

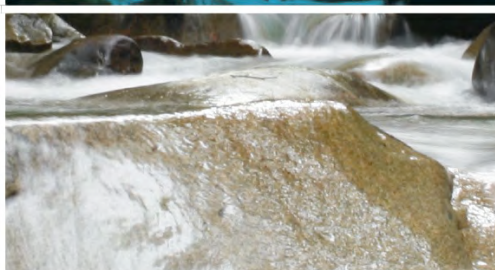
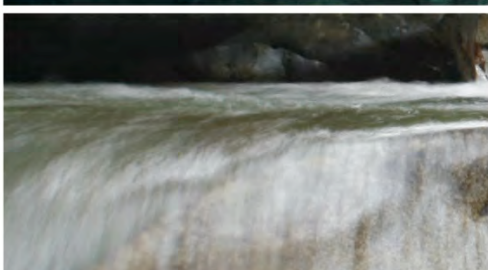
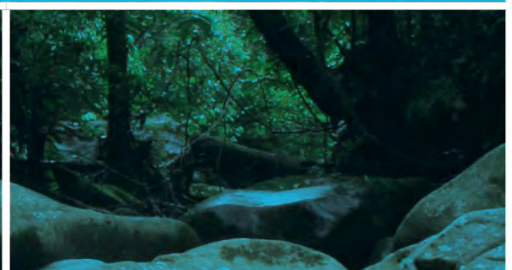
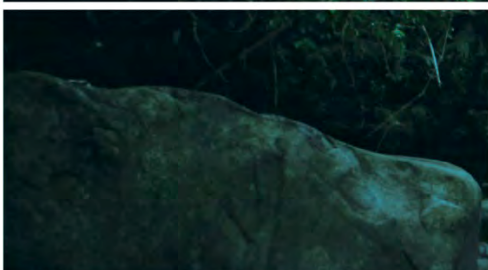
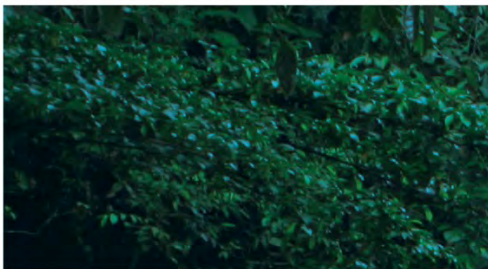
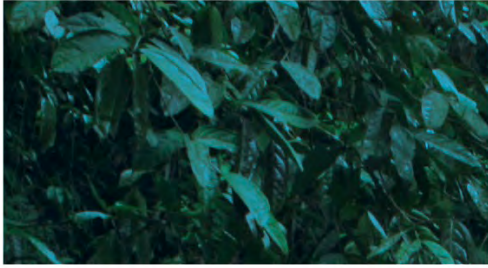
ENVIRONMENTAL ASSESSMENT

Newcastle Gas Storage Facility Project

Major Project Application Number 10-0133

Volume 1: Main Report

May 2011



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CR 6023_8_v3



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Project manager	Edward Niembro		
Version:	Details:	Approved:	Date:
CR 6023_8_v1	Initial draft to client	CB	14/02/2011
CR 6023_8_v2	Second draft to client and Department of Planning	CB	24/02/2011
CR 6023_8_v3	Final to client	CB	23/05/2011

Certification

Preparation and Submission of Environmental Assessment Report under Part 3A of the *Environmental Planning and Assessment Act 1979*

Environmental
Assessment Report
prepared by:

Name	Carolyn Balint	Edward Niembro
Qualifications	BAppSc	MSc, BSc, CPP (Certified Practising Planner)
Address	Coffey Natural Systems 126 Trenerry Cres Abbotsford VIC 3067	Coffey Natural Systems 3 Rider Boulevard Rhodes NSW 2138

In respect of Newcastle Gas Storage Facility Project

Project application Newcastle Gas Storage Facility Project

Applicant address AGL Energy Limited
Locked Bag 1837
St Leonards NSW 2065

Applicant name Mr David Kelly
Head of Land and Approvals – Upstream Gas
AGL Energy Limited
ABN 74 115 061 375

Proposed project land to be developed	Gas Storage Facility - 5 Old Punt Rd, Tomago NSW 2322 (Part Lot 105 DP 1125747 Port Stephens Local Government Area) and associated infrastructure.	Hexham Receiving Station – 235 Old Maitland Rd, Hexham NSW 2322 (Lot 1 DP 813606 Newcastle Local Government Area) and associated infrastructure.
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Environmental
Assessment An Environmental Assessment Report for the proposed development has been
prepared in accordance with the Director-General's Environmental Assessment
Requirements for the Newcastle Gas Storage Facility Project

Certification Carolyn Balint and Edward Niembro of Coffey Natural Systems Pty Ltd, certify that
we prepared the Environmental Assessment for the Newcastle Gas Storage
Facility. We certify that to the best of our knowledge this Environmental
Assessment contains relevant information that is neither false nor misleading



Signature:
Name: Carolyn Balint
Date: 23 May 2011



Signature:
Name: Edward Niembro
Date: 23 May 2011

EXECUTIVE SUMMARY

1. Introduction

AGL Energy Limited (AGL) proposes to develop the Newcastle Gas Storage Facility Project (the Project) in Tomago and Hexham, New South Wales. The Project is required to meet AGL's peak gas market requirements over winter and to provide additional security of gas supply during supply disruption events. New South Wales currently has no reliable gas storage capacity. The estimated capital cost of the Project is \$300 million.

The proponent is seeking approval for the following components (Figure ES1):

- Gas plant site, including sub-division.
- Access road and utility corridor.
- Gas pipeline access corridor.
- Pipeline corridors (option 1, option 2 or a hybrid option) including temporary construction areas.
- Hexham receiving station.
- Gas pipeline connection to the existing Jemena Gate Station at Hexham.

2. Statutory Requirements

On 9 August 2010, the New South Wales Department of Planning (DoP) advised the proponent that the Project was a Major Project subject to Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The Project was allocated Major Project Application Number 10-0133.

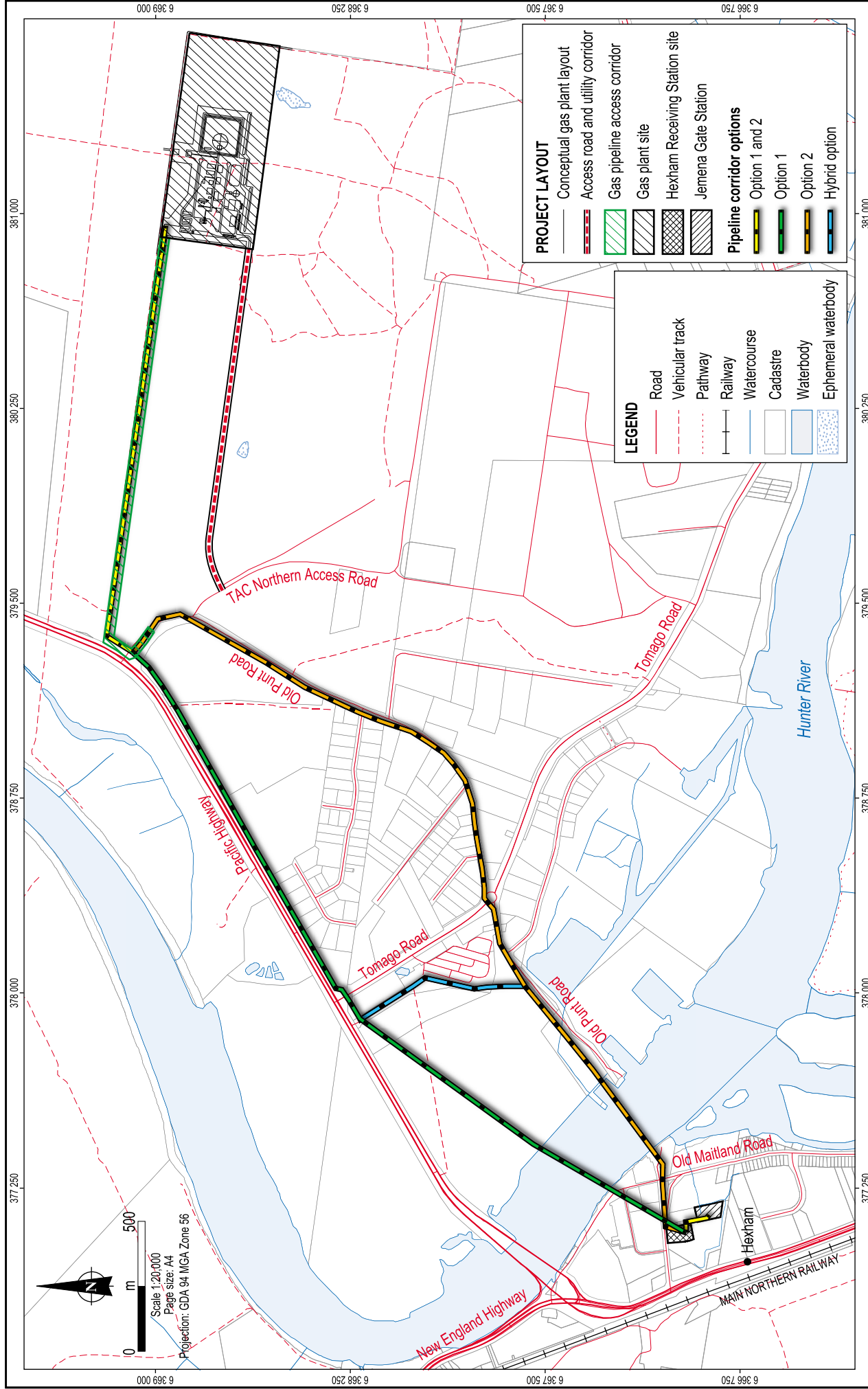
The proponent prepared and submitted a Preliminary Environmental Assessment report for the Project in September 2010.

On 13 October 2010, the DoP notified AGL of the Director-General's Requirements (DGRs) applying to the Project Application. On 28 October 2010, the Minister for Planning declared the Project to be a 'critical infrastructure project' under section 75C of the EP&A Act.

As required under section 75H of the EP&A Act, the proponent has prepared this Environmental Assessment for the Project in accordance with the DGRs.

On 29 November 2010, a referral was formally lodged with the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) for a determination as to whether the Project constitutes a 'controlled action'.

On 23 December 2010, DSEWPC advised that the Project is a 'controlled action' requiring the Project to be assessed and approved under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It was determined that the Project has the potential to have a significant impact on matters of national environmental significance. The following controlling provisions were identified:



- Wetlands of international importance (Hunter Estuary Wetlands).
- Listed threatened species and communities (Earp's gum, dwarf kerrawang and New Holland mouse).
- Listed migratory species (potential bird roosting areas within 5 km of Project site).

On 17 January 2011, DoP in consultation with DSEWPC, issued supplementary DGRs for the Project to ensure that sufficient information is included in the Environmental Assessment to provide an appropriate level of assessment of the relevant controlling actions.

3. Project Justification

Natural gas is an essential energy source to industrial and commercial gas users, hospitals, schools, residential consumers and the community at large, particularly as it is used for environment and water heating in winter. The NSW natural gas network supplies gas to more than 1,040,000 gas consumers via approximately 24,000 km of mains operating at a number of different pressure levels. Gas is currently supplied to Sydney, Newcastle, Central Coast and Wollongong as well as over 20 country centres including those in the Central West, Central Tablelands, South West, Southern Tablelands, Riverina and Southern Highlands regions of NSW (AEMC, 2010 [R022]).

The Project will be able to supply gas directly into the distribution network and will reduce the state's dependence on imported gas thereby providing a secure, continuous gas supply that will minimise incidents of gas supply interruption as a result of:

- Ageing infrastructure and pipeline capacity constraints in South Australia, Victoria and Queensland.
- High demand for gas.
- The legislative sequestration of gas, by South Australia, Victoria and Queensland, to supply their own states in emergency situations.

It will also provide support and distribution infrastructure for the developing coal seam gas production industry in New South Wales.

The Project is compatible with strategic national, regional and local plans as well as existing and potential future adjacent land uses. The Project has been designed to optimise its commercial viability and sustainability.

It will provide environmental and socio-economic benefits to the state and region by helping the New South Wales government meet its commitments to greenhouse gas emission reduction targets. It will create flow-on economic benefits for the state during the construction, commissioning and operational phases.

In summary, the Project is critical energy infrastructure that will provide greater security of supply, create additional capacity to supply the growing demand for gas in New South Wales, generate flow-on economic benefits for the state during the construction, commissioning and operational phases, and support the emerging coal seam gas industry in the Hunter and Gloucester regions.

4. Project Location

The Project is currently a proposal only and is still subject to a number of factors including design and approvals. For reasons of style, the Project and related proposed activities have been described in the active 'will' rather than 'would'.

Gas for the Project will be supplied via the Jemena Gas Networks (NSW) Limited Wilton-Newcastle trunk pipeline. Newcastle is the farthest north that the gas network currently reaches on the New South Wales coast. The proposed location of the Project was chosen based on the following selection criteria:

- Proximity to the Wilton-Newcastle trunk line of the New South Wales gas network.
- Proximity to future gas supplies. There are a number of proposed developments that could supply the Project with gas including the Gloucester and Hunter gas projects.
- Proximity to gas users, including major industrial gas users.
- Compatibility with existing and future land uses.
- Buffered from residential or sensitive neighbours such as public gathering places.
- Size of the gas plant site. The site will be approximately 28 ha and has been sized to accommodate all necessary infrastructure and buffer areas.
- Availability of land. AGL has signed an option deed with Tomago Aluminium Company (TAC) to purchase the land for the Project.

5. Assessment of Alternatives

Project alternatives were considered as part of the ongoing feasibility studies. This Environmental Assessment examines feasible alternatives and recognises that, in some cases, a combination of different alternatives may be adopted. The alternatives proposed and assessed in this Environmental Assessment present a balance between engineering design and operating considerations, and environmental, social and economic outcomes.

Project site location advantages and disadvantages on a state, regional and local scale were considered and assessed.

6. Project Description

The Project comprises three main areas:

- The Primary Project Area includes the gas plant site, access road and utility corridor and gas pipeline access corridor.
- The gas pipeline corridor options.
- The Hexham receiving station site.

Gas Plant

The Project will improve the reliability of gas supply to meet increasing demand across New South Wales. Gas is currently transported from Sydney to Newcastle along the Wilton-Newcastle trunk pipeline, which terminates at the Jemena Gate Station at Hexham. Gas will be transferred from the Hexham receiving station to the gas plant site along the proposed pipeline. At the gas plant site, gas will be refrigerated, transformed into a liquid at -162°C and transferred to the

storage tank at approximately atmospheric pressure. Liquefaction will occur over more than half of a 12-month cycle when gas demand is low. When the storage tank is full, the gas plant will operate on stand-by mode.

During periods of peak demand (primarily over winter) or during supply disruption, the liquefied gas from the storage tank will be passed through the re-gasification unit where it will be heated to form a gas and transferred back along the proposed pipeline into the main trunk line via the Hexham receiving station.

It is envisaged that up to approximately 15 full-time staff will be required to operate the gas plant facility as well as additional contract labour from time to time for routine and major maintenance.

Production capacity will be approximately 66,500 t per annum of LNG. Key features of the gas plant infrastructure will be:

- Natural gas liquefaction plant:
 - Gas pre-treatment plant.
 - Liquefaction system including refrigeration unit.
- Gas storage tank within a containment bund.
- Re-gasification units.
- Road tanker loading bay and truck turning circle.
- Flare.
- Gas plant infrastructure:
 - Custody metering and analysis facilities.
 - Pipelines, vessels and pumps.
 - Odourisation facilities.
 - Compressed air system.
 - Cooling system.
 - Nitrogen storage and gasification unit.
 - Demineralised water unit.
 - Hot oil unit.
 - Emergency response facilities.
 - Safety and fire protection system.
 - Stores and unloading facilities for refrigerants and chemicals.
 - Electrical distribution system and control system.
 - Electrical substation.
 - Backup power supply system for critical systems.
- Control room, offices, amenities, workshop and maintenance areas.
- Security and fences.
- Car parks and laydown areas.
- Buffer areas.
- Lighting.

The gas plant facility will occupy approximately half of the 28 ha gas plant site (Figure ES2).

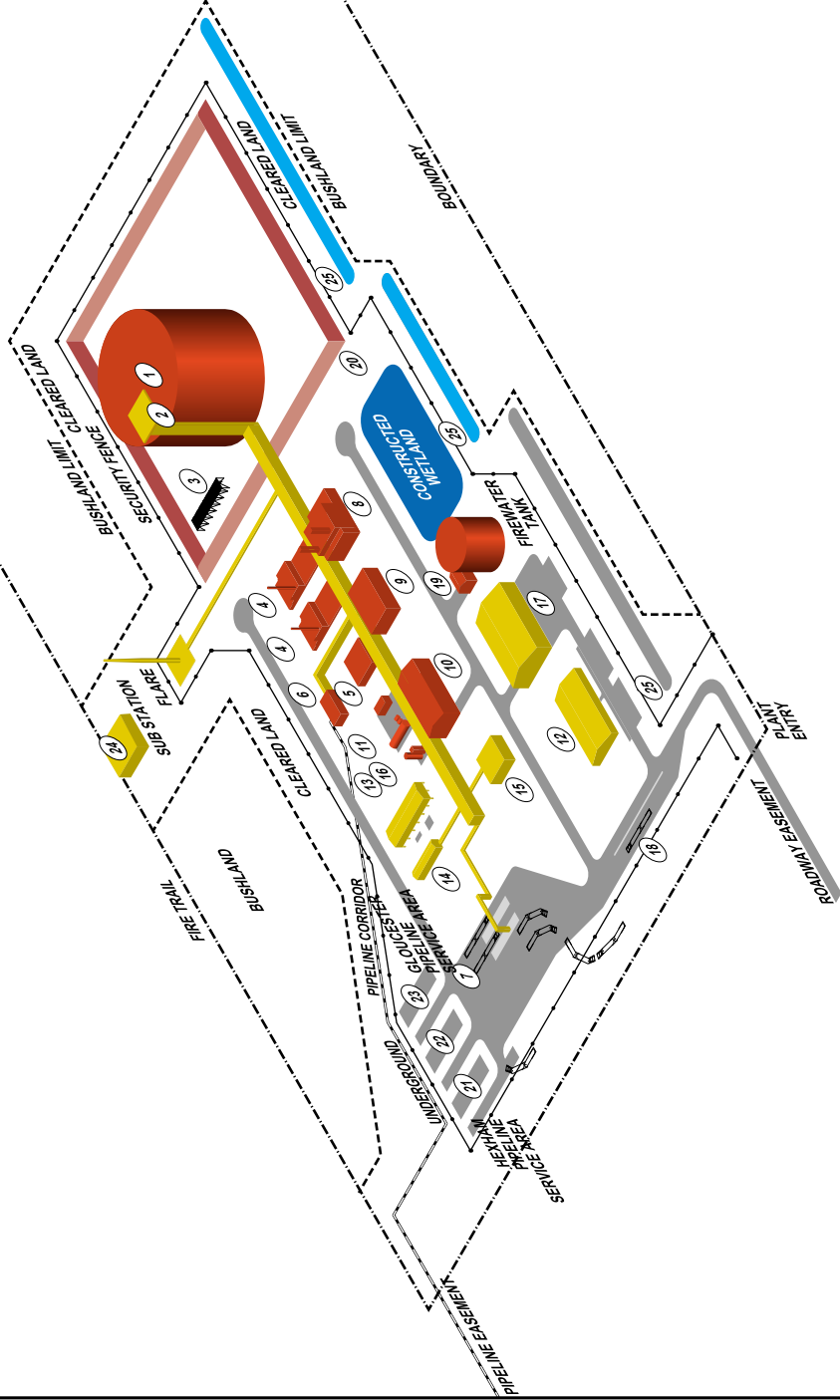
Access Road and Utility Corridor

The access road and utility corridor (approximately 1.4 km in length) will connect the TAC Northern Access Road, approximately 140 m south of the Old Punt Road and TAC Northern Access Road intersection, to the southwest corner of the gas plant site. The access road will be within a 30 m wide cleared easement. It will consist of two lanes with stormwater drainage, shoulders and setbacks to house utilities to service the gas plant site.



BOUNDARY

BUSHLAND



LEGEND

1. Storage tank
2. In-tank pumps
3. Boost pumps (if required)
4. Regasifiers
5. Gas metering
6. Gas pipeline tie-in points
7. Gas truck loading stations
8. Gas pre-treatment system
9. Gas liquefaction system
10. MRL compressor building
11. MRL storage vessels
12. Control and administration building
13. Electrical building #1
14. Electrical building #2
15. Standby generator
16. Utilities
17. Warehouse
18. Truck weigh-bridge
19. Firewater building
20. Tank secondary containment
21. Hexham pipeline service area
22. Glouster pipeline service area
23. Hunter pipeline service area
24. Electrical switchyard
25. Infiltration areas

Source:
Worley Parsons, April 2011.



Job No:
6023
File Name:
6023_08_ES02_HB

AGL Energy Limited
Newcastle Gas Storage Facility Project



Figure No:
ES2

Conceptual gas plant layout

Gas Pipeline Access Corridor

The gas pipeline access corridor (approximately 1.7 km in length) will contain the underground high-pressure gas pipeline along the northern boundary of the Primary Project Area. This corridor will also serve as a secondary access road from the gas plant to Old Punt Road for use in emergencies. A 30 m wide corridor will need to be cleared to allow construction of the pipeline. The secondary access road will be approximately 4 m wide with 1 m shoulders.

The pipeline will be buried at a minimum depth of cover of 0.75 m to top of pipe. Construction of the pipeline within the gas pipeline access corridor will be by conventional pipeline construction methods. The corridor will be revegetated after construction although large trees will not be planted in the immediate vicinity of the buried pipeline.

Gas Pipeline Corridors

The gas pipeline will be designed and operated in accordance with the requirements of AS 2885:2008 *Pipelines – Gas and liquid petroleum*. The diameter of the gas pipeline will be up to 500 mm. It will be constructed from coated steel line pipe and will incorporate a cathodic protection system to prevent corrosion. It will be buried between 0.75 to 2.5 m below the ground surface (depth to top of pipe). The total pipeline length from the gas plant site to the Hexham receiving station will be between approximately 4.2 km to 5 km for each of the various options. The trench for the gas pipeline will be up to 2 m wide. The pipeline will be designed for the maximum operating pressure of 6,895 kPa.

A corridor to construct the pipeline will be:

- Up to 5 m wide along the road verges.
- Up to 20 m within privately owned land.

The design life of the pipeline is 60 years. The pipeline corridor will be rehabilitated after construction, including re-seeding with natural grasses where applicable.

The construction of the gas pipeline corridor route options will use a combination of methods: conventional trenching, horizontal boring, and horizontal directional drilling (HDD).

Hexham Receiving Station

The Hexham receiving station will occupy approximately 0.25 ha – approximately 40% of the receiving station site area. The receiving station will consist of piping and equipment to facilitate the filtering, metering, flow control, and communications for the safe operation of the receiving station. This facility will connect into the Jemena Gate Station by way of a conventionally trenched pipeline.

Project Schedule

AGL is aiming to have the facility in operation by winter 2014 with construction proposed to start in the third quarter of 2011. The construction schedule for the Project is shown in the Table ES1 below.

Table ES1 Indicative construction schedule

Project Component	Proposed Timeframe
<i>Gas Storage Facility</i>	
Procurement and final design	Commence third quarter 2011.
Site preparation and bulk earthworks	Fourth quarter 2011.
Construction	Fourth quarter 2011 – third quarter 2014.
<i>Access Road and Utility Corridor</i>	
Construction	Fourth quarter 2011 – second quarter 2012.
<i>Gas Pipeline Access Corridor</i>	
Construction	2012 – 2014.
<i>Gas Pipeline Corridor</i>	
Construction	2012 – 2014.
<i>Hexham Receiving Station</i>	
Construction	2012 – 2014.

AGL proposes to construct the gas plant under a turnkey contract arrangement. The successful contractor will be required to finalise construction design prior to starting construction.

7. Stakeholder Consultation and Communication

AGL has conducted a number of briefing sessions with key stakeholders who have an interest in the Project. A Planning Focus Meeting was held on 16 September 2010. It was an opportunity for government agencies to gain a better understanding of the Project, ask questions and to undertake a site inspection.

Consultation is currently underway with landowners potentially affected by the Project. Consultation includes direct briefings with landowners and these will continue to occur on a regular basis.

AGL and TAC established a Project Control Group on 7 July 2010. The purpose of the Project Control Group is to allow representatives from TAC and AGL to identify and resolve Project issues that could have a direct impact on the operation of the Tomago Aluminium Smelter.

The stakeholder engagement program contains a range of consultation activities throughout the preparation of the Environmental Assessment report, public exhibition of the Environmental Assessment, government assessment, construction and operations phases of the Project.

The objectives of the stakeholder consultation program are to:

- Provide the stakeholders with timely Project information to assist them in understanding the Project and its likely impact on the community and the environment.
- Provide the relevant stakeholders with opportunities to have input into the social, economic and environmental issues affecting them, from the planning stage through to construction and operation.
- Ensure issues or concerns are addressed as early as possible and, where appropriate, addressed in the environmental assessment report.

- Ensure constructive community relationships are established and maintained throughout the life of the Project.
- Inform the stakeholders of regulatory requirements.

Stakeholder engagement activities proposed for the Project include:

- Direct briefings and site inspections.
- Distribution of Project fact sheets.
- One-to-one consultation.
- Media releases and advertisements.
- Establishment of a Project information hotline and email address.
- Presentation of Project information on the AGL website.

8. Physical Environment and Potential Impacts

8.1 Existing Environment

The Primary Project Area is generally flat, with low-lying, flood-prone areas closer to the Hunter River. The climate in the area is temperate, with generally warm to hot summers and mild winters and has an average annual rainfall of over 1,100 mm.

The main surface water features in the vicinity of the Project are the Hunter River and the associated Hunter Estuary Wetlands. These include the Ramsar wetlands: Kooragang Nature Reserve (approximately 3 km south and east of the Project area) and the Wetlands Centre Australia (approximately 4.5 km south of the Hexham receiving station). There are several ephemeral water bodies near the Primary Project Area and small swamps to the east.

The Project is located within the Tomago Sandbeds Catchment Area, which includes the Tomago Sandbeds Aquifer. This aquifer is part of the potable water supply to the lower Hunter region.

The Primary Project Area and pipeline corridor options contain remnant vegetation that supports a variety of distinct vegetation community types including Coastal Sand Apple-Blackbutt Forest, Alluvial Tall Moist Forest and Swamp Mahogany-Paperbark Swamp Forest suitable for koala habitat. Threatened ecological communities in the vicinity of the Project include Freshwater Wetland Complex, Phragmites Rushland, Swamp Mahogany-Paperbark Swamp Forest and Saltmarsh.

Much of the land adjacent to the Hunter River in Tomago is identified under SEPP 14 Coastal Wetlands as an important environmental conservation area. With the exception of the Primary Project Area, the Project will be located in areas identified under SEPP 71 Coastal Protection Areas as an important conservation area.

8.2 Potential Issues and Mitigation Measures

Soils

The Primary Project Area is located in an area with aeolian and alluvial soils overlying a ridge of residual soil and weathered rock. The majority of the Primary Project Area is underlain by the Tomago Sandbeds sedimentary unit, which consists of a mixture of clean quartzose sand and indurated sand. The Hexham receiving station site is underlain by Quaternary gravel, sand, silt and clay to approximately 0.6 to 0.8 m below the ground surface, with the water table at about 1.0 m below the surface.

Preventing soil contamination (at the Primary Project Area) due to spills or formation of leachate from acid sulfate soils (at the Hunter River pipeline crossing) will be the key potential issues related to soil quality.

Soil testing has indicated that the Primary Project Area has not been contaminated by past land uses including adjacent heavy mineral sand mining activities. Also, it is envisaged that the gas plant site will be levelled by cut and fill and no extra earth will be brought to site. It is unlikely that construction and operation activities will result in soil contamination within the Primary Project Area. Soil monitoring programs will be developed as part of the construction environmental management plan and operations environmental management plan.

A construction surface water management plan that describes erosion and sediment control will be prepared and implemented.

Acid sulfate soils were found in samples collected at a depth of 1 m near the northern bank of the Hunter River at the HDD exit point (Forgacs car park). Soil screening tests for the Hexham receiving station site suggest that potential acid sulfate soils (PASS) may be present. The net acidity of the soils tested was low as the soils have a degree of natural buffering capacity due to the presence of calcium carbonate.

A Project acid sulfate soil management plan will be prepared and implemented in accordance with the *Acid Sulfate Soils Manual* (ASSMAC, 1998).

Surface Water

There are no watercourses within the gas plant site and within the Hexham receiving station site. The gas pipeline corridors cross a small watercourse to the west of the TAC Northern Access Road. The pipeline will be constructed and installed by HDD to run under the Hunter River between Tomago and Hexham.

Key potential surface water issues relate to contamination sources such as spills, sediment runoff, frac-out during HDD, and acid sulfate soils leachate effects. It is unlikely that the Project will impact surface waters in the Ramsar wetland areas of Kooragang Nature Reserve and Wetlands Centre Australia due to their distance from Project activities, the surface runoff control measures in place, the high infiltration rate to groundwater and the flat topography of the area.

A detailed geotechnical investigation will be undertaken prior to HDD under the Hunter River. This will include drilling investigation bore holes and also include undertaking shallow seismic surveys to provide detailed understanding of the geological strata under and adjacent to the river. Detailed geotechnical investigations will also be undertaken for the other HDD locations.

The drill alignment and design will be assessed to ensure that the depth of the drill is sufficiently below the riverbed to minimise risk of a frac-out. An experienced HDD contractor with a proven track record in construction quality and deliverability and environmental management will be used.

A surface water management plan will be prepared and implemented as part of the construction environmental management plan and operations environmental management plan. The plan will describe best practice surface water control measures to reduce the risk of contamination of surface water or the alteration of surface water flows.

The operations surface water management plan will provide measures at the gas plant site to manage water supply and disposal, manage surface runoff flow and erosion, and discharge or leaks of contaminated water.

Preventing surface water contamination is key to preventing impacts to groundwater.

Mitigation and management measures for the protection of surface water (and groundwater) will be based on the following principles:

- Minimise land disturbance.
- Control stormwater runoff from construction sites.
- Provide sedimentation treatment for all surface runoff from disturbed areas.
- Separation of clean water (i.e., runoff from undisturbed areas), and potentially contaminated water at the construction sites.
- Build temporary or permanent infrastructure to capture any spills or leaks of potentially contaminating chemicals before they enter the environment.
- Collect and store wastewater before transporting offsite for treatment or disposal.
- Undertake water quality monitoring to ensure that surface water management is meeting the objectives of the management plan and within criteria limits.

There will be low volumes of chemicals stored at the gas plant site. Liquefied natural gas is not considered a hazardous chemical as it evaporates when spilled. There will also be primary and secondary bunding in place to prevent contaminated surface water runoff from the gas plant site.

Groundwater

The Tomago, Tomaree and Stockton Groundwater Sources are dune sand aquifers within the Lower North Coast and Hunter Water Management Areas. Collectively they are known as the Tomago Sandbed aquifers and cover an area of approximately 275 km² along a coastal strip up to 15 km wide. These aquifers are low salinity, high yield water sources that form an important part of the regional potable water supply for the greater Newcastle area.

The Primary Project Area overlays the Tomago Sandbeds and are within the Hunter Water Special Area.

The remainder of the project area – the gas pipeline corridors (option 1, option 2 or hybrid option), Hexham receiving station and gas pipeline connection into the Jemena Gate Station, does not overlay any part of the Tomago, Tomaree and Stockton Groundwater Sources. Groundwater in these areas is generally believed to discharge to the adjoining Hunter River.

There is highly variable flow into and out of the Tomago Sandbeds aquifer. The aquifer is recharged by direct rainfall infiltration; runoff from outcrop and shallow bedrock areas; and, to a minor degree, from underlying clay or bedrock. Rainfall recharge is rapid due to the highly permeable sands and the shallow depth to the water table.

The key potential risks relating to groundwater from the Project are alteration of groundwater levels or contamination of groundwater.

The following management measures will be implemented to minimise impacts to groundwater levels or flows:

- Groundwater use will be minimised. Water for construction and operations will generally be sourced from existing Hunter Water Corporation (HWC) infrastructure. There is the potential to use up to 42 ML of groundwater for hydrostatic testing which will occur once towards the end of construction.

- The construction environmental management plan (CEMP) will include a contingency plan to respond to any drawdown caused by HDD based on groundwater monitoring.
- Excess groundwater pumped from trenches during construction will be discharged as close as possible to the source to minimise temporary changes in local groundwater levels.
- Pipelines will be bedded on sand in the base of the trench and, as far as practical, material excavated from trenches will be replaced to minimise changes to groundwater flows.
- Infiltration rate tests will be undertaken at the sites of proposed infiltration basins to determine local infiltration rates and the presence of indurated sand layers capable of inhibiting groundwater recharge.
- Groundwater levels will be monitored within and at the boundaries of the gas plant site.

The measures for preventing contamination of groundwater include measures to prevent spills at the gas plant reaching surface water. In addition to the surface water management measures, a groundwater management plan will be developed. This plan will outline groundwater monitoring, a spill response plan and a contingency plan to respond to any spills or measured groundwater contamination.

Flora and Fauna

The Primary Project Area and pipeline corridor options contain remnant vegetation that supports 12 distinct vegetation community types. Of the 12 community types, five are classified as threatened ecological communities (TEC).

The flora surveys indicated the Primary Project Area and pipeline corridor options support 314 flora species, subspecies and varieties. Of these flora species, 273 are native and 41 are considered to be exotic. Earp's gum (*Eucalyptus parramattensis*) was the only threatened flora species under the *Threatened Species Conservation Act 1995* that was identified in the Primary Project Area and pipeline corridors.

The fauna surveys found a total of 100 fauna species were recorded in the Project area, consisting of nine frogs, seven reptiles, 25 mammals and 59 birds. Nine threatened fauna species under the *Threatened Species Conservation Act 1995* were recorded within the Primary Project Area. No threatened fauna species were identified along the access road and utility corridor, gas pipeline access corridor or the pipeline corridor route options. The presence of koala (*Phascolarctos cinereus*) was detected in the Swamp Mahogany-Paperbark Swamp Forest and the Woodland Rehabilitation. The squirrel glider (*Petaurus norfolcensis*) was detected in the Seaham Spotted Gum-Ironbark Forest. The New Holland mouse (*Pseudomys novaehollandiae*) was recorded in the Heath Rehabilitation. The little lorikeet (*Glossopsitta pusilla*) was detected in the Coastal Sand Apple-Blackbutt Forest.

Five species of bat were detected which are likely to forage on the whole study area.

EPBC-listed native flora and fauna communities detected within the Project area included Earp's gum and the New Holland mouse, south of the Primary Project Area. One migratory species, Rufous fantail (*Rhipidura rufifrons*) was recorded within the Swamp Mahogany-Paperbark Swamp Forest. The field surveys did not identify any EPBC-listed threatened ecological communities.

It is envisaged approximately 24 ha of vegetation will be removed with the Project area. The Project will utilise HDD to avoid TECs where possible and minimise the vegetation clearing by reducing construction widths of right of ways pertaining to pipeline construction.

Project construction and operations will create noise, light and dust. These impacts were assessed to temporarily disturb or deter some fauna and avian species from potential foraging areas within the study area or within suitable habitat in the local area. Based on the temporary nature of these effects during construction, there will be low residual impact on these ecological communities.

An extensive range of environmental safeguards, mitigation measures and monitoring and management programs will be implemented in order to avoid or minimise impacts. Residual ecological impacts are provided in Table ES2 based on the implementation of the proposed mitigation measures.

Table ES2 Residual impacts on significant species

Ecological Significance	Residual Impacts
SEPP 14 Coastal Wetlands	- No SEPP 14 Coastal Wetlands will be removed. - No residual impacts are envisaged for SEPP 14 Coastal Wetlands. - A biodiversity offset strategy will be prepared and implemented to compensate for residual impacts that cannot be avoided or mitigated.
SEPP 71 Coastal Protection Areas	- Approximately 0.87 ha of the Phragmites Rushland will need to be cleared for the hybrid pipeline route. - A biodiversity offset strategy will be prepared and implemented to compensate for residual impacts that cannot be avoided or mitigated.
SEPP 44 Koala Habitat Protection	- Approximately 4.9 ha of preferred habitat and feeding trees will be removed. - Restoration of potential koala habitat will be undertaken in consultation with Port Stephens Council. - No significant residual impacts are envisaged.
Threatened fauna species	No significant residual impacts are envisaged.
Habitat and corridors	- Approximately 24 ha of the Primary Project Area will be cleared. Although the project is located on the edge of an existing industrial area on industrially zoned land, the Project will contribute to ongoing incremental loss and degradation of habitat species within the Port Stephens LGA and wider Hunter region. - This could be expected to contribute a decline in some threatened species, in particular avian fauna species such as the regent honeyeater and swift parrot. - A biodiversity offset strategy will be prepared and implemented to include both provision and long-term protection of habitat-containing tree species.
In-stream habitats	No residual impacts are envisaged.
Groundwater dependent ecosystems	No residual impacts are envisaged.
EPBC-listed Earp's gum	- An estimated total of 67 Earp's gums will need to be removed. - A biodiversity offset strategy will be prepared and implemented to compensate for residual impacts that cannot be avoided or mitigated. This will include the protection or planting of Earp's gum in similar habitat.

Table ES2 Residual impacts on significant species (cont'd)

Ecological Significance	Residual Impacts
Dwarf kerrawang	• No removal of dwarf kerrawang will be undertaken. • No residual impacts are envisaged.
New Holland mouse	• The New Holland mouse is well distributed across the Tomago Sands. A small amount of suitable habitat will be cleared for the Project. However, similar suitable habitat will remain intact for the species. • No residual impacts are envisaged.
Green and golden bell frog	• A small amount of suitable habitat will be cleared for the Project. However, similar suitable habitat will remain intact for the species including larger areas of Phragmites Rushland and the Freshwater Wetland Complex to the south of the Project area. • No residual impacts are envisaged.
Migratory species	• White-throated needletail and fork-tail swift: – These aerial foraging birds are found amongst diverse urban and rural landscapes. – The Project is unlikely to have any potential effect on these species in the locality. • Rainbow bee-eater: – Recorded in a variety of habitats including woodland, open country, semi-cleared habitats and areas of human habitation. – The Project is unlikely to have any potential effect on these species in the locality. • Satin flycatcher: – Preferred habitat for this species will include Alluvial Tall Moist Forest, Redgum-Apple-Banksia Forest and the Swamp Mahogany-Paperbark Swamp Forest communities. Approximately 3.4 ha of this habitat will need to be removed. – Given the larger, more preferred habitat that surrounds the Project area the Project is unlikely to have any potential residual impacts on these species in the locality. • Black-face monarch: – Preferred habitat for this species will include Alluvial Tall Moist Forest, Redgum-Apple-Banksia Forest, and larger areas of Swamp Mahogany-Paperbark Swamp Forest and Coastal Sand Apple-Blackbutt Forest communities. Approximately 22.2 ha of this habitat will need to be removed. – Given the larger, more preferred habitat that surrounds the Project area the Project is unlikely to have any potential residual impacts on these species in the locality. • Rufous Fantail: – Preferred habitat for this species will include Alluvial Tall Moist Forest, Redgum-Apple-Banksia Forest, and larger areas of Swamp Mahogany-Paperbark Swamp Forest and Coastal Sand Apple-Blackbutt Forest communities. Approximately 22.2 ha of this habitat will need to be removed. – Given the larger, more preferred habitat that surrounds the Project area the Project is unlikely to have any potential residual impacts on these species in the locality.

Table ES2 Residual impacts on significant species (cont'd)

Ecological Significance	Residual Impacts
Other threatened fauna species	• Other threatened fauna species are: – Spotted-tail quoll. – Long-nosed potoroo. – Grey-headed flying fox. • Given the larger and more preferred habitat that surrounds the Project area the Project is unlikely to have any potential residual impacts on these species in the locality.
Hunter Estuary Wetlands	• The application of management measures associated groundwater assessment will ensure there will be no measurable impacts to groundwater quality, levels or flow. • Geotechnical investigations, specialist site design and suitable management of required materials will be carried out to avoid risk of frac-out associated with HDD. • The surface water management plan will be implemented to avoid disturbance from water runoff and erosion. • The CEMP will include an ASS management plan to avoid ASS entering the Hunter River. • Ensure construction works occur when favourable weather conditions prevail. • Use sediment fences and/or sterile straw bales down slope of exposed soil and stockpiles. • Undertake rapid seeding and revegetation of disturbed areas to limit the time soil is exposed to erosion. • Noise attenuation measures associated with HDD will be considered to minimise impacts on significant bird species. • Therefore, there will be no residual impacts on the Hunter Estuary Wetlands as a result of changes to the groundwater regime.

Biodiversity offsets will be required to maintain or improve biodiversity offsets in accordance with the guiding principles for threatened species assessment under Part 3A of the EP&A Act.

Finalisation of the biodiversity offsets strategy for the Project will be completed in consultation with OEH (formerly DECCW) and DoP during detailed design and prior to commencement of clearing and is subject to commercial availability of the identified offset lands with the relevant landowners.

The biodiversity offset strategy will include identification of the impacts of the Project which are to be offset (as identified in this assessment), lands and/or actions which will be used to offset the impacts, long term maintenance and management requirements for offsets and a monitoring program to assess the effectiveness of the offsets package.

Bush Fire

Port Stephens LGA has a Fire Danger Index (FDI) rating of 100. The FDI combines the temperature, relative humidity, wind speed and drought conditions typical for that area in a rating system between 0 and 100. A FDI rating of 100 indicates that fires within this area are likely to be very aggressive, fast moving and uncontrollable. The Primary Project Area is classified as 'vegetation category 1' in the bush fire prone land map. This indicates the area is categorised as 'forest' vegetation.

A minimum asset protection zone (APZ) of 25 m will be provided around the gas plant site, increasing to 31 m, around the processing plant and storage tank.

The construction and operation of infrastructure within the Primary Project Area will pose a low potential bush fire threat.

9. Social Environment and Potential Impacts

9.1 Existing Social Environment

The Project is located within the Port Stephens LGA, which has a population of 60,484, and the Newcastle LGA, which covers an area of 183 km² and has a population of 141,753. The primary locality for the purpose of the social-economic impact assessment is comprised of the three areas of Tomago, Hexham and Heatherbrae.

Tomago has a population of 95. Tomago is an industrial area. Local industries comprise largely manufacturing companies. The biggest industrial facility is the Tomago Aluminium Smelter, located 500 m south of the Primary Project Area. Other local industries include:

- Distribution.
- Ship-building.
- Display centres (for homes, swimming pools, etc.).
- Haulage.
- Logistics.
- Recycling.

Hexham also has a range of local industries surrounding the proposed Hexham receiving station.

9.2 Potential Issues and Mitigation Measures

Aboriginal Cultural Heritage

The Project is on the boundary of two Local Aboriginal Land Councils (LALC), Awabakal LALC and Worimi LALC. Historically, the Worimi people were the traditional owners of the land north of the Hunter River, including the Tomago area. The Hexham portion of the Project area is predominantly associated with the Awabakal clan subgroups, the Pambulong and the Ash Island Clan.

There is potential for Project related activities to disturb Aboriginal cultural heritage sites. One Aboriginal site was identified within the Project area as part of the survey undertaken in conjunction with the LALCs. This is within the pipeline corridor option 1 route.

There is potential for the Project to disturb unidentified Aboriginal cultural heritage sites. However, the likelihood of further sites being identified is low as archaeological data for the Tomago region shows that inundated and disturbed landform types, such as those within the Project area, do not generally contain highly sensitive archaeological features or isolated artefacts. The exception is the east to west trending sand dune in the eastern portion of the Primary Project Area. A procedure will be included in the construction environment management plan (CEMP) to be followed in the event that Aboriginal cultural heritage sites, objects and/or remains are unearthed during construction based on obligations under the NSW NPW Act.

Non-Aboriginal Cultural Heritage

There are no known non-Aboriginal sites of cultural heritage significance within the Project area. Unidentified non-Aboriginal sites of cultural heritage significance are unlikely to be present within the Project area.

Socio-economic

The Project is expected to positively impact regional and state economies by securing gas supply for New South Wales. The creation of flow-on economic benefits from the Project will include the provision of substantial investment in regional New South Wales. The Project will create up to 300 jobs during construction and commissioning and approximately 15 full-time jobs during operations.

There will be flow-on benefits to local contractors and local businesses (e.g., bowling clubs and food outlets that may benefit from additional patrons), particularly during construction.

A construction camp will not be required as there is sufficient infrastructure and accommodation in the vicinity of the Project that will be able to accommodate the construction workforce.

Any effect on local or regional recreational or sporting infrastructure is expected to be negligible.

Generally, the impact of construction activities of the Project to residential properties will be minimal. Some residential properties may be impacted by the construction of the pipeline between the gas plant and the receiving station in Hexham. Pipeline corridor option 1 will require construction through up to 8 private properties along the Pacific Highway, however only one of these properties includes a residence. Pipeline corridor option 2 will not cross any private residential properties. The pipeline right of ways will be rehabilitated.

The gas plant site will not impact on the productivity of agricultural land and is wholly located on industrial zoned land.

AGL expects to engage local businesses where possible to service the Project both during construction and operations. Detailed advanced notices of goods and services required by the Project will be issued to assist local businesses meet the needs of the Project. This will contribute towards maintaining local economic stability.

Once operating, the Project will secure gas supply for the Newcastle region, including local businesses and industry. It is anticipated that the Project will contribute momentum towards the further development of general industry in the primary locality. The Project may also serve as an impetus for an appreciation in land value stimulated by increased local employment and business activity.

Pressure on local community health infrastructure and emergency services will be minimised through:

- The implementation of preventative occupational health and safety measures and awareness programs (including a zero-tolerance on-site drug and alcohol policy) to educate Project staff and visitors.
- The provision of on-site basic medical facilities and qualified first aid officers to respond to Project incidents.
- Consultation with local emergency service providers to ensure preparedness in the event of an emergency.

The Project will be classified as a Major Hazard Facility and therefore will need to comply with the requirements for hazard and risk management under the National Standard for the Control of Major Hazard Facilities administered by WorkCover in New South Wales.

Visual Amenity

The local area is relatively level and the surrounding topographic variation is low. No significant ridgelines or outcrops are present and therefore elevated viewing locations are minimal and distant.

The gas plant will be approximately 750 m north of the Tomago Aluminium Smelter. The Tomago Aluminium Smelter has six potlines with associated potline stacks and storage silos. The potline stacks are approximately 55 m high, which is 1 m lower than the maximum height of the gas storage tank. The Hexham receiving station site is within a light industrial setting.

There is potential for temporary visual impacts from construction activities at the Primary Project Area (largely out of public view), along the selected gas pipeline option (over approximately 5 km and generally often adjacent to public roads) and at the Hexham receiving station site (obscured to some degree by the existing building on the front of the site that will remain).

Views to the gas plant site will be restricted by the surrounding bushland. At the closest viewpoint to the gas plant site on the south side of the Hunter Regional Botanic Gardens, the gas storage tank and flare stack will not be visible. Aircraft warning lights will be installed on top of the gas storage tank or flare.

The gas storage tank and flare stack will impact visually on the skyline from distant views (greater than 6 km from the gas plant site), however this impact will be a small incremental increase on the current visual impact of the nearby Tomago Aluminium Smelter. At these distances, individual structures are not clearly identified or discernable with the naked eye.

Traffic

The Tomago area is served by the local road network that includes Old Punt Road and Tomago Road. The Pacific Highway runs north-south at the west of Tomago.

The Hexham receiving station, east of the Pacific Highway, is principally served by Old Maitland Road.

During construction, there will be a temporary increase in traffic volumes on all roads in the vicinity of the Project. A construction traffic management plan will be prepared for the Project to minimise any impacts on the road network.

The routes to be used by construction vehicles already carry a high proportion of commercial/heavy vehicles. Given the existing industrial nature of the area surrounding the Project, the consequence of a change in traffic volume and composition will be minor.

Operations traffic will have a negligible impact on the traffic volume and composition on all roads in the vicinity of the Project.

Noise and Vibration

All representative sensitive receptors monitored within the Tomago and Hexham areas are currently exposed to industrial and traffic noise sources.

There will be noise and vibration emissions during construction and operations.

The key noise sources during Project operations will be:

- Gas plant facilities:
 - Gas turbines (including air intakes, enclosure ventilation systems and exhaust stack noise).
 - Lube-oil radiator fans.

- Heating, ventilation and air conditioning for the buildings.
 - Compressors (including motors and fans).
 - Pumps (including truck loading pumps).
 - Flare system.
 - Emergency response alarms and vehicle alarms.
- Hexham receiving station facilities:
 - Dry gas filters.
 - Meters.
 - Flow control valves.

The key vibration sources during Project construction will be:

- Bulldozing.
- Grading and excavating (including possible rock hammering).
- Surface compacting.
- Heavy vehicle movements (including front end loaders and earth-moving trucks).

Construction activities will be undertaken with a focus on noise and vibration control at source, noise attenuation and in consultation with potentially affected receptors to minimise the risk of construction noise exceeding noise criteria and disturbing sensitive receptors.

A noise and vibration management plan will be prepared as part of the construction environmental management plan to ensure construction noise levels are adequately controlled and any impacts managed.

Operations noise at the Primary Project Area will comply with Project noise goals. Noise modelling indicates that, without additional noise attenuation, noise emissions during operation of the Hexham receiving station will exceed noise criteria at R5 (217 Old Maitland Road) during low and high gas flow. There will be no vibration impacts during operations.

Modelling indicated that there will be no cumulative operations noise between the gas plant and the Hexham receiving station as they are too far apart. The operation of the gas plant will not exceed noise criteria or cause disturbance at sensitive receptors.

Air Quality

Fugitive dust will be the main emission to the atmosphere during Project construction.

Construction of all components of the Project will have the potential to generate fugitive dust from:

- Road works associated with construction activities.
- Site preparation and excavation, including for the access road, pipeline access corridor, the selected pipeline route and within the gas plant site.
- Delivery of gas plant and pipeline components along unsealed roads or tracks. (The gas plant site access road is expected to be sealed towards the end of the construction phase).

If not controlled, the fugitive dust emissions may impact on the air quality for surrounding land users. Dust emissions from construction are expected to be relatively short lived across different areas of the site and generally manageable through commonly applied dust control measures.

The main emissions to the atmosphere during operations will be combustion gases from the liquefaction and re-gasification processes during operations. The gas plant will emit exhaust gases principally from:

- Hot oil heaters during liquefaction.
- The sour gas flare during liquefaction.
- The process pilot flare during liquefaction.
- The regasifier during regasification.
- The flare during start-up, shut-down and emergencies.

Emissions from gas combustion and flares will include oxides of nitrogen (NO_x), carbon monoxide (CO), volatile organic carbon (VOC), small amounts of sulfur dioxide (SO₂) and particulates. The combustion of waste hydrogen sulfide (H₂S) in the sour gas flare will also result in emissions of SO₂.

Modelling results for all scenarios indicate that emissions from the Project are minor for all pollutants when assessed against impact assessment criteria. The predictions incorporate a level of conservatism and the actual ground level concentrations would be expected to be lower than during liquefaction. A cumulative assessment indicates that the operation of the Project would not result in any additional exceedence of impact assessment criteria.

There will be no emissions from the Hexham receiving station or pipeline during normal operations.

Greenhouse Gas Emissions

The Project will emit greenhouse gases that will contribute to anthropogenic climate change. Direct and indirect greenhouse gas emissions will vary over the life of the Project. During construction, emissions will result from the consumption of diesel fuel and the emissions associated with land clearing.

The design and construction of the Project will be in line with proven energy-efficient technology. Natural gas has advantages over other fossil fuels with respect to greenhouse emissions. During operations direct emissions from the Project will result from:

- Combustion of natural gas for fired heaters in the amine unit and re-gasification units.
- Emissions of carbon dioxide from the amine unit regeneration.
- Fugitive emissions of methane due to venting of unburnt gases from the gas storage facility.
- The flaring of hydrocarbons and acid gases.
- Any accidental loss of gas.

During operations indirect emissions from the Project will result from:

- Electricity consumption for converting natural gas into its liquid form.
- Upstream gas combustion and transportation losses.
- Downstream combustion of liquefied natural gas used as a transport fuel.

10. Hazard and Risk Assessment

The Project is classified as a Major Hazard Facility under the New South Wales Occupational Health and Safety Regulation 2001. Hazard management and risk assessment will be ongoing throughout the operation of the Project.

A Preliminary Hazard Assessment (PHA) reviewed the hazards and risks associated with the Project and compared these risks with the DoP criteria for land use planning. Risk was assessed in terms of individual fatality risk, injury risk, propagation risk and societal risk.

The assessment considered the risk of fatality, injury, and event propagation due to thermal hazards from different combustion events including pool fires, jet fires, flash fires and explosions.

The hazard and risk assessment identified that risks associated with the Project are within acceptable limits when considered against the DoP risk criteria for industrial installations and surrounding land uses. The analysis is based on preliminary designs and has made conservative assumptions in the design and operation of the Project.

11. Environmental Management Framework

Environmental management during the construction and operation of the gas storage facility and associated infrastructure will be in accordance with the conditions of approval determined through the Environmental Assessment process.

Conditions of approval and management commitments in this Environmental Assessment will be incorporated into Project-specific environmental management plans (EMPs). These will be developed to outline procedures which will address how statutory and community responsibilities will be managed during construction and operation of the Project.

These EMPs will:

- Address environmental objectives, commitments and conditions of approval resulting from the Environmental Assessment approvals process.
- Provide procedures for avoidance, mitigation and management of potential environmental impacts on a site-specific or issue-specific basis.
- Outline a management framework for managing environmental issues during construction and operation of the Project.
- Provide a program for monitoring and reporting against evaluation objectives.
- Provide a basis for developing and improving environmental management procedures during the life of the Project.

The EMPs will be reviewed and updated to reflect changing requirements, new information and feedback from the environmental monitoring program.

12. Conclusion

This Environmental Assessment addresses the key issues and assessment requirements identified in the DGRs and supplementary DGRs for the Project.

The Project will have significant environmental, economic and social benefits for NSW and the Hunter Region. It is considered that the construction and operation of the Project is justified taking into account biophysical, socio-cultural and economic considerations and is in accordance with the principles of sustainability.

Environmental Assessment
Newcastle Gas Storage Facility Project