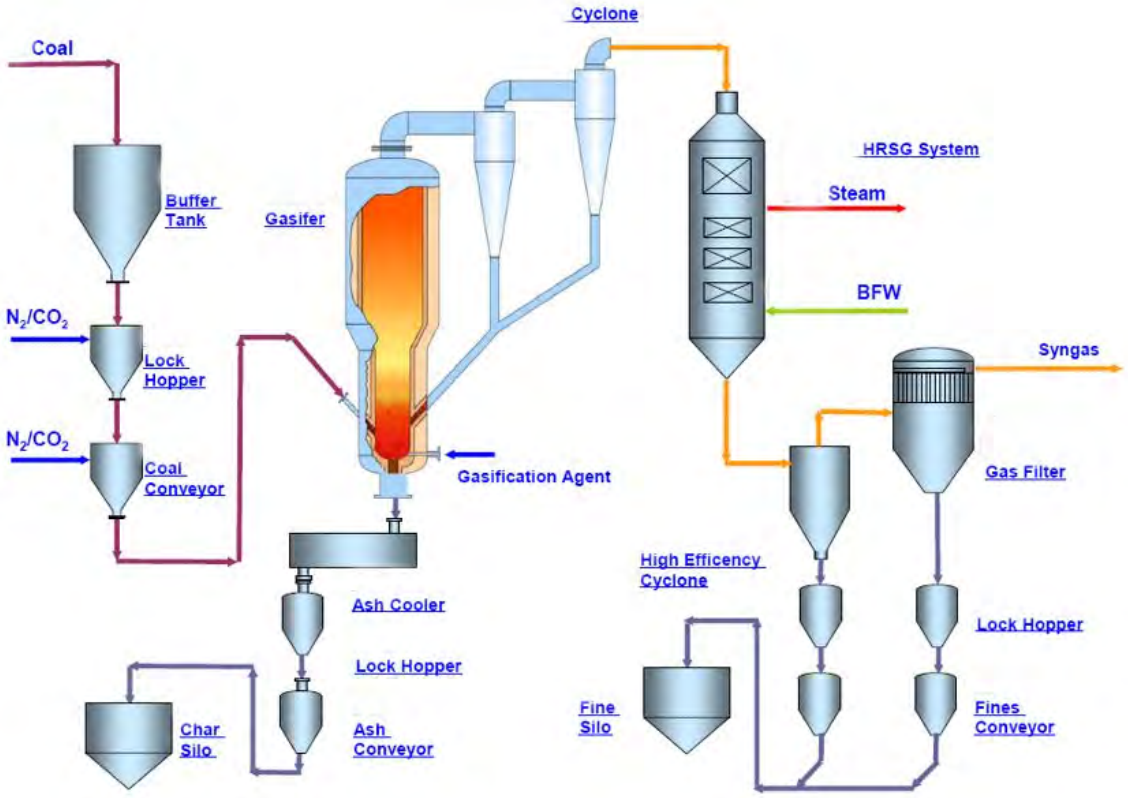

Figure 6-2: SES Coal Gasification Schematic

A schematic of a typical Coal Gasification Plant producing syngas has been shown in Figure 6-2 above.

6.3.3 Ammonia Manufacture and Impacts

Hydrogen generated from the gasification process is extracted and mixed with pure nitrogen extracted using air separation units to manufacture ammonia using the Haber Bosch process. This ammonia is to be sold for use in the manufacture of ammonia nitrate and fertiliser or other industrial products.

The ammonia manufacture process is exothermic and waste heat will be used to generate steam and power.

6.3.4 Gas Processing Impacts

Impacts from syngas processing are limited to the requirement to burn process gases (H2, CH4, CO, CO2, NH3, N2, steam) in the flare if there are any unscheduled stoppages. The flared process gases are released to the atmosphere.

The production of ammonia requires catalysts which have a useful life of approximately eight years. Catalysts once spent need to be replaced and disposed. Most catalysts contain notable quantities of oxides and sulphides of the heavy metals Co, Ni, Mo, Cu, Zn and Fe, which are insoluble in water and are recycled in accordance with regulatory requirements.

A schematic of a typical ammonia manufacturing plant schematic has been shown in Figure 6-3 below.

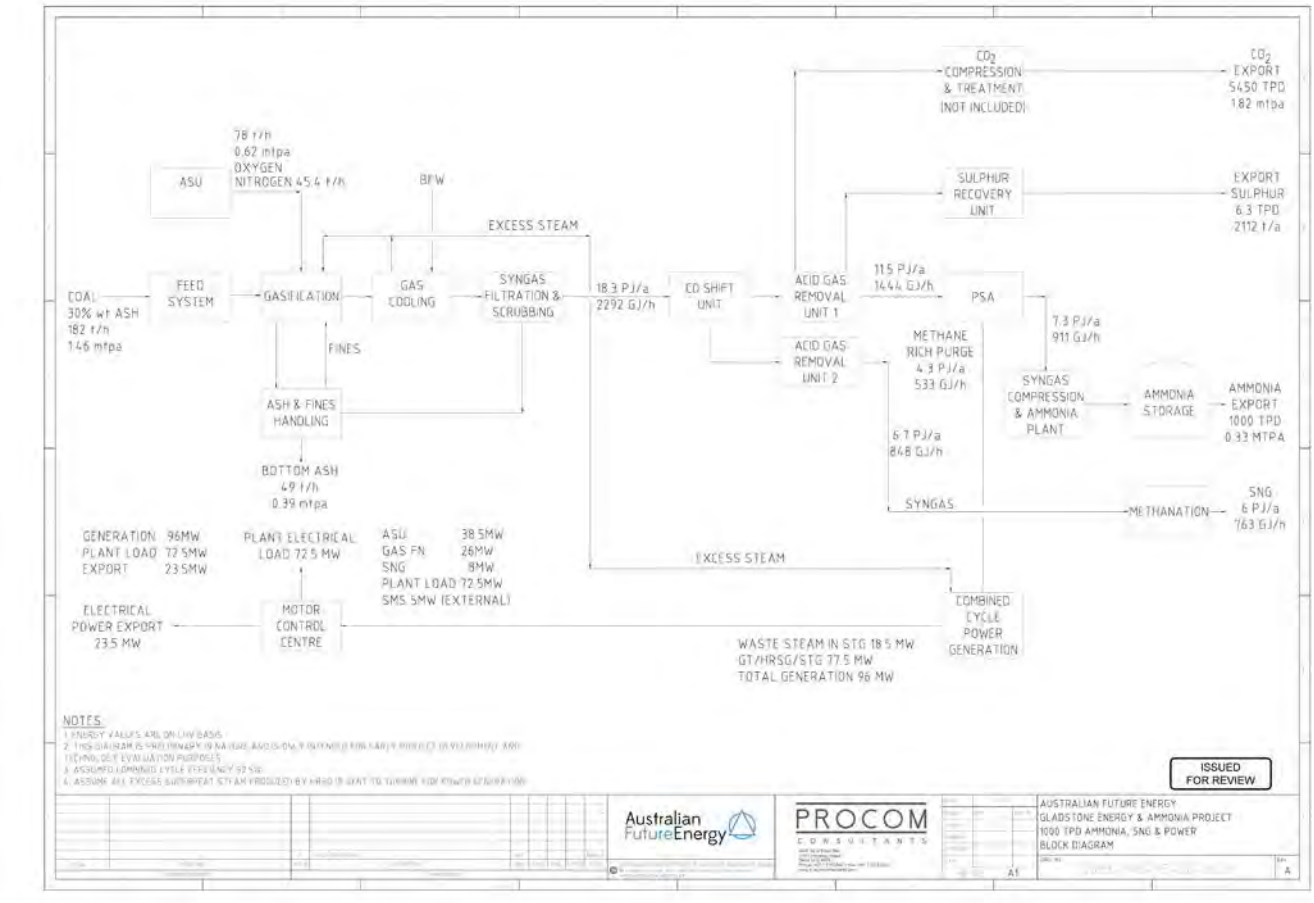

Figure 6-3: Coal Gasification, Power Generation and Ammonia Plant Schematic

6.4 Overall Project Impacts

The production of ammonia and power are anticipated to have the following key environmental impacts which will need to be scoped in the IAS:

- Ecology impacts
- Generation of large quantities of pure carbon dioxide which can be recovered
- Stormwater Impacts
- Process Wastewater Impacts
- Air Quality and dust impacts
- Ash management
- Solid waste management
- Groundwater impacts
- Cultural Heritage impacts
- Native Title and Indigenous Land Use Agreements
- Impacts on water supply
- Amenity impacts- visual, noise and odour
- Hazard and Risk – Health and Safety

6.4.1 Ecology

Impacts during Construction

While the site is unlikely to support MSES or MNES values, there is a low potential that some threatened species will utilise the property such as:

- Greater Glider that can den in individual hollow-bearing trees;
- Coastal Sheath-tail Bat that can forage in regrowth eucalypt woodlands;
- Squatter Pigeon that can forage in cleared areas provided they contain seeding grasses and are near permanent freshwater sources.

The property is predominantly cleared with only a few small patches of regrowth native vegetation remaining as detailed in Table 11: Ground-truthed Vegetation below. This has been mapped in Figure 5-1 Ground-truthed Vegetation communities above.

Regional Ecosystems	VM Act Status	BD Status
Regrowth 12.3.3 - *Eucalyptus tereticornis* woodland on Quaternary alluvium.	Endangered	Endangered
Regrowth 12.11.6 - *Corymbia citriodora* subsp. *variegata*, *Eucalyptus crebra* woodland on metamorphics +/- interbedded volcanic.	Least Concern	No concern at present
Regrowth 12.11.14 - *Eucalyptus crebra, E. tereticornis, Corymbia intermedia* woodland on metamorphics +/- interbedded volcanics.	Of Concern	Of Concern

Table 11: Ground-truthed Vegetation

Of the ground-truthed vegetation, one small patch of Regrowth 12.3.3 - Eucalyptus tereticornis woodland on Quaternary alluvium located at the corner of the Obodin Road and Landing Road intersection could potentially be impacted due to the requirement for construction of slip lanes.

Impacts during Operations

There are no additional ecology impacts anticipated during operations.

Mitigation during Construction

As can be seen in Figure 6-1, the proposed project footprint is almost exclusively within the highly disturbed areas of the site which were previously used as a quarry. All vegetation of value, other than the vegetation near the Obodin Road and Landing Road intersection, will be retained and preserved. Protection in the form of removal of weed and pest species will enhance the value of this preserved vegetation. As far as practicable, the vegetation at this intersection to be impacted by the proposed slip lane construction will be minimised by design.

The field studies did not identify fauna values of significance. The field survey determined that there is low potential that threatened species like the Greater Glider, Koala, Coastal Sheath-tail Bat and Squatter Pigeon will utilise this site. Nevertheless, habitat suitable for these species like hollow bearing trees and regrowth eucalypt woodlands will be as far as practicable.

Mitigation measures shall include:

- Avoiding clearing of remnant and high value regrowth, and where clearing is required minimizing fragmentation of patches
- Prior to, and during clearing, ensuring a fauna spotter catcher is present to identify any fauna breeding places, and fauna species;
- Prior to, and during clearing, ensure measures are taken to avoid harm such as leaving trees that may have Koalas present until the animal has moved out of the area of its own volition, checking under logs, rocks for reptiles etc.;
- Implementing erosion and sediment control measures during clearing and construction to minimize any sediment runoff into waterways
- Minimizing construction works required at night, and where this cannot be avoided ensuring lights are directed away from adjacent bushland;
- Undertaking weed management, feral animal control and bushfire management across those areas of the development site which are retained in their natural state to improve native vegetation condition and reduce impacts on native fauna; and
- Undertake restoration of the endangered RE12.3.3 patch including supplementary plantings to improve its ecological function and connectivity.
- Undertake evaluation of Biodiversity Offset requirements required.

Mitigation during Operations

The measures following will be applied during the operation of the plant

- Undertaking weed management, feral animal control and bushfire management across those areas of the operational site which are retained in their natural state to improve native vegetation condition and reduce impacts on native fauna; and
- Undertake restoration of the endangered RE12.3.3 patch including supplementary plantings to improve its ecological function and connectivity.
- Undertake evaluation of Biodiversity Offset requirements required.

Vegetation and Biodiversity Offsets

During the EIS process, it is anticipated that to develop the Project and its associated infrastructure, the impacts on some environmental values may be unavoidable. The conditional approval of the prescribed activities may occur subject to the proponent delivering offsets in accordance with the Queensland environmental offsets framework established

under the Environmental Offsets Act 2014, Environmental Offsets Regulation 2014 and the Queensland Government Environmental Offsets Policy. The Gladstone Energy and Ammonia Project will provide offsets for impacts on applicable Commonwealth (MNES) and State (MSES) biodiversity values. A Biodiversity Offset Plan will be prepared which consolidates the offset requirements for the project.

6.4.2 Greenhouse Gas Emissions

This project will generate approximately 2 million tonnes of carbon dioxide of which 1.8 million tonnes will be separated in the process as high purity carbon dioxide which can be captured, sequestered or sold directly to available markets.

Mitigation

A Carbon Dioxide Management Strategy has been prepared to ensure that the net carbon dioxide emissions post reuse, mitigation and offsets are equivalent to the emissions from best available technology.

GEAP proposes to offset all the excess carbon emissions which can be expected from the use of coal when compared with the best available technology to produce ammonia.

A Greenhouse Gas Management Plan (GHGMP) will be prepared to ensure that through the use of best practice, the total net greenhouse emissions and/or greenhouse gas emissions per unit of product are minimised. The greenhouse gas (GHG) assessment for the GEAP will be conducted in accordance with the National Greenhouse and Energy Reporting Act 2007.

The GHGMP will consider the following:

- annual global and national GHG emissions;
- international and national policy in regard to GHG emissions; and
- Scope 1 and Scope 2 GHG emissions from the development and operation of the GEAP.

A Carbon Dioxide Abatement Plan will be developed and implemented to manage carbon dioxide emissions.

6.4.3 Stormwater

Protection of Existing Stormwater flows

As discussed, in Section 5.4, stormwater from the Targinie Forest Area flows to the bay via a number of stormwater drainage lines. Two unnamed stream order 1 (minor) ephemeral drainage lines intersect the Project site. One runs along the northern edge of the site and the second runs just north of Obodin road.

To protect these existing stormwater flows a stormwater drainage environmental overlay is proposed over the northern drain line as indicated in Figure 6-4 below. This is to ensure that impacts to stormwater flow can be maintained with minimal impacts from the development of this project and the proposed developments of the adjacent QER site to the north and north-west.

The second minor ephemeral drainage line which runs just north of Obodin Road will be impacted by the development of the Project. A diversion channel is proposed to ensure that stormwater flows will be maintained to minimise environmental impacts.

The details of the proposed stormwater overlay and diversion channel(s) will be confirmed by stormwater studies undertaken as part of the EIS. In addition, these studies will investigate the impacts on flooding by the development of the Project and ensure that these impacts are eliminated or mitigated.

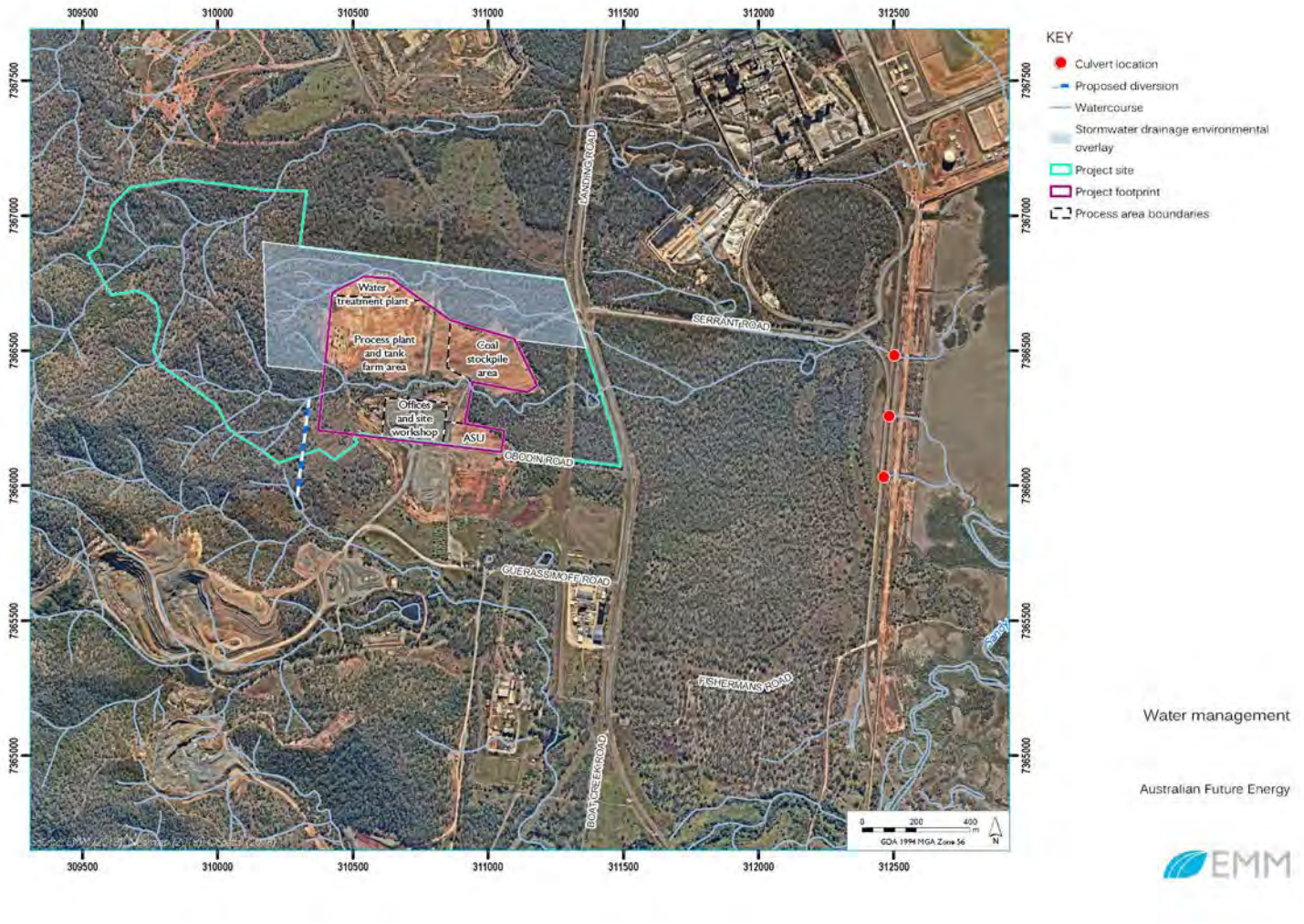

Figure 6-4: Protection of existing Stormwater Flows

Project Site Stormwater Management

The project footprint is expected to be approximately 750 m x 650 m. This will include the coal stockpile areas, process plant areas and non-process plant areas.

The introduction of gravelled and paved areas will increase the stormwater flows from the site. This could increase the erosion and sediment load from the site. Chemical spills could occur in process plant areas which must be contained and prevented from reaching the stormwater system. Rain water and run- off from coal dust suppression could also contain fine coal dust which needs to be removed prior to discharge to stormwater.

Mitigation

The GEAP project site will be subdivided into three different stormwater management areas.

1. **Process plant areas** which drain to stormwater bunds built around the process plant areas.
2. **Coal stockpile areas** which drain to a separate sedimentation pond.
3. **Non- process plant areas** which have minimal potential for chemical contamination of stormwater.

* It should be noted that all ash is currently proposed to be stockpiled separately and sold off site and no stormwater management will be required for ash storage areas, other than from bunds around these ash storage areas.

Process plant areas will be segregated from all other site areas and are bunded to contain chemical spills which may occur. Rainwater incident within these bunded process plant areas will be collected separately and treated if required to meets the stormwater discharge licence conditions, prior to disposal.

Drainage of rainwater incident on coal stockpiles and drainage from water sprays used for dust suppression will be collected separately. This water will be collected separately and treated in a sedimentation pond to remove fine coal dust prior to reuse for dust suppression or discharge to the environment.

All areas outside the core process plant areas and coal stockpile areas are non- process plant areas. These areas which have minimal potential for chemical contamination and include administration buildings, roads, buffer zones, landscaped areas etc.

A detailed stormwater management plan will be completed as part of the EIS which will evaluate the impacts on stormwater as well as erosion on the site and surrounds and ensure that mitigation is implemented to minimise and eliminate these impacts.

Impacts on Great Barrier Reef World Heritage Area

The project is in the Great Barrier Reef World Heritage Area and potential impacts of the project, in particular run off during construction which could increase the sediment load or carry pollution to the waters feeding the Great Barrier Reef will be assessed during the EIS phase and appropriate mitigation implemented to protect these values.

6.4.4 Process Water

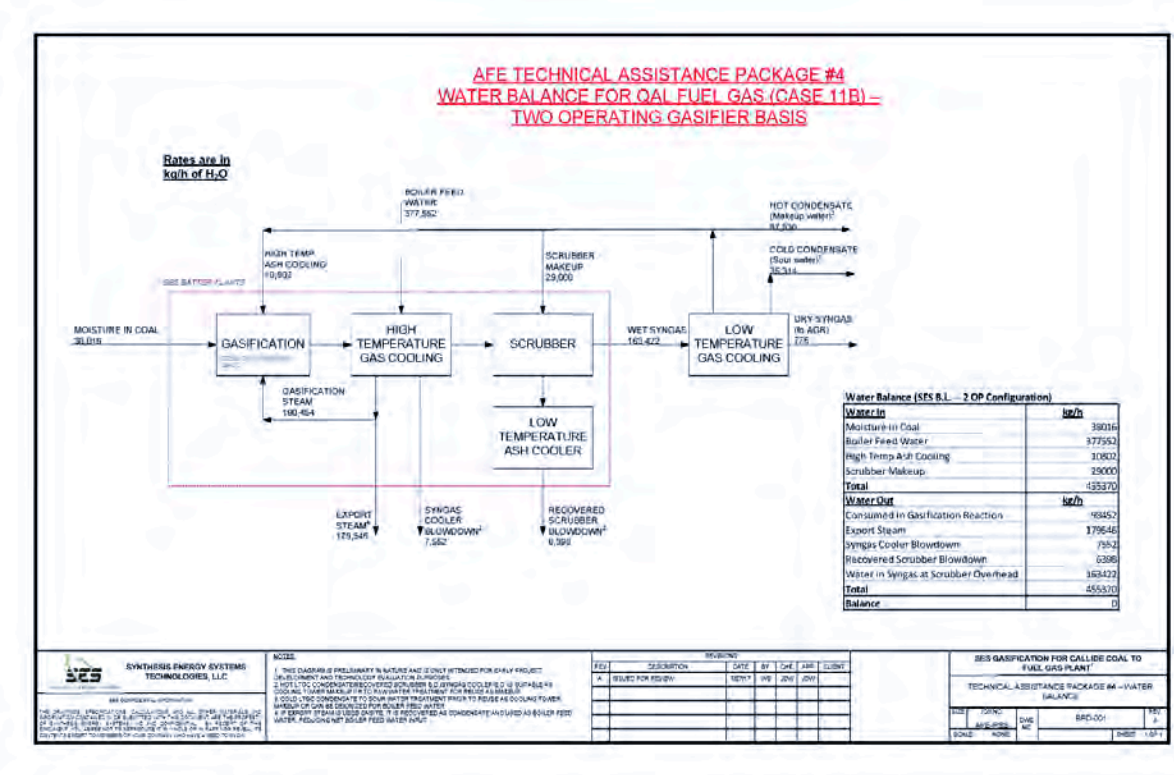

Figure 6-5: Water balance schematic diagram

Process water is condensed from the process systems and this water is recycled where possible. Where process water streams cannot be recycled, they are sent to the waste water systems for treatment. The streams which make up the majority of waste water are as follows:

- Evaporative Cooling tower blowdown containing dissolved solids
- Boiler blowdown containing dissolved solids
- Scrubber and other process blowdowns containing small quantities of cyanides

Mitigation

These streams will be collected, chemically treated, mixed in a balancing pond and tested are where practicable reused. Waste water streams (expected to be high in salinity) unsuitable for reuse, will be disposed in accordance with licence conditions and regulatory requirements.

6.4.5 Air Quality and Dust

The plant will produce a number of air emissions from the gasification and gas purification processes. These emissions will include:

- Sulphur oxides.
- Nitrogen oxides.
- Particulates - PM_{10} and $PM_{2.5}$

In addition, there are potential fugitive emissions from gas leaks. Gases produced by the project will include syngas, synthetic natural gas (methane), carbon dioxide and ammonia. There is potential for these gases to leak from pipelines and process plant equipment.

Sulphur Oxides

Sulphur contained in the coal is released as hydrogen sulphide in the gasification reaction and becomes a minor component of syngas.

Nitrogen Oxides (NOx)

An air separation unit is used to generate oxygen for the gasification process. As nitrogen is removed and not fed to the gasifier, the potential for NOx formation is minimal.

Nitrogen is produced as a by-product does not form nitrogen oxides. In addition, the gasification process is fed with pure oxygen and hence the formation of NOx is supressed due to the absence of nitrogen.

Nitrogen Oxides are generated as by-product in the combustion of fuel gases in the Gas Turbine Generator.

Carbon Dioxide

Carbon Dioxide is generated in the gasification reaction and separated from Synthesis Gas in the Acid Gas Removal Unit (Pre-combustion). Carbon Dioxide is also generated by combustion of fuel gases in the Gas Turbine Generator and vented via the GT/HRSG stack.

Particulates - PM_{10} and $PM_{2.5}$

Particulates may be generated in handling coal on the project site. Coal will be unloaded from coal rail wagons. It will be conveyed to stockpile storage where dust minimisation techniques will be used. The coal is then crushed and processed in the coal gasification unit to Synthesis gas and ash. There is no coal fired boiler onsite.

Unreacted coal dust is recovered from the Synthesis gas stream leaving the gasifier using hot gas cyclones and recycled to the coal gasification process via a proprietary Fines Management System. Any dust still remaining in the synthesis gas is scrubbed by contact with a circulating water stream such that the Synthesis gas is particulate free and can be fed to process units downstream. The gasification process does not emit particulates.

Mitigation

Sulphur Oxides
The hydrogen sulphide is removed from the syngas in the Acid Gas Removal Unit and is converted to a molten sulphur product in the Claus Unit. It is expected that over 97% of the sulphur in the coal is recovered as useful product.

Nitrogen Oxides
A special Low NOx burner design in the Gas Turbine is used to minimise the formation of nitrogen oxides.

Carbon dioxide
The separated CO2 is available for recovery or is vented to the atmosphere.

Cumulative Impacts

While individual stack emissions are predicted to be minimal (based on similar sized plants elsewhere), the emissions will contribute to the cumulative loads in the Gladstone / Yarwun air shed.

Dust PM10 and PM 2.5

The gasification process does not emit particulates and this section deals with particulates generated from the transport and handling of coal and other sources such as vehicle movements. Generally, there are two types of controls used for managing dust, management controls and engineering controls. Management controls focus on avoiding certain activities or restricting such activities to certain areas or at certain times.

Engineering controls are generally divided into three different approaches: containment, suppression and collection. Containment is the mechanical control and confinement of dust at the source. Dust suppression is the application of water or chemically treated water in some manner of spray or fog to prevent fine particulates from being emitted off the surfaces of haul roads, stockpiles, conveyors, dump hoppers, etc. into the air. Dust collection involves passing the air carrying dust from the source through some form of filtration system (eg. electrostatic precipitators, baghouse filters).

A Dust Management Plan will be prepared and implemented during construction and operations to meet air quality standards from both the *Coal Mining Safety & Health Act (1999)* and the *Environmental Protection Act (1999).*

Fugitive Emissions

The project will also be designated as a Major Hazard Facility. The requirements to detect and monitor for gas leaks and to undertake mitigation to remove the safety and human risks posed by these leaks are very comprehensive.

The gas leak detection system for all process gases including ammonia, carbon dioxide, syngas and methane will ensure that gas leaks if any are promptly identified and rectified.

Cumulative Air Quality impacts

Dispersion modelling will be carried out for the project as part of the process, assessing the impact and recommending mitigation strategies or technologies to reduce impacts. The air quality guidelines in the EPP Air will be used to develop mitigation controls relating to aesthetic enjoyment of places, visual and local amenity, biological integrity and other (unspecified).

6.4.6 Ash

The gasification process will produce ash dependent on the coal quality. The ash produced from the SES gasification process is very high quality, with trace carbon content and does not leach.

The ash is cooled and stored onsite in a hopper. It will be loaded into a covered truck and transported offsite for a beneficial use.

Mitigation

Discussions have been initiated with the Australian Road Research Board towards getting the ash tested so it can be certified for use as a raw material for building products. (eg. road base).

During the preparation of the EIS, the project team develop an ash management to secure an end market to reuse all the ash produced. This plan will also identify options for ash management should a market not be available for reuse of all the ash as a raw material for building products.

6.4.7 Solid Waste Management

The construction and operations of the Project will include the generation of general, commercial and industrial waste products. These wastes may include:

- vegetation cleared from ground disturbance areas;
- regulated waste (hydrocarbon waste, detergents, solvents, batteries and tyres);
- scrap metal and off-cuts from maintenance activities and from construction;
- general waste (food scraps, paper, rags, cans and glass); and
- sewage effluent and sludge.

Mitigation

A Waste Management Plan will be prepared to ensure that all wastes are managed appropriately during the construction, operation and decommissioning phases. It will investigate means to implement waste prevention followed by reuse, recycling, recovery including recovery of energy. The last option will be to ensure that wastes which cannot be reused, recycled or recovered are disposed in accordance with all regulatory requirements.

The preferred waste management hierarchy will align with existing approved site management practices and form the basis of a framework for prioritising waste management practices to achieve an acceptable environmental outcome on site in accordance with *Waste Reduction and Recycling Act 2011* (WRR Act). A Waste Management Plan will be developed as part of the EIS.

6.4.8 Groundwater

Impacts

The project does not draw down on groundwater. The ecology study determined there were no groundwater dependent ecosystems likely to be impacted by the project. Nevertheless, as part of the EIS a detailed groundwater investigation will be conducted. As identified in Section 5.5 above groundwater exists in both the unconfined Quaternary alluvial close to the surface and in the Rundle formation groundwater system. The Rundle formation groundwater system is located at depths of over 75 metres[22] and will not be impacted by construction activities.

Table 12: Potential Ground Water Impacts below summarizes the potential impacts on groundwater and the future work proposed to address the uncertainty.

Receptor	Data gap / uncertainty / risk	Initial assessment	Future work proposed
GDEs	Impacts to potential GDEs on and near the Project site.	There are no identified Groundwater Dependent Ecosystems (GDEs) including aquatic, terrestrial or	Ecological assessment to confirm the dependence of vegetation on groundwater

[22] Gladstone New Fuels Development Project- Stage 2A Project Description to support Draft Terms of Reference. – Queensland Energy Resources as lodged with Department of Environment and Heritage Protection (2014).

		subterranean on the subject properties based on review of the Groundwater Dependent Ecosystems Atlas (BOM 2018). Some minor areas adjacent to Sandy Creek in the south are mapped as potential aquatic and terrestrial GDEs. These potential GDEs will not be impacted by the proposed developments. The project does not draw down on groundwater. Paving of process areas and spill protection to be implemented to eliminate potential for groundwater contamination.	Groundwater investigations to confirm groundwater levels and quality.
State Forests and Nature Reserves Targinie, Mount Stowe and Calliope	Groundwater impacts to the national park from the project development.	Targinie National Park is located approximately 3 km west of the project site. Given the spatial distance from the project site and that groundwater is not being extracted, this is initially classified as a low risk to the project.	Groundwater investigations to confirm groundwater levels, hydraulic parameters and quality. Numerical model required to predict impacts.
Existing users	Impacts to existing users on and within 5 km of the Project site.	A limited number of private bores have been identified in this desktop assessment. However, groundwater use does not appear to be significant and this is initially classified as a low risk to the Project.	Landholder communication to engage stakeholders and confirm lack of groundwater use. Bore census to be completed in accordance with DES baseline assessment guidelines. Numerical model required to predict impacts to existing bores.
Outflow of nutrients/ nitrogen compounds to bay via groundwater	The project will generate ammonia which could potentially enter the groundwater through spills.	Chemical spill leak detection to be implemented.	Chemical spill and leak detection to be implemented as part of HAZOP studies and plant design.
Groundwater / surface interaction	There is potential for interconnection between the shallow aquifer systems.	This is initially classified as a low risk to the project.	Groundwater investigations to confirm groundwater levels, hydraulic parameters and quality within the various strata.

Table 12: Potential Ground Water Impacts

The project is located outside the Great Artesian Basin and hence does not pose any risk to it.

Mitigation

Hydrogeological data will be collected as part of the EIS studies and this information shall be utilised in the design process to minimise potential impacts on groundwater during construction and operations. A Construction Environmental Management Plan will be prepared to ensure that impacts if any to the unconfined Quaternary alluvial aquifer are minimised during construction.

6.4.9 Cultural Heritage

Impacts

There are no known Aboriginal Cultural Heritage places in the Project plant site area. The desktop due diligence Cultural Heritage study[23] conducted identified one Department of Aboriginal and Torres Strait Islander Partnership (DATSIP) site (JF:D17) (Shell Midden(s)) is recorded within 25 m of the one proposed conveyor belt location options and may extend into the study area.

Project works within the area of quarrying are assessed as Category 2 activities under the Duty of Care Guidelines (Figure 5-8). That is, as an activity that will cause No Additional Disturbance, and so is unlikely to cause any additional harm to Aboriginal heritage (s4.4). Category 2 activities can generally proceed without further heritage assessment (s4.5).

As was seen in Section 5.7, most of the site is classified as Category 2 and the project footprint is expected to be placed within the Category 2 area, with some minor impacts on the areas classified as Category 4 and Category 5 under the Duty of Care Guidelines.

Based on this evidence, works within the Project area are not anticipated to impact on any Matters of National Environmental Significance (MNES) heritage values, and therefore no assessment will be required under the EPBC Act.

Mitigation

A Cultural Heritage Management Plan will be developed under Part 7 of the *Aboriginal Cultural Heritage Act 200*3 (ACH Act).

A cultural heritage survey will be conducted ahead of project works. Category 4 and 5 areas, as classified under the Duty of Care Guidelines, to be surveyed and the Aboriginal Party given the opportunity to attend and engaged to undertake the survey.

6.4.10 Indigenous Land Use Agreements

One ILUA see below has been entered into with the State which relates to land tenure (and therefore native title status across the PCCC claim area).

Name	Tribunal No	Status	Lodged	Notified	Registered	Type	Applicant
Port Curtis Coral Coast Tenure Resolution ILUA	QI2017/013	ILUA registered	13 Nov 17	17 Jan 18	3 May 18	Area Agreement	State of Queensland

Mitigation

The details and implications this ILUA on native title will be confirmed with a native title specialist and the State Government during the EIS process.

6.4.11 Amenity – Odour, Noise and Light Pollution

Amenity Impact

[23] Gladstone Energy and Ammonia Project – Due Diligence Cultural Heritage Study – AECOM, April 2018.

During GEAP's construction and operation, amenity impacts are expected to be observed by some Gladstone residents and landholders in the immediate vicinity of the project site. The site is situated within a highly industrialised area. Due to the distance from sensitive receptors, both visual impacts and lighting impacts are expected to be minimal.

Chemical plants by nature have a very specific appearance, the proposed Gladstone Energy and Ammonia is unlikely to be assessed as impacting on visual amenity of the immediate surrounding area due to the size and scale of the facility.

During construction and operation of the Project, amenity impacts are expected to be noticed most by residents and landholders in the immediate vicinity of the project and the Gladstone area. Landholders in the immediate vicinity are other industrial sites. Nevertheless, the gasification structure is expected to be approximately 70 metres high and may be potentially visible from Gladstone.

Public perceptions will be evaluated and addressed as per Community and Stakeholder Consultation Plan described in Section 9 of this document.

Mitigation

The site is located in the midst of heavy industry and at some distance from sensitive receptors. It is anticipated that these impacts will be manageable in terms of control measures. A visual amenity study will be conducted as part of the EIS.

Odour Impact

Odour generated from the site is expected to be minimal as the process does not produce tars and oils. It is not anticipated that the odour emissions from the will be at levels to cause impacts to nearby residents.

Mitigation

Treatment and detection systems are designed to reduce the risk of odours being produced at levels that maybe considered offensive.

6.4.12 Noise and Vibration

The proposed site location will be subjected to background noise from heavy vehicle and rail traffic as well as noise from industrial sources located in the area. Noise and vibration impacts associated with the project's construction and operation will be assessed and managed in accordance with the relevant noise management guidelines EM2371 – Planning for Noise Control. Off-site road traffic noise was assessed against the Department of Transport and Main Roads (DTMR) Road Traffic Noise Management Code of Practice (DTMR, 2007) criteria. Rail noise associated with the Project was assessed in accordance with the Queensland Rail (QR) Code of Practice for Railway Noise Management (QR, 2007) criteria.

Mitigation

An assessment of noise impacts including low frequency noise impacts from the operations of compressors, turbines and other plant equipment will be conducted as part of the EIS. Noise and vibration mitigation will be conducted to ensure compliance with licence conditions.

6.4.13 Visual Amenity and Light Pollution

GEAP's proposed site is wholly contained within the Gladstone State Development Area (SDA), approximately 15 kilometres north-west of Gladstone CBD.

Figure 6-6: Queensland Alumina Plant Gladstone – at night

The Gladstone area consists of numerous industrial sites with significant light pollution. The Project is not expected to impact significantly on the existing light pollution levels.

Mitigation

It is anticipated that visual amenity and light pollution impacts will be manageable in terms of control measures. A visual amenity study will be conducted as part of the EIS. This will include an assessment of the impacts of light pollution from the proposed project and means to mitigate any impacts on the surrounding terrestrial and marine environments.

6.4.14 Hazard and Risk, and Health and Safety

Hazard and Risk

Hazards need to be identified and associated risks managed to reduce or eliminate the potential for harm to occur to people, property and the environment. The project will require approval as a Major Hazard Facility. This is a separate parallel process requirement detailed hazard and risk and health and safety impact assessment.

The EIS will include a formal hazard and risk assessment to ensure the effective management of all risks associated with the construction and operation of the Project. AFE as Operator of a Major Hazard Facility must develop a safety management system, safety assessment and safety case. Workplace Health and Safety Queensland major hazard team (a group of qualified inspectors) will undertake audits and assess the performance of AFE in meeting its obligations

Mitigation measures would include the movement of hazardous goods in accordance with the Australian Dangerous Goods Code and the Transport Infrastructure (Dangerous Goods by Rail) Regulation 2008. ARTC would also prepare and implement an Emergency Management Plan during the operational phase of the project.

Health and Safety

The purpose of the *Work Health and Safety Act 2011* (WH&S Act) is to provide a regulatory framework for workplace health and safety that is consistent with national policy.

A Health and Safety Management System in accordance with the WH&S Act will be developed and implemented to cover all operations (on-site and off-site) associated with the development, construction and operations of the GEAP.

6.4.15 Closure and Decommissioning

The Project is located within the Gladstone State Development Area (GSDA) and it is hence considered likely that the post project land use will also be industrial in nature.

The Project will work closely with the Office of the Coordinator-General and relevant State government bodies to prepare an agreed decommissioning plan applicable to the site. Other key stakeholders (DES, DNRME, DSD, GRC and WSHQ) will be consulted and engaged throughout the process of preparing the decommissioning plan, to ensure that agreements are in place relating to acceptable closure outcomes for the project site. Upon closure, the decommissioning plan would be implemented with key closure objectives to be met prior to the handover of the land. A Decommissioning and Rehabilitation Plan will be developed and implemented, both during plant operations and after plant closure to ensure progressive and final rehabilitation of all disturbance caused by the activities over the life of the project.

The Coal Gasification Plant, Ammonia Plant, all buildings, structures, equipment and plant erected and/or used for project activities will be removed from the site prior to surrender, except when agreed in writing by the administering authority and/or the landowner. After removal, the land will be rehabilitated in accordance with the Rehabilitation Plan and Environmental Authority conditions.

Subject to agreement at the time, infrastructure developed may be left on site to be utilised by subsequent users and where required all other infrastructure will be removed in accordance with the agreed.

The rehabilitation will include management of ash storage should all the ash produced not be sold for reuse.

6.5 Environmental Management Measures

This section discusses overall environmental management which will be implemented throughout the life of this project. Many of the environmental and social values are positively impacted. Hence the second section which discusses mitigation measures deals only with values which are potentially impacted and require mitigation.

6.5.1 Environmental Management

The EIS will identify the impacts on water resources (surface water and groundwater), land resources, air quality (including greenhouse gases), noise and vibration, cultural heritage (including indigenous and non-indigenous), and flora and fauna of conservation significance.

The Environmental Management Plan prepared as part of the EIS will identify:

- the environmental protection objectives to be met.
- measures to prevent or mitigate potential adverse impacts on the environment to meet these environmental protection objectives.
- monitoring requirements to measure actual performance and effectiveness of control measures.
- auditing requirements and responsibilities to demonstrate implementation of agreed construction and operation environmental management strategies and compliance with agreed performance criteria.
- procedures for complaints and inquiries.
- roles and responsibilities in relation to environmental management, monitoring and corrective actions.
- requirements for training and competence of workers.

The mitigation measures and monitoring to meet the environmental protection objectives are embodied in the draft Environmental Authority conditions issued by the Department of Environment and Science and Health Protection on approval of the EIS.

6.5.2 Construction and Commissioning

During construction, environmental impacts will be managed through a Construction Environment Management Plan (CEMP), which will detail environmental outcomes, performance criteria and mitigation measures to meet relevant legislative requirements and stakeholder expectations. The CEMP will be implemented by the GEAP and its contractors to minimize potential environmental impacts during the construction phase of the Project.

The CEMP has the following objectives:

- Identify the environmental issues and potential environmental impacts associated with construction;
- Outline management plans, procedures and controls for each of the environmental issues associated with construction;
- Specify the environmental responsibilities of the Project management team, contractors and on-site workers;
- Ensure construction is undertaken in compliance with relevant environmental legislation and standards;
- Define monitoring, reporting and auditing requirements for the construction phase; and
- Effective implementation of the CEMPs during construction will ensure environmental risks are appropriately managed.

6.5.3 Operations

During the EIS process, the risks and impacts of the project are identified along with mitigation measures to eliminate and/ or minimise these risks to acceptable levels. The approval of the Project is accompanied by the issue of an Environmental Authority (EA) by the Department of Environment and Science. The EA identifies the requirements during operations to ensure environmental protection. In addition to specifying actions to be taken and limits on emissions to protect environmental values.

An Environmental Management System (EMS) consistent with the principles of ISO 14001, will be developed. The EMP's include provisions for monitoring and continuous improvement of environmental performance. The EMS forms a component of the broader Project

management system that addresses the occupational health and safety and community and heritage aspects of the Project.

7 APPROVALS REQUIRED FOR THE PROJECT

Potential Approval	Legislation	Trigger for Approval	Administering Authority	Relevance to the Project	Action
Commonwealth Approvals					
Commonwealth approval for an action which may significantly impact on a matter of national environmental significance (MNES).	*Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)	The Project will require to be referred to DoE for determination as to whether or not it will be a controlled action due to potential impacts on MNES.	DoE	The autumn field survey conducted identified low potential for EPBC listed species to occur within the local region of the Gladstone Energy and Ammonia Project study site. The project site however, is within the Great Barrier Reef World Heritage Area and an EPBC referral will be lodged with DoEE after a decision is made by the Coordinator-General as to whether the project is a coordinated project.	. EPBC referral will be submitted to the Minister to determine if the action is “a controlled action” or “not a controlled action” under the EPBC Act
Requirement to report greenhouse gas emissions.	*National Greenhouse and Energy Reporting Act 2007*	Corporations are required to register and report if they emit greenhouse gas, produce energy or consume energy at or above the annual thresholds specified in the Act.	Greenhouse and Energy Data Officer	No specific approval required.	Evaluate greenhouse emissions and identify works to be conducted as part of the GHG management plan for the IAS.
A relevant agreement (Indigenous Land Use Agreement (ILUA)) or right to negotiate agreement) with Native Title claimants for future acts.	Native Title Act 1993	The Project may be located within an area subject to active Native Title claims and approved Indigenous Land Use Agreements.	National Native Title Tribunal (NNTT)	National Native Title Tribunal desktop searches revealed that a number of approved ILUAs apply to the project site.	The IAS includes the results of these searches.

Potential Approval	Legislation	Trigger for Approval	Administering Authority	Relevance to the Project	Action
State Approvals					
Co-ordinated project declaration and the Coordinator-General Evaluation Report as to whether impacts can be managed. Coordinator-General.	State Development and Public Works Organisation Act 1971 (SDPWO Act)		Co-ordinator-General, Department of State Development, Manufacturing Infrastructure and Planning (DSDMIP)	An environmental impact assessment process pursuant to the State Development and Public Works Organisation Act 1 971 will be undertaken to determine whether the impacts of the project can be managed. A Report by the Coordinator-General is an evaluation of the impacts, not an approval for the project.'	IAS to be completed in accordance with the guidelines provided on the Coordinator-General's website.
Environmental Authority (Chapter 5 activity) Petroleum activity under section 107 (d)	Environmental Protection Act 1994 (EP Act)	The Project involves petroleum activities which require an environmental authority to be issued prior to any activity commencing	Department of Environment and Heritage Protection. (EHP)	The project will have both a Petroleum Facilities Licence and a Petroleum Pipeline Licence which are Chapter 5 – petroleum activities. Petroleum activities for the Project will require an environmental authority.	Outline requirements for Environmental Management Plan which will determine the content of the Environmental Authority.
Material change of use	State Development and Public Works Organisation Act 1971	Development Scheme for the Gladstone State Development Area	Coordinator-General	Application for a material change of use will be made after the outcome of the EIS process is known.	The IAS includes a description of the uses of the project site. Final design and route selection of off-site infrastructure will be conducted as part of the EIS.

Potential Approval	Legislation	Trigger for Approval	Administering Authority	Relevance to the Project	Action
Environmentally relevant activities (ERAs)	*Environmental Protection Act 1994 (EP Act)*	ERAs are industrial activities with the potential to release contaminants into the environment. The ERA's are typically authorised under Environmental Authorities for relevant mining and petroleum tenements. Separate applications for approvals to carry out ERAs may be required where such ERAs are proposed to be carried out off-tenement or are mobile activities.	Department of Environment and Science. (DES)	Potential ERA's required on the Project include: ERA 7(1)(b) Chemical Manufacturing. ERA 8(3)(a) Chemical storage ERA 10 Gas producing ERA 14(1) Electricity generation ERA 15(1) Fuel burning ERA 16(2)(a) Extractive and screening ERA 43(1) Concrete batching (Construction only) ERA 56(2) Regulated waste storage ERA 58(1) Regulated waste treatment ERA 60 (1)(d) Waste disposal ERA 61 Waste Incineration (potentially, depending on the option adopted for treatment/disposal of process water) ERA 63 (1)(b) Sewage Treatment ERA 64 Water Treatment	No further work required for the IAS except to confirm all relevant ERA's. This will be covered in the ToR for the Environmental Management Plan (EMP).
Survey licence	*Petroleum & Gas (Production and Safety) Act 2004. See Chapter 4, Part 1*	Investigation and survey of an area's potential and suitability for the construction and operation of pipelines or petroleum facilities, and identification of possible pipeline routes and pipeline facility access routes.	Minister for the Department of Natural Resources, Mines and Energy (DNRME).	A survey licence will be needed to access land to: investigate and survey its potential and suitability for the construction and operation of pipelines or a petroleum facility; and identify possible pipeline routes and pipeline or petroleum facility access routes.	Required for site selection and initial works for IAS. Could possibly defer this requirement to the ToR stage.

Potential Approval	Legislation	Trigger for Approval	Administering Authority	Relevance to the Project	Action
Environmental Authority for a survey licence	*Environmental Protection Act 1994 (Qld). See chapter 4A, Part 2*	Required before the Minister for the DME grants a survey licence.	Department of Environment and Science. (DES)	For a petroleum project only, a single application for an Environmental Authority is required to cover all proposed activities. The Environmental Authority for a survey licence should form part of this single application.	Should be able to tailor the on-line compliant EA's for surveys.
Petroleum Pipeline Licence (PPL). Relevant if SNG or syngas is to be exported.	*Petroleum and Gas (Production and Safety) Act 2004 (P&G Act))*	A PPL is required to permit the construction and operation of a pipeline within a defined easement for transfer of SNG to an existing gas transmission pipeline.	Department of Natural Resources, Mines and Energy (DNRME)	PPLs are required for higher-pressure gas transmission pipelines (though some petroleum and water pipelines can be constructed under the authority of, and in the area of, a PL or PLs).	Will require some details on the nearest pipeline which are likely to be connected to, for the IAS.
Approval for Gas Pipeline Corridor (if required)	*Planning Act 2016*	Approval for the use of parts of land for the pipeline corridor.	Local Government or a Minister	Environmental and Social impacts of Pipeline corridors to be investigated as part of EIS.	Relevant if SNG or syngas is to be exported. Identify that pipeline corridors will need to be investigated and identify all possible pipeline route options to include in ToR.
Petroleum Facility Licence (PFL)	*Petroleum and Gas (Production and Safety) Act 2004 (P&G Act))*	A PFL is required to permit the construction and operation of a petroleum facility within a defined lease area / easement.	Department of Natural Resources, Mines and Energy (DNRME)	A PFL is required for: A facility which distils, processes, refines, stores or transports syngas, other than a distribution pipeline. Flaring of excess syngas in the flare. Steam production by the boiler	Will require details on plant footprint and emissions.

Potential Approval	Legislation	Trigger for Approval	Administering Authority	Relevance to the Project	Action
Development approvals may be required for: • Material change of use • Operational works • Building works • Plumbing and drainage works • Reconfiguring a lot • Major Hazard Facility	Planning Act 2016	A development assessment by the State Assessment and Referral Agency (SARA) under the Planning Act 2016 as this development is expected to trigger State interest. The use of premises for a major hazard facility or possible major hazard facility as defined under the Dangerous Goods Safety Management Act 2001.	Coordinator - General DSDIP Relevant local government authority Relevant referral and advice agencies (such as DES, DNRME, etc) Work Health and Safety Queensland	MCU approval for new infrastructure is required from the Coordinator- General. Development assessment by SARA under the Planning Act. The Gladstone Ammonia Plant is expected to be classified as a Major Hazard Facilities.	List developments including offsite infrastructure to be assessed by SARA.
Major Hazard Facility	Work Health and Safety Regulation 2011 Schedule 15 Schedule 18 Chapter 9	Threshold parameters for output production, application to operate a major hazard facility, operator's licence.	Hazardous Industries and Chemicals Branch (HICB) of Work Health and Safety Queensland	A proposed chemical manufacturing facility should notify during the design phase of its development and keep the regulator informed of changes, as appropriate The operator of a determined MHF must provide a safety case outline to the regulator within three months after the determination of the MHF. Applications will be made after the outcome of the EIS process is known.	Only relevant for the IAS that another regulatory body needs to be involved and hence further supports the case for being a co-ordinated project. A Safety Case needs to be prepared concurrent to Environmental and Social approvals. No further work required for the IAS.

Potential Approval	Legislation	Trigger for Approval	Administering Authority	Relevance to the Project	Action
A relevant agreement (Indigenous Land Use Agreement (ILUA)) or right to negotiate agreement) with Native Title claimants for future acts.	*Native Title (Queensland) Act 1993*	The Project is located within an area potentially subject to active Native Title claims.	National Native Title Tribunal (NNTT)	It is likely that native title claims have been extinguished on this allotment. This is to be confirmed as part of the EIS.	Desktop Native Title Aboriginal and European cultural heritage study and historical title searches completed.
Cultural heritage management plan (CHMP)	*Aboriginal Cultural Heritage Act 2003*	A CHMP is required to ensure that matters of Indigenous cultural heritage are protected and respected.	Department of Aboriginal and Torres Strait Islander Peoples	AFE commits to develop a Cultural Heritage Management Plan (CHMP) with traditional land owners for the Project. Works cannot commence until the Plan has been approved.	Cultural Heritage is described in the IAS to be addressed as part of the EIS process.
Development permit (operational works) for waterway barrier works	*Fisheries Act 1994*	The establishment of a barrier across a waterway (including partial barrier) may affect fish passage through the waterway.	Department of Environment and Science. (DES)	This approval may be required for both on- and off-tenement operational works that are waterway barrier works.	Determine if water barrier works are likely for this project.
Protected animals movement permit	*Nature Conservation Act 1992*	Required if the Project will impact upon a protected animal species listed under the Act or subordinate regulations.	Department of Environment and Science. (DES)	All Project activities.	Not relevant to IAS.
Protected plants clearing permit and Clearing Permit of least concern Plants	*Nature Conservation Act 1992*	Required if the Project will interfere with plant species listed under the Act or relevant subordinate regulations.	Department of Environment and Science. (DES)	All Project activities unless an exemption applies.	Not relevant to IAS.

Potential Approval	Legislation	Trigger for Approval	Administering Authority	Relevance to the Project	Action
Wildlife movement permit	*Nature Conservation Act 1992*	Required if the Project will impact upon native wildlife (other than protected wildlife) in an area that is identified under a conservation plan.	Department of Environment and Science. (DES)	All Project activities.	Not relevant to IAS.
Development permit to clear native vegetation	*Vegetation Management Act 1999*	Clearing of native vegetation and high value regrowth, regional ecosystems and/ or essential habitat communities	Department of Environment and Science. (DES)	All Project activities unless an exemption applies.	Not relevant to IAS.
Mapping of Assessable Remnant Vegetation	*Vegetation Management Act 1999*	Property map of assessable vegetation (PMAV).	Department of Environment and Science. (DES)	All Project activities unless an exemption applies.	Terrestrial Ecology desktop and field study to determine offsets and whether EPBC referral is for a controlled action.
Water licence	*Water Act 2000*	Taking or interfering with water. Licensing of bores, taking water for groundwater monitoring, dewatering and compensatory water supply.	Department of Natural Resources, Mines and Energy (DNRME)	Project not expected to extract groundwater.	Not relevant to IAS
Licences required for Referable and Hazardous Dams	*Water Act 2000*	Trigger as applicable to referable and hazardous dam applications.	Department of Natural Resources, Mines and Energy (DNRME)	Dams for process water are expected to be referable.	Identification if referrable dams are required for inclusion in ToR.
Riverine protection permit	*Water Act 2000*	Destroy vegetation, excavate, or place fill within a watercourse, lake or spring.	Department of Natural Resources, Mines and Energy (DNRME)	Dependent on-site location, a riverine protection permit may be required for Project activities that involve works within a watercourse, lake or spring which occurs off tenement.	May apply to stormwater easement works.

Potential Approval	Legislation	Trigger for Approval	Administering Authority	Relevance to the Project	Action
Right to compulsorily acquire land for purposes of the project	*State Development and Public Works Organisation Act 1971 and Petroleum & Gas (Production and Safety) Act 2004*	Compulsory acquisition of land required for the purposes of the project. Only relevant if the compulsory acquisition of land becomes necessary	Minister responsible for SDPWO Act.	Likely to be required for offsite coal offloading stations or specific areas of pipeline corridor or electricity substations.	Not relevant except to identify that it may be required for conveyer and water supply.
Local Government Approvals					
Gladstone Regional Council Planning Scheme	Planning Act 2016	Council's infrastructure policies provide for the triggers and are mandatory. There are no development applications involved in this process. Application to the Coordinator-General pursuant to the Development Scheme is not dependent upon providing evidence of compliance with these policies. A separate process is provided for under Council's Planning Scheme.	Gladstone Regional Council	Water, sewage, roads, infrastructure contributions are not considered as part of the applications made to the Coordinator-General under the Development Scheme for the Gladstone State Development Area.	Infrastructure required to support the project is described in the IAS

8 COSTS AND BENEFITS SUMMARY

8.1 Local, State and National economies

An Economic Impact Assessment (EIA) will be submitted with the EIS. An EIA will assess benefits, values and potential impact areas resulting from the construction and operational phases of the Project.

- Creation of employment opportunities during the planning, design, construction and operation of the Gladstone Energy and Ammonia Project estimated at approximately 800 direct jobs during construction and 200 direct jobs during operations;
- During operations, it is estimated that the project will generate over 1,280 sustainable, indirect supply chain jobs (i.e. 1 FT job = 6.4 indirect jobs using QRC employment multiplier);
- Facilitate retention of local jobs;
- Flow on economic effects in local community's due employment opportunities and presence of the workforce within the Study Area;
- Strategically significant to the Gladstone region and Queensland providing significant capital investment in a regional area of approximately $1 billion; and
- Provides an end market for 1.5 million tonnes of coal.

8.2 Natural and social environments

It is the intention of the EIS process to investigate the possible impacts and define suitable environmental mitigation strategies to be incorporated into management protocols and plans in support of anticipated approvals. AFE will implement mitigation strategies as part of the construction and operation of the Project. Where impacts are unavoidable, the intent will be to offset such impacts to land-based and ecological values.

An assessment of the existing social environment and possible impacts associated with the Project will be submitted in the EIS. Most of the potential social impacts are anticipated to be positive for the area including economic diversification, population diversification, and increased economic, employment and training opportunities. The proponent believes that this will in turn raise the level of business confidence in the region and assist with retaining qualified people who have migrated to Gladstone to build the Curtis Island Gas plants.

The social environments will benefit from increased local expenditure in Gladstone and the broader region due to additional expenditure, expenditure by employees and indirect employment growth where this results in the additional employees moving to Gladstone. Strategies will be developed through the Social Impact Assessment conducted as part of the EIS process to avoid or mitigate against social impacts.

9 COMMUNITY AND STAKEHOLDER CONSULTATION

The overall purpose of the community and stakeholder consultation process is to enable opportunities for the community and other stakeholders to identify issues, impacts (potential or perceived) and mitigation measures of the Project and for these to be documented for consideration as part of the environmental assessment.

A Community and Stakeholder Consultation Plan will be developed for the Gladstone Energy and Ammonia Project (the Project) to guide the consultation activities during the environmental assessment process and demonstrate how the consultation will inform the development of the environmental assessment.

The Community and Stakeholder Consultation Plan will be designed to:

- raise awareness and understanding of the Project, its objectives, and timings among key stakeholders in industry, government and the community;
- identify stakeholders, community issues and concerns in relation to the Project;
- initiate and maintain open communication with the stakeholders on all aspects of the Project;
- obtain, consider, manage and document stakeholder comments and issues of concern;
- target specific stakeholders to help identify potential social impacts and develop appropriate mitigation strategies;
- proactively respond to and work with the stakeholders to develop appropriate solutions and strategies to minimise negative impacts associated with the Project;
- provide feedback to the stakeholders about their issues and concerns and how their feedback has been used;
- address stakeholder issues through the EIS process and communications;
- enable stakeholders to provide feedback;
- facilitate contact with government stakeholders;
- undertake formal public consultation with the stakeholders as part of the EIS process;
- meet the requirements for community and stakeholder consultation as outlined in the Project Terms of Reference; and
- consolidate the finding in a Community and Stakeholder Consultation Report for inclusion in the EIS.

9.1 Community involvement

The Project is proposed as another positive chapter in the Gladstone story, and anticipates a role contributing towards the development and maintenance of social services in the Gladstone LGA.

The proponent aspires to be seen as responsible corporate citizens and the project itself to win broad public acceptance through job creation, responsive environmental stewardship and community involvement, which could take the form of individual corporate or collective industry support for local social services.

Depending on the demographics of the workforce, there is potential for impact on community services and infrastructure, particularly on local health, education and child care services.