NSW GOVERNMENT | Planning

MAJOR PROJECT ASSESSMENT: Gloucester Gas Project

Director-General's
Environmental Assessment Report
Section 75I of the
Environmental Planning and Assessment Act 1979

November 2010

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EXECUTIVE SUMMARY

The Gloucester Gas Project involves a proposal by AGL Upstream Infrastructure Investments Pty Ltd (the Proponent) for the:

1. staged development of gas extraction wells and associated infrastructure within an approximately 210 square kilometre area of the Gloucester Basin in the Gloucester Shire and Great Lakes Shire Local Government Areas (LGAs);
2. construction and operation of up to 110 gas extraction wells and associated infrastructure as the first stage of the gas extraction area, in the Gloucester Shire LGA;
3. construction and operation of a central processing facility to compress and process the extracted gas ready for transport, at one of two potential sites in the Gloucester Shire LGA;
4. construction and operation of a gas transmission pipeline within an overall 100 metre wide assessment corridor to transport the gas from the central processing facility to the existing gas supply network at Hexham, traversing six LGAs: Gloucester Shire, Great Lakes Shire, Dungog Shire, Port Stephens, Maitland City and Newcastle City; and
5. construction and operation of a gas delivery station at Hexham in the Newcastle City LGA, to deliver the gas from the pipeline to the existing Sydney-Newcastle gas pipeline.

The Proponent has sought concept plan approval for the entire proposal comprising components 1 to 5 and concurrent project approval for components 2 to 5. The proposal involves a capital investment of $276 million and is expected to generate up to 40 jobs during operation and 465 jobs during construction.

The project has been declared to be a 'Controlled Action' under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and has been subject to an accredited assessment process under Part 3A of the *Environmental Planning & Assessment Act 1979*.

The Environmental Assessment for the project was placed on public exhibition for an extended period from 8 November 2009 until 15 January 2010 and the Department received a total of 136 public submissions on the project, 77 of which comprised form letters. Of these 90% raised objection to the project whilst the remainder did not state a specific position. In addition, submissions were received from eleven public authorities: NSW Department of Environment, Climate Change and Water; NSW Office of Water; Industry and Investment NSW; Hunter-Central Rivers Catchment Management Authority; TransGrid; NSW Roads and Traffic Authority; Gloucester Shire Council; Great Lakes Shire Council; Dungog Shire Council; Maitland Shire Council; and Port Stephens Shire Council.

The key environmental issues associated with the project relate to surface and ground water, noise and vibration, flora and fauna, air quality, visual amenity and heritage impacts. Submissions on the project mainly reflected these issues, however also raised other issues including traffic and transport, rehabilitation, construction camps and development contributions.

The Department has assessed the Proponent's Environmental Assessment, Preferred Project Report and Statement of Commitments and submissions received on the project. Based on its assessment, the Department is satisfied that the Proponent has undertaken an appropriate and conservative level of assessment covering all aspects of the project including the concept plan area, both central processing facility site options and the 100 metre wide assessment corridor for the gas pipeline. The Department is further satisfied that the project can be constructed and operated consistent with best practice and acceptable environmental and amenity standards. In relation to fraccing processes associated with gas well installation, the Department notes that the Proponent has not proposed the use of Benzene, Toluene, Ethylbenzene and Xylene (BTEX) chemicals in this process. Whilst some residual impact may occur in relation to operational noise from the Hexham gas delivery station, the Department considers that this would not outweigh the overall need and benefits of the project and therefore does not warrant refusal of the project. The Department has recommended acquisition rights to protect landowner interests, in the event that detailed design investigations confirm that operational noise emissions from the delivery station are likely to significantly exceed criteria, despite all reasonable and feasible mitigation measures having been considered.

In summary, the Department's assessment concludes that there are no significant environmental or amenity constraints to the development of the project as proposed. Consequently, the Department has recommended concept plan approval for the proposal as a whole. The Department is also satisfied that the Proponent has undertaken sufficient assessment of all project elements for which project approval has been sought (i.e. the stage 1 field development area of 110 gas wells, the two site options for the central processing facility, the 100 metre wide gas pipeline corridor, the gas delivery station at Hexham and potential constraints associated with temporary construction facilities). Consequently, the Department has recommended full project approval for these project elements. The Department considers that granting project approval for the two site options for the central processing facility and the 100 metre wide gas pipeline corridor would provide the Proponent with maximum flexibility during the detailed design phase of determining the final facility option and pipeline route with consideration to operational efficiencies, environmental and amenity constraints, landowner preferences and constructability (the latter issues are particularly relevant in relation to the pipeline corridor). The Department has formulated stringent recommended conditions of approval in relation to surface and ground water, noise and vibration, flora and fauna, air quality, visual amenity and heritage impacts as part of its recommended project approval to ensure that these project elements achieve acceptable environmental standards and to ensure that public amenity is protected and residual impacts are offset, as far as practicable.

It is noted that the Proponent has not sought project approval for further stages of gas extraction beyond the first stage of 110 wells at this stage. The Department considers that further assessment and planning approval would be required for any future gas wells before this element of the project can be further developed and has recommended that any future approvals for this project element be progressed under Part 3A of the *Environmental Planning & Assessment Act 1979*. In this regard, the Department has incorporated comprehensive further assessment requirements in relation to surface and ground water, noise and vibration, flora and fauna, air quality, visual amenity and heritage impacts as part of the recommended concept plan approval, which the Proponent must address in seeking any further approval for gas wells within the concept plan area.

On balance, the Department considers the project to be justified and in the public's interest and should be approved subject to conditions in relation to the concept plan and project components, and the Proponent's Statement of Commitments.

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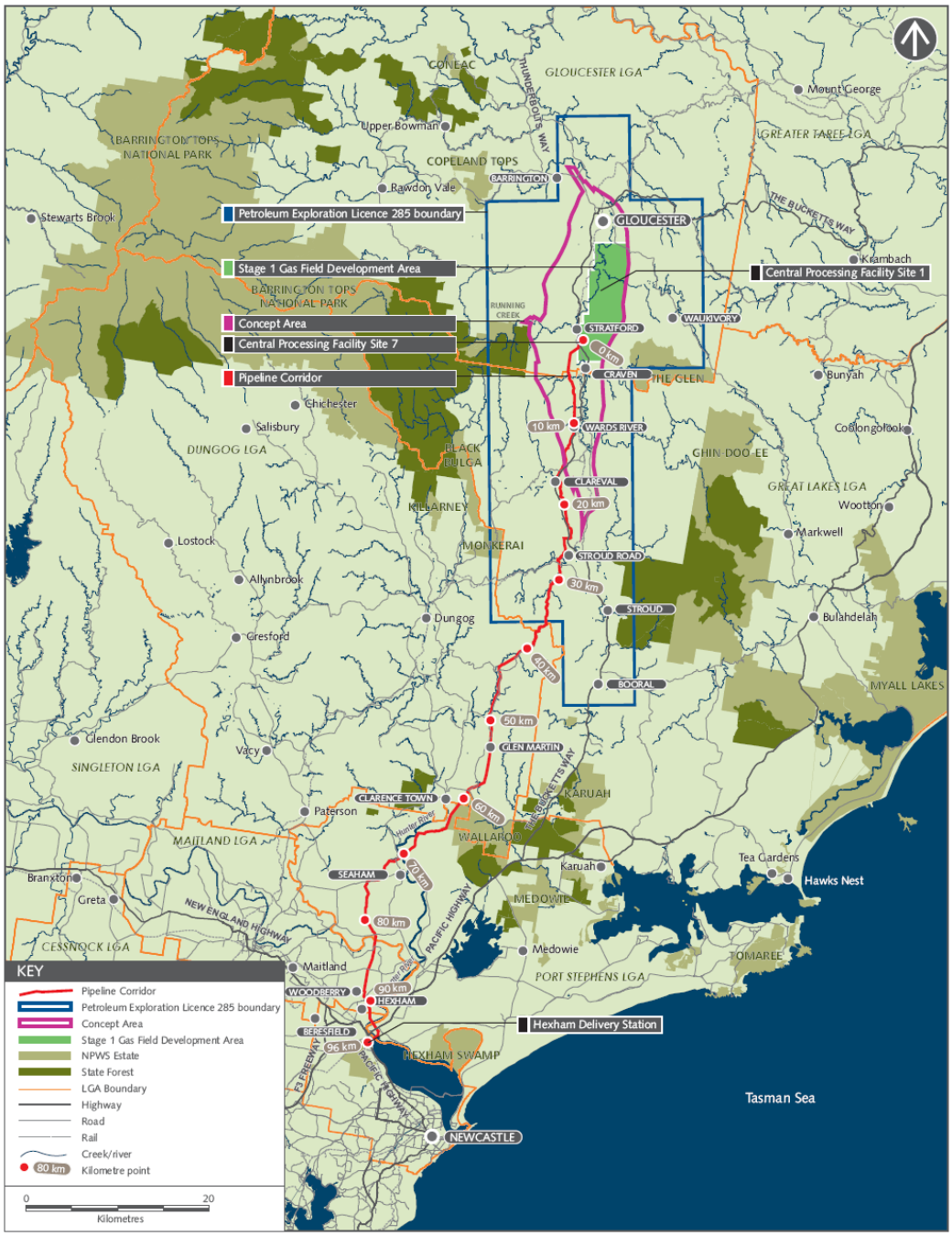
1. BACKGROUND

AGL Upstream Infrastructure Investments Pty Ltd (the Proponent) has proposed to construct and operate the *Gloucester Gas Project* involving the extraction, processing, transport and delivery of coal seam gas to the existing gas supply network in the Hunter Region of New South Wales. The four elements of the project would traverse six Local Government Areas (LGA), as identified below and illustrated in Figure 1:

- coal seam gas extraction from the Gloucester basin in the Gloucester and Great Lakes LGAs;
- processing and compression of the gas ready for transport at a processing facility, located in either of two locations near Stratford in the Gloucester LGA;
- transport of the compressed gas from the processing facility via an underground pipeline, across the Gloucester, Great Lakes, Dungog, Maitland, Port Stephens and Newcastle LGAs; and
- delivery of the gas to the existing Sydney-Newcastle gas pipeline via a new gas delivery station at Hexham in the Newcastle LGA.

Figure 1: Site Area (AECOM, November 2009)



The Proponent has identified that the three northern LGAs traversed by the project (Gloucester, Great Lakes and Dungog) are largely characterised by rural and agricultural landuse with some rural residential development and hobby farms, whilst the LGAs to the south (Maitland, Port Stephens and Newcastle) are more urbanised with more residential and industrial landuse. In this regard, the Proponent has identified that the areas currently proposed for gas extraction and the gas processing facility would be generally located within existing disturbed, rural/ grazing land in the Gloucester LGA, close to mining landuse associated with the Stratford Coal Mine operated by Gloucester Coal. Potential future areas of gas extraction have been identified to extend across both the Gloucester and Great Lakes LGAs, predominantly across rural/ agricultural landuse.

Two location options have been identified for the central processing facility: either between the townships of Gloucester and Stratford (Site "1") or just to the south of the township of Stratford (Site "7") (refer Figure 1). Site 1 is situated within a larger rural grazing property owned by the Proponent (the "Tiedemann property") and is located approximately 5.5 kilometres to the south of Gloucester and four kilometres to the north east of Stratford. The nearest areas of extant remnant vegetation to Site 1 are located approximately 1.5 kilometres to the east and are not proposed to be disturbed as part of the development of the facility. The nearest residential dwelling to the site is located some 1.3 kilometres away.

Site 7 comprises a property owned by Gloucester Coal, located approximately 1.8 kilometres to the south of the township of Stratford, approximately 500 metres to the south west of the Stratford coal mine and directly adjacent to the rail loop which services the coal mine. The site is located within an area zoned "industrial" under the newly gazetted *Gloucester Local Environmental Plan 2010*. Parts of the eastern section of the property are vegetated, however disturbance of these areas are not proposed should the facility be developed at this location. The nearest residential dwelling to the site is located approximately 450 metres away. Should this site be developed, an alternative access via Buckets Way is proposed due to limited site distance off the existing road access (Parkers Road).

The pipeline would traverse generally rural agricultural and rural residential landuse to the north, with landuse becoming progressively urbanised further to the south. The Proponent has identified that the pipeline would pass near land proposed to be zoned or released for future residential development within the Great Lakes LGA (near Stroud) and the Maitland LGA (the "Thornton Release Area"), however would not directly traverse through these areas. The pipeline is also proposed to traverse through the Wallaroo National Park and two private properties on which property vegetation plans (PVP) are being negotiated in the Dungog LGA; however the pipeline would be confined to the existing power line easements (at the National Park and one of the PVP properties) and already cleared areas (in the remaining PVP property). The pipeline would also involve a number of waterway crossings (including the Karuah River, Williams and Hunter Rivers) and the crossing of two wetland areas (830 and 831) at Tomago which are listed under *State Environmental Planning Policy No 14 – Coastal Wetlands* (SEPP 14). The pipeline at its southern end would be located approximately 0.8 kilometres to the east of the Hexham Swamp section of the Hunter Wetlands National Park and approximately one kilometre to the north-west of the Kooragang section of the Hunter Wetlands National Park. The southern end of the pipeline would be located approximately one kilometre upstream of the Ramsar listed Hunter Estuary Wetland, which is made up of the Kooragang Nature Reserve (now also part of the Hunter Wetlands National Park) and the Shortland Wetlands (now called the Wetlands Centre Australia). Several major roads (including the Pacific Highway near Hexham) and rail infrastructure (North Coast Railway near CPF Site 7) are also proposed to be crossed by the pipeline.

The gas delivery station is proposed to be located adjacent to the existing Sydney-Newcastle trunk gas pipeline off Punt Road and Old Maitland Road at Hexham, on land largely characterised by industrial and commercial land uses (including industrial warehouses and vehicle sales yards). A single residence is located at the corner of Punt Road and Old Maitland Road approximately 150 metres from the proposed delivery station. Several residences are also located along the southern end of Old Maitland Road, the closest of which is situated some 350 metres from the proposed delivery station.

2. PROPOSED DEVELOPMENT

2.1 Project Description

The four main elements of the Gloucester Gas Project are described below.

Gas Extraction Area

The potential gas extraction area for the proposal ("gas field development area" - GFDA) covers approximately 210 square kilometres (km^2) of mostly rural/ agricultural land between the townships of Barrington and Stroud Road, encompassing the known coal measures of the Gloucester coal seam (refer Figure 1). The Proponent has established six test wells at the Tiedeman property near Stratford ("the Stratford pilot project") to determine the availability and characteristics of gas reserves in the region and on this basis has identified an area of approximately 50 km^2 between the townships of Gloucester and just south of Stratford, within the broader GFDA, which would be developed in the first instance. The Proponent has sought concept plan approval for the larger area of potential gas extraction (GFDA) and project approval (i.e. approval to construct) for the smaller extraction site within the larger GFDA (Stage 1 GFDA) (refer Figure 1).

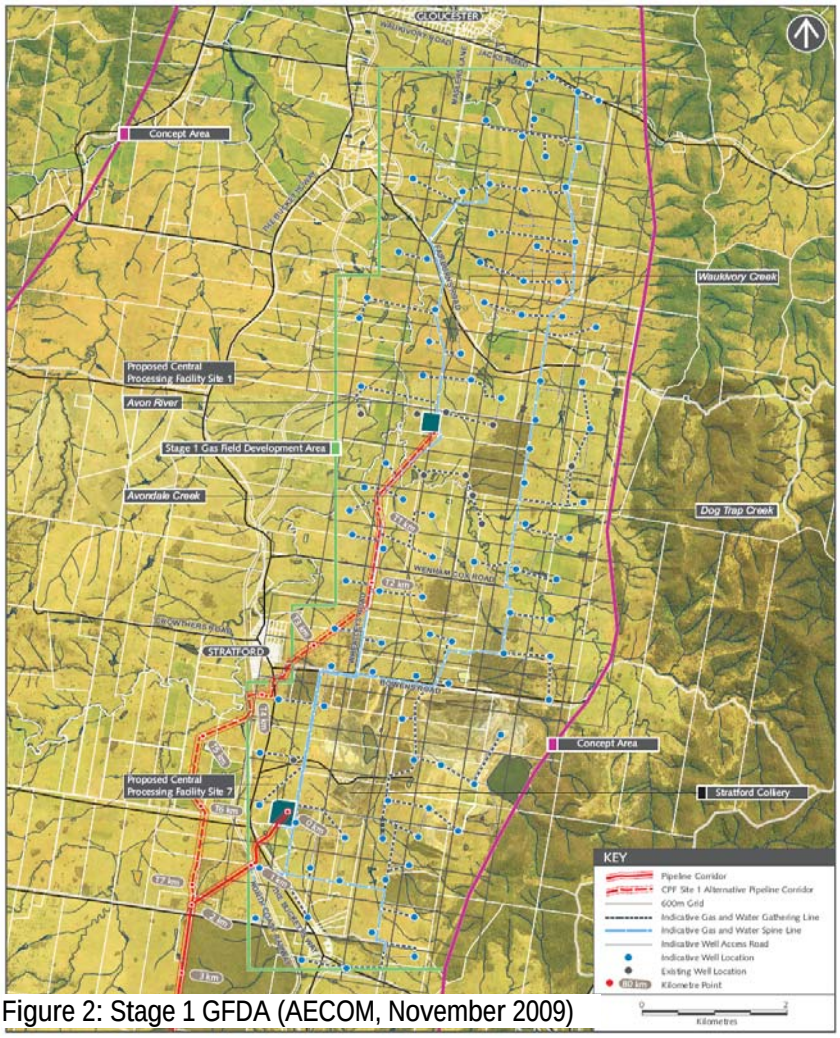


Figure 2: Stage 1 GFDA (AECOM, November 2009)

The Stage 1 GFDA is proposed to comprise: up to 110 gas extraction wells (including the six test wells of the Stratford pilot project); underground gas and water gathering lines; and access roads (refer Figure 2). The Proponent has identified indicative well head locations based on a notional 600 x 600 metre grid pattern, with the final locations to be confirmed following detailed design (including environmental and geological constraints and landowner preferences).

Each well head is expected to require a disturbance footprint of up to 90 x 90 metres of which a final footprint of 15 x 15 metres would remain at the cessation of construction following the implementation of rehabilitation measures. The gas well itself within the final hard stand footprint of 15 x 15 metres would be limited to an area of approximately six by 4 metres and 2.5 metres in height. Gas would be extracted by drilling into and dewatering the coal seam, which would act to lower the seam pressure and gradually release the methane adsorbed within the coal seam.

The proposed water gathering lines would act to collect and transport water released from the dewatering process from each well head to the existing 40 megalitre water storage ponds at the Tiedman property (developed as part of the Stratford Pilot project) and to new ponds at the central processing facility (CPF) (should additional capacity be required). The water flow rate from the Stage 1 GFDA is expected to be around 2 megalitres per day (potentially increasing to up to 6 megalitres per day should the concept plan area be

developed in the future). The proposed gas gathering lines would act to collect and transport gas released from the coal seam to the CPF for processing and compression. The gas and water gathering lines would be installed in trenches (co-located where possible) generally following the proposed access roads for the project. Access roads established for the project are proposed to follow existing access routes or disturbed areas as far as practicable.

The gas extraction wells are expected to be established over 18 months to five years, with construction generally restricted to standard construction hours, although drilling activities which cannot be stopped once commenced (for safety and geotechnical reasons) may extend outside these hours.

The Proponent has identified that should the broader concept GFDA be developed in the future, it would involve similar infrastructure as identified for Stage 1. In this regard, the Proponent has identified location criteria which would be used to determine appropriate siting and design of any future gas extraction infrastructure within the concept GFDA (subject to further approvals). The location criteria include: appropriate distance (200 metres) from sensitive receptors including ability to achieve project noise goals; location away from watercourses (40 metres from a major watercourse and 20 metres from a minor watercourse); avoidance of significant vegetation and riparian areas; avoidance of areas of heritage significance (Aboriginal and European); location adjacent to existing fence lines and access tracks (i.e. already disturbed areas), where possible; location on flat land, where possible; consideration of visual effects including opportunities for natural screening; and landuse and landowner preferences.

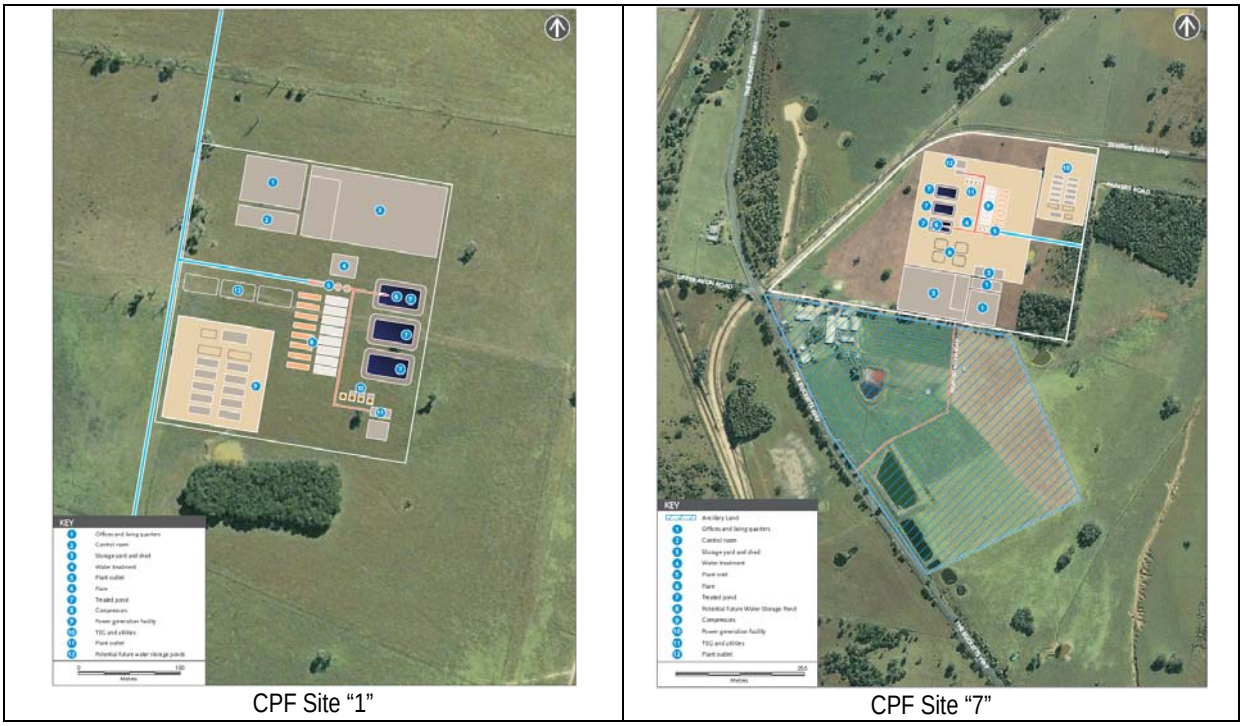
Central Processing Facility (CPF)
The Proponent has sought project approval to construct and operate a gas processing facility with an average capacity of 80 tera joules per day at one of the two location sites identified (refer Figure 3). The Proponent has identified that the CPF involves a footprint of approximately six hectares and comprises:

- gas compression and dehydration systems to compress the extracted gas from pressures of approximately 100 KPa to 15.3 MPa ready for transport;
- flare system which allows the gas in the CPF and gathering system to be burnt in the vent of an emergency which requires the gas to be evacuated;
- regulation, metering and analysis equipment and bulk storage facilities;
- control room, offices, staff amenity and accommodation facilities; and
- ancillary gas-fired power generating facility (comprised of up to five x 3 megawatt generator units with a total generating capacity of up to 15 megawatts), fuelled by gas produced on site and capable of meeting the electricity requirements of the CPF, with any additional power fed into the existing 11 kilovolt electricity grid through a new 11 kilovolt connection. An exact route for the new transmission connection has not been identified. However, the Proponent has indicated that the connection would be approximately 700 metres in length, undergrounded where possible and would follow existing infrastructure corridors such as the railway line and the Buckets Way.

In addition to the above, the CPF would also include water management systems to process the saline waters extracted from the gas wells and transported onto site via the water gathering lines ("produced water") and residual water separated from the gas during gas processing at the CPF ("process water"). The Proponent has identified that "produced water" collected via the water gathering lines would in the first instance be stored in lined storage ponds either at the Tiedeman property (existing 40 ML ponds) or at the CPF site (new 25 ML pond), before being treated in a desalination plant to a quality suitable for its final reuse or disposal. Final reuse/ disposal options being considered include: aquifer re-injection, discharge to surface water, re-use via irrigation and/ or sale of water to the market. The treated water would be stored on site (in a separate 25 ML pond) prior to its final re-use or disposal. The concentrated (brine) wastewater from the desalination plant would be stored in separate evaporation ponds (also 25 ML in capacity) with residual salt following evaporation either sold to a salt producer or disposed of at a licensed facility.

With respect to "process water" generated during gas processing, the Proponent has identified that "clean process water" would be transferred to the "produced water" storage ponds at the Tiedeman property and/ or CPF (for subsequent treatment in the desalination plant); whilst any "oily process water" would be treated in a specialist wastewater treatment plant to a level suitable for disposal at a licensed facility.

Construction of the CPF is expected to take approximately 12 months under standard construction hours. During operation the CPF would operate 24 hours a day, with the site generally being staffed with up to 30 personnel during the hours of 7am to 5pm



CPF Site "1" CPF Site "7"

Figure 3: CPF Location Options (AECOM, November 2009)

Gas Pipeline

The proposed gas transmission pipeline would extend between the CPF for the project and the gas delivery station at Hexham, approximately 95 to 100 kilometres in length (depending on the CPF site selected). The Proponent has identified that a corridor width of at least 30 metres would be required to accommodate the construction requirements for the pipeline although in sensitive areas this would be reduced to 15-20 metres. In this regard, the Proponent has identified and sought project approval for a 100 metre wide investigation corridor within which the final 30 metre wide corridor would be developed to provide maximum siting flexibility during detailed design. The pipeline would be constructed using open trenching or in the case of significant infrastructure (e.g. rail, road and buried utilities) or sensitive environments (e.g. important water courses and SEPP 14 wetlands), through the use of thrust boring or horizontal directional drilling. The entire disturbance width of the pipeline corridor (i.e. 15-30 metres depending on location) would be rehabilitated consistent with existing landuse following construction, with ongoing maintenance activities (including vegetation maintenance), limited to an approximately 10 metre width easement directly above the buried pipeline.

Construction of the pipeline is expected to take approximately 12 months, with construction proposed between 7am to 6pm seven days a week. Some activities such as horizontal directional drilling which cannot be stopped once commenced (for safety and geotechnical reasons) may extend outside these hours.

Hexham Delivery Station

The gas delivery station for the project, which the gas pipeline would connect to, is proposed to be located on land zoned for industrial use on Old Maitland Road at Hexham. The Hexham Delivery Station (HDS) would feed into the existing "gate station" at the Sydney-Newcastle trunk gas pipeline, and thereby feed in gas from the project to the existing gas network. The HDS would comprise a footprint of approximately 0.27 hectares and take approximately six months to construct. The HDS would operate on a 24 hour basis.

Construction Facilities

The Proponent has identified that a temporary construction workforce camp may be required to accommodate up to 100 personnel during the concurrent construction of the Stage 1 GFDA and the CPF site. The camp is proposed to be located within already disturbed and cleared areas within the Tiedman property. An additional

camp is also proposed approximately midway along the gas pipeline length to accommodate the approximately 300 construction personnel likely to be required during peak pipeline construction. A specific location has not been identified to date in regards to the second camp site, but the Proponent has committed to identifying a suitable location considering existing environmental and amenity constraints.

2.2 Changes to the Project Since Exhibition

There were no changes to the project following the exhibition of the Environmental Assessment.

2.3 Project Need

The *Gas Statement of Opportunities 2009* (Gas SOO) released by the Australian Energy Market Operator (AEMO) forecasts annual growth in the domestic demand for natural gas in Australia from 626 Peta Joules (PJ) in 2009 to 1,205 PJ in 2029. Demand in NSW and the ACT is forecast to increase from 130 PJ in 2009 to 199 PJ in 2029. The Gas SOO has identified that increases in demand are likely to be significantly driven by regulatory and market responses to the need for greenhouse gas reductions, with gas expected to play an increasing role in the energy generation sector. The majority of gas demand in NSW is met from inter-State supplies (with less than 5% of demand sourced from NSW supplies). The Gas SOO has identified that in the next decades declining reserves in Victoria and South Australia are likely to place pressure on the existing gas distribution network in NSW (which has historically developed focused on these reserves, supplied via the Eastern Gas Pipeline and Moomba-Sydney Pipeline). This means that the existing distribution network may not efficiently connect with new and emerging reserves or supply emerging areas of high demand (including growth areas and new industry such as gas power generation). In this regard, the Gas SOO has predicted that the capacity of the existing NSW/ ACT distribution network would be progressively exceeded from 2012 onwards.

The Proponent has identified that the Gloucester gas project has the potential to contribute significant gas reserves to the NSW market: up to 423 PJ of 2P (proved and probable) reserves and up to 630 PJ of 3P (proved, probable and possible) reserves. The new transmission line would also serve to supply gas directly to a significant domestic and industrial growth area in NSW (the Hunter region) and increase the total capacity of the NSW distribution network.

The Department notes that natural gas is increasingly recognised as an important transition fuel in helping to move towards a more carbon-constrained economy and is likely to play an increasing role in industry particularly in the energy generation sector (with gas-fired generation recognised as a more greenhouse gas efficient option than coal for meeting forecast electricity requirements). In this regard, the Department considers that a secure and reliable gas supply network would be an important factor in contributing to continued economic growth in NSW. The Department considers that the gas reserves developed by the project would help meet existing and future demand for natural gas in NSW. In particular, the Department considers that the project would strengthen gas supply security in NSW (and provide opportunities for associated economic growth) by contributing an additional source of supply to the NSW market; supplying directly to key market and growth areas including the Hunter and Sydney region (via the Newcastle-Sydney pipeline); and increasing the distribution capacity of the supply network (and thereby reducing the pressure on other existing pipeline routes). The Department considers that the development would provide opportunity for the growth of existing industry and the development of new industry within the Hunter Region by tapping into the additional fuel resources provided by the project along the pipeline corridor. Furthermore, by helping to secure less-greenhouse gas intensive fuel resources, the project would help meet the greenhouse gas priorities and targets of the NSW State Plan including "achieve a 60% cut in greenhouse gas emissions by 2050 in line with the Federal Government targets".

In addition to its strategic benefits, the Department also accepts that the project would involve direct economic benefits to the State and locally through direct investment, employment generation and multiplier effects at all stages of project development including construction and operation. This includes capital investment of up to $276 million in the Australian economy (including NSW) for the acquisition of plant; estimated employment generation of up to 465 personnel during construction and up to 30-40 personnel during operation; and multiplier effects such as benefits to the local service industry through patronage from construction and operation personnel. Ongoing operational employment generation is also likely to boost local communities by providing opportunities for employment.

3. STATUTORY CONTEXT

3.1 Major Project

On 21 May 2008, the Director-General of the Department of Planning, under delegation from the Minister for Planning, formed the opinion under clause 6 of the *State Environmental Planning Policy (Major Development) 2005* (Major Development SEPP) that the abovementioned project meets the categories of development identified in Schedule 1 of the SEPP, including development for the purposes of:

- drilling and operation of petroleum wells (including associated pipelines) that has a capital investment value of more than $30 million (Group 2, clause 6 (1) (a));
- petroleum related works (including processing plant) that has a capital investment value of more than $30 million (Group 2, clause 6 (2) (b)); and
- development for the purposes of a pipeline (including the gas delivery station) in respect of which a licence is required under the *Pipelines Act 1967* (Group 8, clause 26A)

The project is therefore subject to Part 3A of the *Environmental Planning and Assessment Act 1979* (the EP&A Act) and the Minister for Planning is the approval authority.

On 4 August 2008, the Minister authorised the submission of a concept plan for the proposal pursuant to Section 75M of the EP&A Act.

3.2 Controlled Action

The project has been declared to be a 'Controlled Action' under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (EPBC reference no. 2008/4432), which means that the project will also require approval from the Commonwealth Minister for Sustainability, Environment, Water, Population and Communities. The EPBC Act Part 3, Division 1 controlling provisions are sections 16 and 17B (wetlands of international importance) and 18 and 18A (listed threatened species and communities).

The Department of Sustainability, Environment, Water, Population and Communities (DSEWPAC) has confirmed that pursuant to section 87 of the EPBC Act, the project would be assessed under Part 3A of the EP&A Act through an accredited assessment process. This means that the environmental assessment process under Part 3A of the EP&A Act would stand for the purposes of the EPBC Act in relation to the project. To enable the assessment of controlling actions under the EPBC Act, the Director-General's requirements issued for the project on 26 August 2008 were supplemented pursuant to section 75F(3) of the EP&A Act with additional requirements relating to EPBC matters on 19 October 2008. The Department has considered relevant EPBC controlling provisions in its assessment of the project (refer to Sections 5.1 and 5.3). Its assessment of the project against Matters of National Environmental Significance is summarised in Table 2 below.

Table 2: Matters of National Environmental Significance (NES)

Matters of National Environmental Significance	Department's Assessment
World Heritage Properties	The project does not affect any World Heritage Properties.
National Heritage Places	The project does not affect any National Heritage Places.
Wetlands of International Importance (Ramsar Wetlands)	The project would not directly impact on any Ramsar Wetland, however the southern end of the gas pipeline would be located approximately one kilometre upstream of the Ramsar listed Hunter Estuary Wetland. Consequently, there is the potential for indirect impacts on the water quality of the wetland (and through this to the ecology of the wetland), through construction related disturbance including acid sulphate exposure and/ or erosion and sedimentation runoff. The Department's assessment (section 5.3) has concluded that these issues can be managed so as to pose a low risk of impact through the implementation of comprehensive management measures including acid sulphate soil management plans, water quality monitoring programs and site specific erosion and sediment control plans.
Listed Threatened Species and Ecological Communities	The EPBC controlling provisions in relation to EPBC listed species related to the potential for the project to disturb breeding populations of the Booroolong Frog and Giant Burrowing Frog species. The Proponent's flora & fauna assessment did not record individuals of these species or potential habitat for these species within the study site. Notwithstanding, the Proponent's
Migratory Species	

	assessment recorded the presence of a single EPBC listed flora species (*Grevillea Parviflora sub. Species parviflora*) within the pipeline corridor, which is proposed to be disturbed by the project and identified that the entire project area had the potential to provide habitat for up to 9 additional EPBC listed flora species, 10 EPBC listed fauna species (including three frog species – the Green and Golden Bell Frog, Stuttering Frog and Giant Barred Frog) and 21 EPBC listed migratory bird species. The project has the potential to impact on EPBC listed species through the direct clearance of approximately 18 hectares of vegetation and associated habitat (including direct clearance of the *Grevillea Parviflora sub. Species parviflora* species and direct disturbance of aquatic and riparian habitat around waterways during pipeline crossings of waterways). Species and ecosystems which are dependent of alluvial aquifers and associated waterways (such as the identified frog species) may be indirectly impacted by the project should gas extraction activities affect the volume and/or water quality of alluvial aquifers. Indirect impacts could also occur to wetland and other aquatic or riparian species (including the identified frog species) from water quality impacts to these areas during construction through acid sulphate exposure and/ or erosion and sedimentation runoff. The Department's assessment (section 5.3) has concluded that the direct vegetation clearing impacts of the project (including direct disturbance of the population of *Grevillea Parviflora sub. Species parviflora* species identified) can be suitably offset through the provision of offset land which provides compensatory habitat for the values lost. In this regard, the Proponent has identified the availability of a 134.9 hectare offset site including potential habitat for the *Grevillea Parviflora sub. Species parviflora* species. The Department's assessment (section 5.3) has also recommended stringent conditions with respect to managing water quality and direct disturbance of waterways during construction including acid sulphate soil management plans, water quality monitoring programs, site specific erosion sediment control plans, pre-construction surveys of the habitat sensitivity of waterways (with specific consideration of frog species habitat) and design of waterway crossings with consideration to that sensitivity and rehabilitation requirements of all disturbed waterways back to existing conditions or better. The Department's assessment (section 5.1) also concluded that the gas wells are unlikely to pose a significant risk of impacts to shallow aquifers (and associated species and ecosystems). This is due to gas extraction being limited to deep bedrock aquifers which are confined and exhibit low connectivity to shallow alluvial aquifers and due to the procedures for well installation and decommissioning proposed which include procedures for minimising the potential for connectivity and water cross contamination between different aquifers and strata. The Department's assessment has incorporated stringent pre-construction and ongoing operational groundwater monitoring requirements to ensure accurate baseline conditions are established and ongoing operations are monitored to ensure no significant impacts to alluvial aquifers and associated ecosystems.
Commonwealth Marine Areas	The project does not affect any Commonwealth Marine Areas.
The Great Barrier Reef Marine Park	The project does not affect the Great Barrier Reef Marine Park.
Nuclear Actions (including Uranium Mines)	The project does not involve a nuclear action (including uranium mining).
Commonwealth Land	The project does not affect any Commonwealth Land.
Action being carried out by a Commonwealth Agency	The project is not being carried out by a Commonwealth Agency.

3.3 Permissibility

The project is a permissible landuse pursuant to the provisions of the following environmental planning instruments:

- gas production wells – permissible pursuant to Clause 7(2)(a) of *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (Mining SEPP), which allows for petroleum production to be carried out (with development consent) on land on which agriculture or industry is a permissible landuse. The Stage 1 gas production wells are proposed to be developed on land zoned RU1 Primary Production under the newly gazetted *Gloucester Local Environmental Plan 2010* and 1(a) Rural under the *Great Lakes Local Environmental Plan 1996*, under which agriculture is a permissible landuse. A small number of wells may also be located on land zoned IN3 Heavy Industrial under the *Gloucester Local*

Environmental Plan 2010, under which industrial landuse is permissible. Consequently, pursuant to Clause 7(2)(a) of the Mining SEPP, the gas production wells are a permissible landuse in the subject land. Whilst the exact location of gas wells in the larger concept plan gas development area is not known at this stage, it is expected that these areas would generally be located on Primary Production/ Rural zonings, under which the gas wells would be permissible, pursuant to the provisions of Clause 7(2)(a) of the Mining SEPP;

- central processing facility - permissible pursuant to Clause 7(2)(d) of the Mining SEPP, which allows for facilities for the processing or transportation of petroleum to be developed (with development consent) on or adjoining land on which petroleum production is a permissible landuse (with or without consent). The central processing facility is proposed to be located on land zoned either RU1 Primary Production (processing facility site "1") or IN3 Heavy Industrial (processing facility site "7") under the *Gloucester Local Environmental Plan 2010.* Petroleum production is a permissible landuse pursuant to Clause 7(2)(a) of the Mining SEPP under both these zonings. Consequently, the central processing facility would be a permissible landuse pursuant to Clause 7(2)(d) of the Mining SEPP as the facility would be located on or adjacent to land within which petroleum production is a permissible landuse;
- electricity generating works proposed as part of the central processing facility - permissible pursuant to clause 34 of *State Environmental Planning Policy (Infrastructure) 2007* (Infrastructure SEPP), which allows electricity generating works to be carried out by any person (with consent) on 'prescribed' or equivalent land zonings. These include the prescribed zone IN3 Heavy Industrial (on which processing facility site "7" would be located) and zone 1(a) Rural which is equivalent to the prescribed zone RU1 Primary Production (on which processing facility site "1" would be located). Any transmission line connection associated with the generating works would be permissible on any land (with the exception of land zoned for National Park) without consent, pursuant to clause 41 of the Infrastructure SEPP, as it would comprise development for the purpose of an electricity transmission by a person or body engaged in the generation of electricity for supply, directly or indirectly, to the public; and
- gas pipeline and gas delivery station - permissible pursuant to Clause 53(1) of *State Environmental Planning Policy (Infrastructure) 2007* (Infrastructure SEPP), which allows development for the purposes of a gas pipeline which is the subject of a licence under the *Pipelines Act 1967*, to be developed without consent on any land. Clause 53(3) of the Infrastructure SEPP places some restrictions on the development of gas pipelines within land zoned for "National Park" or equivalent zonings. Whilst the pipeline would traverse within land declared to be a National Park under the *National Parkes and Wildlife Act 1974* within the Dungog Local Government Area, this land is not zoned for National Parks (i.e. zone 8(a)) under the *Dungog Local Environmental Plan 2006*. Further, the project's impact within this area would be confined to an existing cleared easement within the National Park, which is allowed for under Clause 53 (3) (c) of the Infrastructure SEPP. Furthermore, as the section of National Park traversed by the pipeline is zoned 7(a) Environment under the *Dungog Local Environmental Plan 2006* under which agriculture is a permissible use, this section of the pipeline would also be permissible pursuant to Clause 7(2)(d) of the Mining SEPP as it would comprise a 'facility for the processing or transportation of petroleum', which would be located on land within which 'petroleum production' is a permissible landuse (pursuant to Clause 7(2)(a) of the Mining SEPP).

3.4 Other Environmental Planning Instruments

There are no other environmental planning policies that substantially govern the carrying out of the project.

3.5 Exhibition and Notification

Director-General's requirements were issued for the project on 26 August 2008 and were subsequently supplemented on 19 October 2008 in relation to EPBC matters and on 25 August 2009 in relation to changes made to the project since the original requirements were issued (i.e. addition of a power generating facility at the central processing facility site). The Proponent submitted an Environmental Assessment to the Director-General in November 2009. Pursuant to Section 75H and 75I(2)(g) of the EP&A Act, the Director-General was satisfied that the Environmental Assessment had addressed the Director-General's requirements issued for the project on 26 August 2008 and supplemented on 19 October 2008 and 25 August 2009. A copy of the Environmental Assessment is attached (see Appendix D).

The Environmental Assessment was placed on public exhibition for an extended period from 18 November 2009 until 15 January 2010 and submissions invited in accordance with Section 75H of the EP&A Act. The exhibition meets the minimum statutory period for exhibition (i.e. 30 days) required by the EP&A and EPBC Acts. Exhibition

of the Environmental Assessment was also advertised in locally and nationally circulating newspapers in accordance with the requirements of the EP&A and EPBC Acts. The Environmental Assessment was also made publicly available on the Department's website. Following the exhibition period, the Director-General directed the Proponent to respond to the issues raised in submissions. The Submissions Report (see Appendix E) prepared by the Proponent was subsequently made publicly available on the Department's website.

3.6 Objects of the *Environmental Planning and Assessment Act 1979*

Section 5 of the EP& A Act details the objects of the legislation. The objects of the EP&A Act are:

(a) to encourage:
- *(i) the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment;*
- *(ii) the promotion and co-ordination of the orderly and economic use and development of land;*
- *(iii) the protection, provision and co-ordination of communication and utility services;*
- *(iv) the provision of land for public purposes;*
- *(v) the provision and co-ordination of community services and facilities;*
- *(vi) the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats;*
- *(vii) ecologically sustainable development;*
- *(viii) the provision and maintenance of affordable housing; and*

(b) to promote the sharing of the responsibility for environmental planning between the different levels of government in the State; and

(c) to provide increased opportunity for public involvement and participation in environmental planning and assessment.

Of particular relevance to the environmental impact assessment and eventual determination of the subject project application by the Minister, are those objects stipulated under section 5(a). Relevantly, the objects stipulated under (i), (ii), (vi) and (vii) are significant factors informing determination of the application (noting that the proposal does not raise significant issues relating to communication and utility services, land for public purposes, community services and facilities or affordable housing). With respect to ecologically sustainable development, the EP&A Act adopts the definition in the *Protection of the Environment Administration Act 1991*, including the precautionary principle, the principle of inter-generational equity, the principle of conservation of biological diversity and ecological integrity, and the principle of improved valuation, pricing and incentive mechanisms. In applying the precautionary principle, public decisions should be guided by careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment and an assessment of the risk-weighted consequences of various options.

It is important to recognise, that while the EP&A Act requires that the principles of ecologically sustainable development be encouraged, it provides other objects that must be equally included in the decision-making process for the subject proposal. The Department's assessment has given due consideration to the objects of the Act in its assessment including:

- the need to encourage the principles of ecologically sustainable development:
  - the Department's assessment of the need for the project (section 2.3) has considered the benefits of the project in helping to secure less-greenhouse gas intensive fuel resources, which are consistent with the principle of inter-generational equity;
  - the Department's assessment of the ecological impacts of the project (section 5.3) is based on a conservative and rigorous assessment of the likely extent of ecological impacts and of likely offset requirements to ensure that appropriate and adequate measures are put in place to prevent the threats of serious or irreversible environmental damage consistent with the precautionary principle and the principle of conservation of biological diversity and ecological integrity; and
  - the Department's assessment of key issues (including sections 5.1 and 5.3) has considered the requirement for appropriate contingency strategies (in relation to groundwater impacts to surrounding users) and appropriate offsets for residual biodiversity impacts, which is consistent with the principle for the appropriate valuing of natural resources;

- the proper management, development and conservation of natural and artificial resources (including agricultural land, natural areas, water resources and minerals) has been considered in sections 4.4 and 5 (in relation to landuse, water and biodiversity impacts);
- the orderly development of land, which has been considered in sections 5.2, 5.4 and 5.5 of the Department's assessment in relation to the potential amenity impacts of the project (noise, air quality and visual) on surrounding receptors; and
- the protection of the environment including threatened species, which has been considered in section 5.3 of the Department's assessment.

In addition to the above, the agency and community consultation undertaken as part of the assessment process (see Sections 3 and 4 of this report), address objects 5(b) and (c) of the Act.

3.7 Planning Assessment Commission

The Minister for Planning is the approval authority for the project. On 15 November 2008, the then Minister for Planning delegated her approval functions under Section 75J of the EP&A Act (in relation to project applications) to the Planning Assessment Commission (PAC) in the case where a statement has been made disclosing a reportable political donation, where an application is made in the Minister's electorate, or where the Minister has a pecuniary interest in the development (refer Appendix H). The Proponent has provided a statement indicating it has made reportable political donations (refer Appendix G). Consequently, pursuant to the Minister's delegation of 15 November 2008, the project application is subject to determination by the PAC.

The Minister's delegation of 15 November 2008 did not extent to concept plan applications. On 28 September 2010, pursuant to section 23 of the EP&A Act, the Minister for Planning delegated his powers and functions under sections 75O and 75P of the EP&A Act (in relation to the determination of concept plan applications) to the PAC for the Gloucester Gas Project concept plan application (refer Appendix H) on the basis that there would be merit in the PAC determining both applications due to the concept plan application forming an integral component of the proposal including being subject to consolidated assessment by the Department along with the project application. The delegation was gazetted in the NSW Government gazette on 1 October 2010.

Consequently, pursuant to the Minister's delegations of 28 September 2010 and 15 November 2008, the PAC may determine the concept plan and concurrent project application for the Gloucester Gas Project.

4. CONSULTATION AND ISSUES RAISED

4.1 Public Submissions

The Department received a total of 136 public submissions on the project, 77 of which comprised form letters. Of the 136 public submissions 90% raised objection to the project whilst the remainder did not state a specific position. The issues raised in public submissions are presented in Figure 4. The graph indicates the relevant frequency of a particular issue against all issues raised, rather than as a percentage of submissions raising that issue.

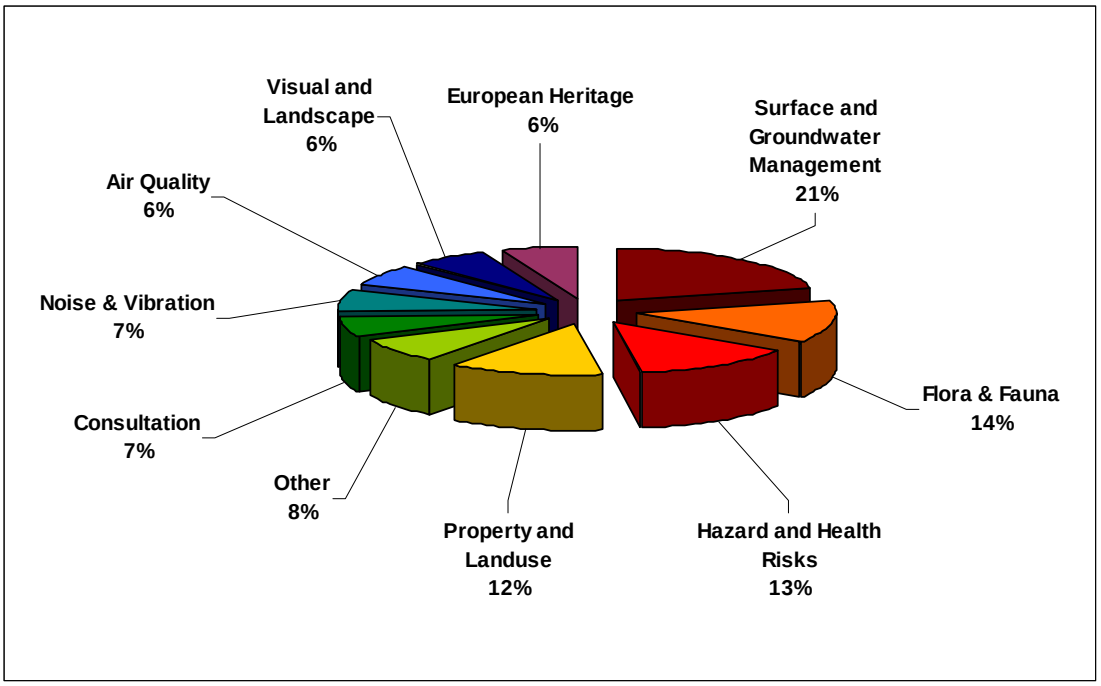


Figure 4: Issues Raised by Public Submissions

The main issues raised in public submissions in order of magnitude were:

- Surface and Groundwater Management – risks to groundwater during gas extraction (dewatering of aquifers, groundwater migration between aquifers and risks to groundwater quality); management of water extracted from the wells (including potential for groundwater and/ or surface water contamination from water storage, treated water discharge or reinjection into the aquifers, and disposal of concentrated waste produced from the water treatment process); flooding impacts; erosion and sediment control and soil contamination during ground disturbance (including from acid sulphate soils);
- Flora & Fauna – including concerns regarding vegetation clearing, impacts on Ramsar wetlands and impacts on waterways including associated riparian vegetation during waterway crossings;
- Hazard & Health Risks – concerns regarding health risks from air emissions, contamination of surface/ ground water drinking water supplies and hazard risks from methane migration and/ or release during gas extraction, processing or transport of the gas;
- Landuse and Property – including concerns regarding impacts on individual properties, surrounding landuse (such as agriculture and future residential development), property values (including request for compensation) and impacts on the tourism industry;
- Consultation – concern regarding the extent of consultation undertaken on the project by the Proponent;
- Noise & Vibration – during the construction and operation of the project;
- Air Quality – concern regarding air quality emissions, particularly particulates, including cumulative impacts from surrounding mining operations;
- Visual and Landscape – visual impacts of the pipeline corridor and of the gas wells on the rural landscape values and vistas of the area;
- European Heritage – cultural heritage value of the Vale of Gloucester; and
- Other – including greenhouse gas, traffic and infrastructure impacts.

4.2 Submissions from Public Authorities

Eleven submissions were received from public authorities: NSW Department of Environment, Climate Change and Water (DECCW); NSW Office of Water (NOW); Industry and Investment NSW (DII); Hunter-Central Rivers Catchment Management Authority (HCRCMA); TransGrid; NSW Roads and Traffic Authority (RTA); Gloucester Shire Council; Great Lakes Shire Council; Dungog Shire Council; Maitland Shire Council; and Port Stephens Shire Council.

Department of Environment, Climate Change and Water (DECCW) – raised the following issues:

- Biodiversity – raised concerns regarding survey effort and offset detail and considered that due to these uncertainties it could not support the project as the significance of ecological impacts and whether these impacts can be suitably offset could not be determined;
- Air quality – raised concern that the Proponent's assessment was not representative of realistic nitrogen dioxide emissions from the ancillary power station component of the central processing facility and also questioned the formaldehyde assessment presented in the environmental assessment. Due to these modelling uncertainties, DECCW considered that it could not support the project on air quality grounds. DECCW also noted that the Proponent's assessment had likely overestimated nitrogen oxide emissions from the Hexham Delivery Station by basing the assessment on emissions of 393 mg/m^3 rather than the regulatory limit of 350 mg/m^3. DECCW considered that the PM_{10} exceedances predicted for gas well flaring to be conservative and recommended that a spacing of four kilometres be maintained between clusters of flaring gas wells to minimise the potential for cumulative air quality impacts; and
- Other issues - required further confirmation on the cultural significance of Aboriginal heritage items proposed to be impacted and considered that the project should be designed to ensure no pollution of waters through discharge or the irrigation of treated water. DECCW also recommended management measures in relation to erosion and sediment control, waterway crossings, acid sulphate soil management and hydro-testing water management and sewage management at the central processing facility and temporary construction camp site.

NSW Office of Water (NOW) - required all necessary water licences to be obtained, the scale of the project to match available water supply and for NOW to be consulted in relation to the rehabilitation and stabilisation of waterway crossings. NOW recommended conditions in relation to licensing and stabilisation methodology for water crossings.

Industry and Investment NSW (DII) – raised the following issues:

- Rehabilitation of gas wells - noted that gas well rehabilitation requirements and completion criteria would be covered under the petroleum production lease that would need to be obtained for the gas extraction wells;
- Landuse conflicts - raised concerns regarding the proximity of the gas pipeline to several quarries including potential conflicts with their operation (e.g. from blasting required for gas pipeline construction). Required ongoing consultation with nearby quarry/ mining operators, mineral title holders and the mine subsidence board to ensure that the project is constructed and operated to minimise conflict with existing operations, avoids sterilisation of coal resources and is designed to withstand the potential for future subsidence. Also raised concerns regarding the potential impacts of the project (including gas extraction wells and pipeline corridor) on agricultural land including conflicts with agricultural practices, and recommended conditions of approval to ensure mechanisms for landowner consultation (regarding project location, farming practices and rehabilitation) and dispute resolution; and
- Surface and groundwater - also raised concerns regarding the potential surface and ground water impacts of the project including impacts to surrounding bore users and appropriate contingency and rehabilitation measures in the case of impact; potential for cross contamination between aquifers and of surface water and shallow alluvial groundwater from the gas extraction and process water management process; the process water management / disposal process should extraction wells yield larger volumes than expected including risks of over-irrigation on rising water tables and salinity; and impacts of water crossings on stream integrity and water quality.

NSW Roads and Traffic Authority (RTA) – recommended design and construction standards that would need to be met during the crossing of any State roads by the gas pipeline and required all design and construction of works affecting State roads to be undertaken in consultation and to the satisfaction of the RTA.

Hunter-Central Rivers Catchment Management Authority (HCRCMA) – raised the following issues:

- Biodiversity - raised concerns regarding the potential impact of the pipeline corridor on an area subject to a 'Property Vegetation Plan' conservation agreement and on two biodiversity corridors. HRCMA also raised concerns regarding the level of survey effort and required the offsetting of unavoidable ecology impacts; and
- Surface and groundwater - raised concerns regarding the potential for groundwater extraction impacts on groundwater dependent species, potential disturbance of wetland system during waterway crossings and the potential for the extraction and irrigation of saline waters to exacerbate dry-land salinity.

TransGrid – raised concerns regarding the proximity of the proposed gas pipeline to existing transmission line infrastructure with respect to potential conflicts with future upgrade requirements of the line and on the basis of electrical conductance, electrical safety and access for construction and maintenance. TransGrid required ongoing consultation by the Proponents in relation to these matters including management of cumulative impacts during gas pipeline construction.

Gloucester Shire Council – raised the following issues:

- CPF location - supported the location of the central processing facility at site "7", within land zoned for industrial use under the *Gloucester Local Environmental Plan 2010*, rather than at site "1" due to potential flood and access constraints at the latter location;
- Construction camps - raised concern regarding the potential increased demand for services and potential for anti-social behaviour from the proposed temporary construction camps and recommended that separate Council approval be sought under Part 4 of the EP&A Act for the camps;
- Road haulage and contributions - raised concern regarding the material sourcing requirements of the project, its associated traffic generation and the capacity of the road network to accommodate such haulage and recommended community contributions for road maintenance;
- Operation of generators - recommended that any water pumps at gas extraction wells be powered by central power lines rather than generators due to potential noise and exhaust impacts that may result from generators;
- Water management - advised that waste salt (from the water treatment process) and oil waste could not be accommodated at the Gloucester landfill, however supported ongoing consultation on the option of using treated water produced by the project to supplement Council's domestic water supplies;
- Air quality - raised concerns regarding particulate emissions from the project;
- Groundwater - raised concerns regarding groundwater impacts and recommended monitoring requirements;
- Visual impacts - raised concerns regarding visual impacts of the central processing facility including on the Vale of Gloucester and recommended requirements for appropriate landscaping and urban design; and
- Management Plans – recommended that management plans be prepared in consultation with Council.

Great Lakes Shire Council – raised no objection to the granting of project and concept plan approval as requested by the Proponent and identified the following issues:

- Biodiversity – recommended further consideration of avoiding vegetation impacts near Black Camp Road through relocation to the nearby power line easement and highlighted the requirement for biodiversity offsets. Also recommended conditions of approval to reinforce commitments in the Environmental Assessment for construction and operational biodiversity management plans; and
- Roads and Traffic - required ongoing consultation regarding managing traffic and road infrastructure impacts.

Dungog Shire Council – raised the following issues

- Construction camps & material sourcing - recommended that separate Council approval be sought for the development of temporary construction camps and quarries for obtaining road base and construction fill material.
- Road haulage and contributions - recommended conditions in relation to: pre- and post construction road dilapidation surveys of all roads to be used for construction related traffic and for any damage to be restored by the Proponent; for pre-construction surveys of proposed transport routes including bridges to determine their ability to accommodate project related traffic; construction/ road design standards for local unsealed roads proposed to be disturbed through pipeline trenching; and road maintenance contributions for the reduced life of road infrastructure;

- Management Plans – recommended that management plans be prepared in consultation with Council and recommended conditions in relation to compliance and complaints management and community engagement during construction; and
- Cumulative impacts - raised concerns regarding potential cumulative construction impacts of the project and other major development approved or proposed in the area such as the Tillegra Dam.

Maitland Shire Council – raised the following issues for the Department's assessment: ecology impacts, impacts on indigenous heritage items, traffic management, requirement to consult with Council regarding road crossing design and construction, potential conflict with transmission lines, erosion and sedimentation control, impacts on agricultural values, management of groundwater impacts and impacts on Ramsar wetlands.

Port Stephens Shire Council – recommended conditions of approval in relation to: ongoing community engagement during construction, employment of appropriate buffer zones during horizontal directional drilling of SEPP 14 wetlands, the preparation of management plans in relation to weed, acid sulphate soil and Phytophthora management, appropriate offsetting of unavoidable ecology impacts, and road crossings to be designed in consultation with and to the satisfaction of Council.

4.3 Submissions Report

Upon review of the submissions received the Department directed the Proponent to prepare a response to submissions. In responding to issues raised in submissions, the Proponent did not make any changes to the project, as such a Preferred Project Report was not prepared. The Proponent also confirmed that there were no changes to the Statement of Commitments as presented in the Environmental Assessment (refer Appendix C). The Submissions Report (refer Appendix E) prepared by the Proponent was made publicly available on the Department's website and a copy provided for comment to DECCW, NOW and DII.

DECCW – reiterated its objections on flora and fauna grounds and considered that whilst the additional air quality assessment presented in the submissions report had adequately addressed DECCW's comments on $N0_2$ issues, it did not address DECCW's comments on formaldehyde emissions. DECCW also raised concern regarding the additional carbon monoxide assessment presented in the Proponent's submissions report, considering that the discharge limit used in the modelling (950 mg/m^3) was higher than the regulated limit of 125mg/m^3.

In response to DECCW's concerns on flora and fauna, the Proponent submitted additional information on the offsets and pre-construction measures proposed in relation to flora & fauna management. In response to this information, DECCW provided additional advice indicating that the project could be supported subject to conditions framework which provided for additional targeted surveys prior to construction to confirm the impacts of the project and for the finalisation of the offset package and associated management detail based on these additional surveys. In relation to the air quality concerns raised, the Proponent submitted additional assessment information including a revised formaldehyde assessment and confirmation that the project could achieve DECCW's regulated air quality limits. Following review of this information, DECCW provided additional advice indicating that all residual air quality issues had been addressed by the Proponent and that the project could be supported subject to conditions.

DECCW also recommended conditions in relation to compliance with the requirements of section 120 of the *Protection of the Environment Operations Act 1997*, sewage treatment at construction camps and Aboriginal heritage management and compliance.

NOW – whilst not raising any groundwater concerns at the Environmental Assessment stage, NOW raised objection to the project on the basis of the sufficiency of groundwater assessment in its submission on the Submissions Report. In response to NOW''s concerns, the Proponent submitted additional groundwater assessment information including a conceptual hydrological model developed based on information to date. In response to this information, NOW provided additional advice stating that the project could be supported subject to the conditions framework recommended by the Department which provided for detailed pre-construction monitoring and an adaptive management framework during operation.

DII – reiterated its recommendations for the project to be designed in consultation with relevant stakeholders to minimise conflicts with existing farming and mineral operations and to avoid sterilisation of land of high

agricultural value or mineral resources. DII also identified the need for the Proponent to obtain a petroleum production lease from DII before the project can commence and noted the gas resource and reserve information that the Proponent would need to submit to DII in order to obtain this lease.

The following Councils also made additional submissions following the release of the Submissions Report:

- Gloucester Shire Council - reiterated requests for developer contributions;
- Great Lakes Council – recommended that the biodiversity offset package be consistent with the principles of 'like for like', provide the opportunity for Council input in the development of the package and ensure that the package is secured in perpetuity through an appropriate legal mechanism; and
- Dungog Council - reiterated concerns regarding the temporary construction camp sites and developer contributions in relation to road and haulage impacts and recommended Council involvement in the preparation of management plans.

4.4 Department's Consideration

The Department's consideration of issues raised in public and agency submissions is summarised in Table 3.

Table 3: Department's consideration of issues raised in Submissions

Issue	Department's Consideration
Surface and ground water management	Sections 5.1 and 5.3
Noise and Vibration	Section 5.2
Biodiversity	Section 5.3
Air Quality	Section 5.4
Visual amenity	Section 5.5
Heritage	Section 5.6
Hazard and Health	Based on the Preliminary Hazard Study undertaken for the proposal, the Department is satisfied that the proposal would not pose an unacceptable risk to surrounding landuse with respect to construction and operational safety (including issues such as methane release, explosion and fire risk from project infrastructure). The Department has recommended comprehensive hazard and risk management requirements in its recommended conditions of approval to ensure appropriate construction and operational controls. Risks to water quality and air quality are considered in Sections 5.1, 5.3 and 5.4 of this report.
Property and Landuse	The Department is satisfied that whilst the project is expected to traverse a large number of land parcels (approximately 145 for the Stage 1 gas development area and 201 for the gas pipeline), the project would not pose an unacceptable constraint to existing or planned future landuse in the area, (including agriculture, mining or residential use), due to: • the project being sited to minimise landuse conflicts as far as possible (balanced with other constraints) including location of the central processing facility on rural land (owned by the Proponent) or industrial zoned land; siting of gas/ water gathering lines along fence lines, access roads and other disturbed areas; co-location of the gas pipeline within existing infrastructure corridors wherever possible; and location of infrastructure away from planned future residential areas; • the ongoing land area affected by the project, following post-construction rehabilitation, being relatively small including much of the infrastructure being buried (i.e. gas/water gathering lines and gas transport pipeline) and the final footprint being significantly reduced compared to construction related disturbance (i.e. 90 x 90 metre to 15 x 15 metre for the gas wells and a 30 metre construction width to a 10 metre operational maintenance easement for the gas pipeline); • retained infrastructure not posing a significant constraint on landuse including: minimal restriction on agricultural practices (with the exception of planting deep rooted vegetation directly above buried infrastructure to avoid conflict with pipeline integrity); minimal sterilisation of mining land (as coal seams would be retained onsite); and including appropriate design and environmental controls to ensure that acceptable environmental and amenity standards are met at surrounding receptors and landuses (including air quality, noise, surface & groundwater and hazard & safety) to minimise the potential for development constraints on these landuses; • inherent flexibility in the project design (including location criteria for the gas wells and a 100 metre wide assessment corridor for the gas pipeline) which would provide further opportunity at the detailed design stage for design amendment to minimise property impacts, if required; and • the siting of project components within private property being subject to consultation and

	negotiation with landowners including on measures to minimise construction and operation related disruption such as property access, depth of pipeline burial to minimise restriction on ongoing landuse such as cropping etc. A number of submitters have requested compensation on the basis of perceived loss of property values, which are considered to be affected by what is perceived to be a polluting, unsafe and industrial activity that is inconsistent with existing rural and lifestyle landuse. The Department notes that the project comprises a permissible landuse within all land to be traversed and is satisfied that the project has been sited to minimise landuse conflicts as far as possible. Based on its assessment (refer section 5), the Department is satisfied that the project can be designed, constructed and operated to meet acceptable environmental and amenity standards at surrounding landuses such as to not warrant specific compensation at surrounding properties on the basis of unacceptable landuse impacts. The Department notes that direct property impacts (where land is traversed by the project) would be subject to negotiation and appropriate agreement between the Proponent and the affected landowner. The Department has recommended conditions of approval requiring the Proponent to finalise the detailed design and siting of the project in consultation with affected landowners and other stakeholders (such as mineral titleholders and infrastructure owners) with the aim of avoiding impacts to private properties, landuse and infrastructure as far as practicable. The Department's recommended conditions also require the Proponent to develop measures for minimising and managing adverse property, landuse and infrastructure impacts during construction and operation, in consultation with affected stakeholders, including management of cumulative impacts and a process for dispute resolution in the case of disagreement between parties.
Traffic and road infrastructure impacts	The Department accepts that the traffic volumes generated during the construction of the project (including up to 37 movements per day from material haulage, over 50 heavy vehicle movement per day and up to 465 construction personnel) has the potential to affect local road operation and condition. Construction traffic impacts are also likely to occur over an extended period, particularly for the Stage 1 construction area which is expected to last for up to 5 years. To ensure appropriate management of traffic and road infrastructure impacts the Department has recommended conditions of approval requiring: • the development of a comprehensive traffic management plan in consultation with relevant Councils and the RTA to detail the management of traffic impacts during the construction of the project; • comprehensive assessment (and where required upgrade) of all public roads proposed to be used during the construction of the project, prior to the commencement of construction, to accommodate the traffic volumes associated with the project; • assessment of the roads prior to the commencement of operation to determine any damage associated with the project during construction and their upgrade as necessary; and • the design and construction of all pipeline crossings of roads or other required road upgrades or works within the road corridor in consultation with relevant Councils and the RTA. The Department is satisfied that with the implementation of the above requirements, the construction traffic impacts of the project can be appropriately managed.
Developer Contributions	The Department is satisfied that developer contributions would not be warranted for the project as it would not pose an ongoing demand on Council services or infrastructure. A number of Councils have requested developer contributions on the basis of traffic impacts and influx of population to local areas as a result of the project, which would increase demand on Council services. The Department is satisfied that the construction traffic impacts and associated impacts to infrastructure would be temporary and can be appropriately managed, as discussed above. The Department is also satisfied that the project would not generate significant levels of operational traffic (i.e. confined to approximately 30 light vehicles per day with an addition 5 light vehicles and 3 heavy vehicles during periodic maintenance works) that would warrant ongoing road maintenance contributions. The Department is also satisfied that the operational workforce associated with the project (30-40 personnel) would not lead to a significant influx of population to local areas or increase to the demand for Council services such as to warrant ongoing developer contributions. The influx of personnel during constructed would be a temporary impact only and would not warrant ongoing developer contributions for the life of the project. On the above basis, the Department has not recommend conditions requiring contributions on the basis of direct infrastructure or service impacts. The Department has also assessed the environmental impacts of the project (refer Section 5) and is satisfied that the project can be designed, constructed and operated to meet acceptable

	environmental limits, and would not result in significant or unacceptable residual impacts. Consequently, and in consideration of the inherent strategic and local socio-economic benefits of the project (refer section 2.3), the Department is satisfied that additional community contributions are not warranted in this case, to offset residual environmental or amenity impacts.
Temporary Construction Camps and source of construction material	A number of submissions raised concern regarding uncertainties in relation to the location and impacts of the temporary construction camps and sources of construction fill material. Gloucester and Dungog Councils recommended that the Proponent be required to obtain additional planning approval for the camps prior to their development. Although an exact location for one of the camps has not been determined at this stage, the Department does not consider that additional planning approvals would be required for such temporary construction facilities if they are located within the approved footprint of the project. This would not, however, preclude the Proponent from having to obtain all other necessary approvals for each site, such as sewage and utilities connection from Council, prior to the commencement of construction. To ensure that the facilities are developed with due consideration to social and environmental constraints, the Department has recommended conditions of approval requiring the Proponent to develop a Construction Camp Environmental Management Plan, prior to the commencement of construction, in consultation with relevant Council and agencies. The plan would need to detail: the final location of the site(s), how the site(s) have been chosen to avoid and minimise environmental and landuse impacts as far as practicable considering surrounding constraints, and measures to manage the environmental and social impacts of the camps for the duration of their establishment including additional approvals (for sewage, utilities connection etc) that may be required to be obtained. With respect to sources of construction material, the Department has recommended conditions of approval requiring the construction environmental management plan for the project to include details of material sourcing and management measures for associated haulage (including traffic and noise). The Department notes that any approval granted for the project would only provide for the sourcing of materials from existing approved sources. Should a new gravel or material source be required to be developed for the project, the Proponent would need to seek separate approval for this development under the *Environmental Planning and Assessment Act 1979.*
Transmission line	The Department notes that the Proponent's Environmental Assessment does not include an impact assessment of the proposed transmission line connection from the power generating plant associated with the central processing facility to the existing electricity grid. The Proponent has advised the Department that the line is expected to be located outside of the areas assessed for the project to date. As a consequence, the Department has not recommended full project approval for this component of the proposal. However, given its small scale (i.e. some 700 metres in length) and the Proponent's advice that the line would be likely be located adjacent to existing disturbed corridors such as road and rail lines, the Department is satisfied that at a concept level, there is unlikely to be significant environmental constraints to its development, and has therefore included this element in its recommended concept plan approval for the overall proposal. The Department considers that the exclusion of this element from project approval at this stage would not place an unacceptable constraint on the development of the project noting that it is not identified as a fundamental element of the project and would likely only be required in the case that excess power is generated beyond the requirements of the facility (using extracted gas that would otherwise be sold to the market). The Department notes that the Proponent would need to seek further approval as part of a modification application under section 75W of the *Environmental Planning and Assessment Act 1979* to develop this component, should it be required in the future.
Rehabilitation	The Department has recommended comprehensive conditions of approval in relation to initial post-construction rehabilitation, consistent with existing landuse as well as post-operational rehabilitation requirements, consistent with DII licensing requirements.
Subsidence	The Department is satisfied that project would not pose a material risk of land subsidence as extraction activities would be limited to coal seam gas, with the coal seam itself remaining in place. The Department has incorporated conditions of approval requiring the Proponent to ensure that the pipeline is designed to take into account potential subsidence impacts from surrounding underground mining operations, which are traversed by the pipeline route.
Other	The Department is satisfied that all other matters have been adequately addressed in the Proponent's Submissions Report and / or Statement of Commitments.

5. ASSESSMENT OF ENVIRONMENTAL IMPACTS

After consideration of the Environmental Assessment, submissions, Submissions Report and Statement of Commitments the Department has identified the following key environmental issues associated with the proposal:

- Surface and Groundwater;
- Air quality;
- Flora and fauna;
- Noise and vibration;
- Heritage; and
- Visual amenity.

All other issues are considered to be adequately addressed by the Proponent's Statement of Commitments.

5.1 Surface and Groundwater

Issue

Gas Field Development

The key surface and groundwater risks associated with the project largely relate to the gas production component of the project including associated water management. This component of the project involves drilling into and dewatering of underground coal seams to allow gradual release of the methane adsorbed within the coal seam by releasing coal seam pressure. To enable gas and water to flow from the coal seams, well establishment would involve a process of hydraulic fracture stimulation or "fraccing" which will involve the injection of a stimulation fluid (typically water and sand based) into the coal seam at high pressure to perforate the seam. Water gathering lines would act to collect water released from the dewatering process (including the inserted fraccing fluid) at each well head and transport this "produced" water to storage ponds. The water flow rate from the Stage 1 field development area is expected to be around 2 mega litres (ML) per day (potentially increasing to up to 6 ML per day should the concept plan area be developed in the future).

The Proponent has identified that this produced water would in the first instance be stored in lined storage ponds at either the Stratford Pilot Project site within the Stage 1 gas field development area (within existing 40 ML ponds developed as part for the Stratford Pilot project) or at the proposed central processing facility site (in new 25 ML ponds). The produced water is expected to be highly saline and is proposed to be treated at the central processing facility via a reverse-osmosis desalination plant or similar process prior to disposal or re-use. The level of treatment required will depend on the final re-use option(s) determined which may include: aquifer re-injection, discharge to surface water, re-use via irrigation and/ or sale of water to the market. The Proponent has proposed that the treated water would be stored within the central processing facility site (in separate 25 ML storage ponds) prior to its final re-use or disposal. The concentrated (brine) wastewater from the desalination plant would be stored in separate evaporation ponds (also 25 ML in capacity) at the central processing facility site with residual salt produced from evaporation either sold to a salt producer or disposed at a licensed facility.

On the above basis, the key risks to surface and groundwater from this project component relate to:

- potential risks to groundwater aquifers during gas well drilling for coal seam gas extraction – including potential dewatering of beneficial aquifers, groundwater migration between aquifers and risks to groundwater quality; and
- management of water extracted from the wells - including potential for groundwater and/ or surface water contamination from water storage (via leaching or ponds overtopping capacity), surface water discharge or reinjection into the aquifers, and disposal of concentrated waste produced from the water treatment process.

The Proponent's Environmental Assessment included an assessment of potential risks to groundwater aquifers from the gas development area, based on known geological mapping of the area, a review of existing registered bore data and the monitoring results from wells installed as part of the Stratford Pilot project. In response to concerns raised by NOW in relation to the sufficiency of groundwater impact assessment, the Proponent provided additional groundwater assessment information to the Department (following the lodgement of its Submissions Report) particularly focusing on the Stage 1 field development area. The assessment comprised a conceptual hydro-geological model of the area developed based on a more detailed review of existing geological and

groundwater monitoring data (including information on registered bores in the region, groundwater monitoring data from the surrounding Duralie and Stratford Coal mines and the results of permeability tests undertaken as part of exploration/ production boreholes drilled by Pacific Power in 1999) as well as a preliminary surface and groundwater survey undertaken in May 2010, which sampled 25 bore wells, 29 cemented bore wells, 7 pilot wells and 9 surface monitoring sites.

As part of its overall assessment, the Proponent identified three main aquifer systems within the Gloucester Basin comprising: a shallow alluvial aquifer located along the main drainage lines (fresh to brackish water quality) generally between 2-20 metres in depth; a shallow bedrock aquifer (brackish to saline water quality) generally within 150 metres of the surface; and a deep bedrock aquifer (slightly alkaline saline water quality) generally greater than 150 metres in depth. The Proponent has identified that the Gloucester Gas Project would target coal seams within the deep bedrock, mostly deeper than 200 to 250 metres and up to 1000 metres below the surface. Given the saline nature of the deep bed rock aquifer (unsuitable for human consumption and most cropping and livestock, apart from very salt tolerant crops and short term consumption for certain livestock), the Proponent has identified that dewatering activities within this aquifer are unlikely to negatively affect groundwater users in the area. The Proponent has identified that of the 47 registered bores in the area for which depth information is available, all are sited within either the alluvial aquifer (four bores within six to nine metres) or the shallow bedrock aquifer (the deepest at 66 metres in depth), which are considered to exhibit "beneficial" or usable water quality and are not proposed to be targeted by the project.

Based on its assessment, the Proponent has identified that the deep bedrock aquifers that would be dewatered by the project are confined and compartmentalised below low permeable overburden within coal measures and exhibit generally low connection to shallower aquifers above. In particular, based on preliminary monitoring from the Stratford Pilot project (which has not identified decreases in water levels at the surface aquifers as a result of dewatering of the deep bed rock aquifers) and the results of permeability tests undertaken as part of exploration/ production boreholes drilled by Pacific Power in 1999 (which show sharp decreases in hydraulic conductivity with depth from 8.6 x 10^{-2} metre per day at 100 metres depth to 4.8 x 10^{-4} metres per day at 500m metres depth), the Proponent has determined that there is broadly poor connection between surface and deep bed rock aquifers. Therefore, the dewatering of the deep aquifers is unlikely to pose a high dewatering risk to shallow aquifers and to associated water levels in surface creeks which are dependent on shallow aquifers. Nevertheless, the Proponent has identified that localised geological features such as faults and fractures could lead to localised changes in permeability different to the broader pattern such as increases in hydraulic conductivity by orders of magnitude. To ensure that the gas wells are developed with consideration to spatial variations in geology and hydraulic connectivity, the Proponent has committed to undertaking further detailed field sampling of groundwater levels and permeability (through the implantation of a monitoring bore and testing program) and carrying out 3D seismic surveys of the Stage 1 area to better characterise underlying features, prior to the commencement of construction.

To ensure there is no interaction or cross contamination between aquifers or strata within the extraction well, a pressure-rated steel casing would be installed within the well following drilling (but prior to seam perforation through fraccing for gas extraction), which would be pressure cemented to seal the well and isolate aquifers and other formations encountered during drilling (refer Figure 5). The targeted coal seams would only be perforated once the well casing is in place so as to prevent connectivity or cross contamination between aquifers. In addition, upon decommissioning the abandoned wells would be filled with cement consistent with the requirements of DII (Mineral Resources) to seal perforated areas and prevent any ongoing interaction between aquifers.

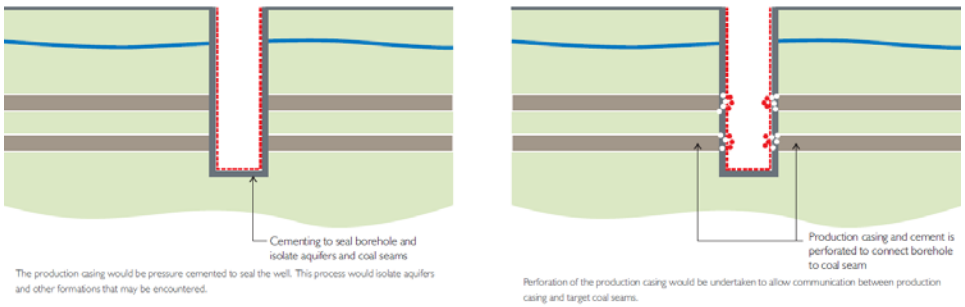


Figure 5: Well Casing Procedures for Gas Wells (AECOM, November 2009)

The Proponent has identified that the extracted water would only be stored within lined ponds of an appropriate size to accommodate water flow rates (with appropriate free-board for contingency) and that no water would be disposed or re-used prior to treatment to a quality appropriate for the final use, as determined in consultation with relevant agencies. The Proponent has identified that the current preferred method for treated water disposal is re-use for irrigation purposes.

Other Impacts

Construction related surface and water management issues relate to general erosion and sedimentation control during soil disturbance activities to prevent surface runoff and sedimentation impacts to surrounding waterways (particularly during construction near sensitive areas such as wetlands and waterways); risks of shallow groundwater interception during pipeline trenching activities; and risk to water quality (surface and groundwater from the interception of acid sulphate spoils). The Proponent has proposed the development of detailed construction management plans in relation to soil and water and acid sulphate soils to manage these impacts.

Consideration

The Department has focused its assessment on potential surface and groundwater impacts associated with the gas production wells and associated extracted water management processes. In relation to construction related water quality impacts (including erosion and sediment control and acid sulphate soils), the Department considers that key water quality risks relate to construction close to or involving waterways and wetlands and has considered this issue in detail in section 5.3 of this report. In relation to potential flood risk concerns raised in submissions, the Department is satisfied given the generally small scale nature of above ground infrastructure associated with the project, that the project would not pose a significant barrier to flow regimes or cause a significant reduction to the areas of flood plain within flood prone areas. Furthermore, the Proponent has identified that the gas wells would include design mechanisms to minimise the risk of flood waters dislodging or disconnecting equipment and thereby causing a risk of gas release (including location of the wells at high elevations in flood prone areas, well head production separators being mechanically connected to the well head with carbon steel piping, gas and water gathering lines being anchored to the well head separators and buried as per Australian Standards, and the ability to remotely shut down production process in emergencies). The Department accepts that these design measures demonstrate due consideration of food risks in the design and location of the gas production wells.

Gas Wells

The Department notes that the key groundwater risks raised in submission related to:

- cumulative dewatering associated with the project and surrounding mining operations, affecting water availability within the Gloucester Basin catchment for bore users, surface waters and associated ecosystems and species;
- the potential for dewatering of alluvial aquifers due to existing geological connectivity between surface aquifers and the deep bedrock coal seems being targeted by the project and due to the gas well installation process creating fractures and connectivity between seams. Such dewatering has the potential to affect water available for bore users, surface waters, and associated ecosystems and species (such as sensitive frog species) that rely on these alluvial aquifer systems;
- potential water quality impacts to beneficial alluvial aquifers (with associated consequences for bore users, surface waters, and associated ecosystems and species) through the migration of highly saline groundwater from the deep bedrock coal seems being targeted by the project and/ or the migration of fraccing liquid (and associated chemicals) used in the well installation process as a result of geological connectivity between seams or connectivity created through the gas well installation process; and
- the potential for gas migration to the surface (and associated hazards) once the coal seams are perforated as part of the gas wells.

Based on the Proponent's assessment, the Department understands that water extraction associated with the project would be confined to deep bedrock aquifers which display limited connectivity to surface bedrock and alluvial aquifers (the aquifer systems which are utilised by groundwater users and are linked to surface waterways/wetlands and associated ecosystems and species). This is demonstrated by monitoring data obtained to date from extraction wells at the Stratford Pilot project and permeability tests undertaken as part of previous exploration/ production investigations undertaken in the area. This low connectivity indicates that the surface bed rock and alluvial aquifer systems are not substantially dependent on water levels in the deeper coal seams for re-

charge. Consequently, dewatering at these deeper aquifers is unlikely to affect water volumes available for beneficial use in the surface bedrock and alluvial aquifers within the Gloucester Basin. The Department notes that groundwater monitoring results from nearby coal mining operations (Duralie and Stratford) have also supported this conclusion, with monitoring results reported in recent Environmental Assessments for each mine (Resource Strategies, January 2010 and Resource Strategies, July 2010) showing little affect at alluvial/surface aquifers from mining activities concentrated at the deeper coal seams (apart from localised drawdown effects of open cut operations). In this regard, the Department is satisfied even with consideration of dewatering activities from surrounding mines, the dewatering volumes proposed as part of the project (2 mega-litres a day) are unlikely to affect overall water availability or water security for beneficial use within the Gloucester Basin (including for associated ecosystems), as the dewatering activities associated with the project would be limited to deep rock aquifers. The Department has recommended conditions of approval limiting the maximum water extraction rate for the project to 2 mega litres per day unless otherwise agreed to by NOW.

The Department notes concern raised in submissions that the water quality of deep bedrock aquifers may not be uniformly un-usable across the extraction area, such that dewatering of this resource may constitute a loss of usable water in the region for activities such as agriculture. However, based on the preferred groundwater resource utilised by registered bore users across the region, the Department considers that the shallow/alluvial aquifers are likely to remain the primary source of beneficial groundwater used for agriculture. Water from the very deep bed rock aquifers (i.e. >200-250 metres) (proposed to be utilised for the project) is unlikely to constitute a consistent source of usable quality water, such as to become a primary source of beneficial water for important landuse in the area such as agriculture. Consequently, the Department is satisfied that the dewatering of deep-water aquifers by the project would pose a low risk of affecting water security in the region.

Given the expected low hydrological connectivity between the coal seams targeted by the project and surface/ alluvial aquifer systems discussed above, the Department is satisfied that dewatering activities associated with the project are unlikely to pose a significant risk of surface/alluvial aquifers dewatering or water quality impacts to these surface alluvial systems through the migration of saline groundwater from the targeted seams. The Department is also satisfied that the gas well installation process is in itself unlikely to pose significant risks of creating fractures and connectivity between seams, given the casing and cementing process of gas wells proposed prior to any seam perforation. In relation to groundwater quality risks posed by the well fraccing/ drilling liquid itself, the Department is satisfied that the additive component of the fraccing liquid would not pose a material risk to groundwater quality due to the relatively small quantity of fraccing liquid used (i.e. approximately one mega litre per well); the highly diluted nature of the fraccing additive itself within that liquid (i.e. 0.5% by volume, with the remainder comprising 90% water and 9.5% sand); the non-toxic nature of the additive in diluted form (i.e. comprising chemicals such as sodium hypochlorate, hydrochloric acid, surfactants, cellulose and acetic acid which are commonly found in diluted form in uses such as swimming pools, soaps, and vinegar); the fraccing liquid being subject to further dilution within the groundwater aquifer; and the fraccing liquid being confined to deep bed rock aquifer, which is not expected to interact with other aquifers due to well casing procedures and which is not beneficially used by bore users. Furthermore, the fraccing liquid is not expected to remain in the coal seams permanently as once fraccing activities are completed, the fraccing liquid would be pumped out as part of the 'produced' water extracted from the coal seams (via the water gathering lines) and transported to water storage ponds and subject to the same water treatment process as for all "produced water" extracted from the wells (refer below). The Proponent has not proposed the use of Benzene, Toluene, Ethylbenzene and Xylene (BTEX) chemicals in the fraccing process. Based on the matters discussed above, the Department is satisfied that the fraccing liquid would not pose a water contamination to surface aquifers (including associated groundwater users and ecosystems) or an associated health risk to groundwater users.

With respect to risks of gas migration, based on the well casing procedure proposed to be implemented during the production phase (prior to seam perforation) and the cementing of wells proposed at decommissioning stage, the Department is satisfied that gas well development is unlikely to pose a significant risk of creating connectivity between strata which would encourage gas migration. To minimise the risk of connectivity posed by old coal exploration wells which connect to the same seams that would be targeted by the project, and which have not been properly or completely decommissioned, the Proponent has committed to identifying and plugging with cement abandoned old exploration coal holes within 500 metre radius of gas well locations, prior to the commencement of construction to minimise the potential for gas migration to the surface through these wells. The

Department is satisfied that through the implementation of these measures the risk of gas migration risks via old exploration wells can be appropriately managed.

In summary based on the Proponent's assessment, the Department is satisfied that gas well development is unlikely to pose a significant risk of gas migration and/ or dewatering or water quality risk to shallow aquifers (and associated groundwater users or groundwater dependent waterways/ species. Notwithstanding, given the large area of proposed extraction, the Department accepts that there is likely to be spatial differences in hydro-geological conditions across the basin, with localised geological conditions having the potential to pose higher risk of gas migration or groundwater impact as a result of increased connectivity/ permeability between deep and shallow aquifers in the case of fault and fracture features. However, the Department considers that prudent well location based on further detailed field monitoring and seismic surveys designed to confirm hydro-geological conditions at a finer scale (as proposed by the Proponent), would enable such risks to be minimised and avoided as far as possible and has therefore, recommended conditions in this regard. The Department specifically required that a minimum of six months of baseline monitoring be undertaken to establish detailed pre-construction hydro-geological conditions, which would form the basis of gas well location.

To monitor any interactions of the gas production wells with the surrounding hydro-geological environment during the operational phase, the Proponent has committed to establishing and implementing a detailed monitoring network covering both shallow and deep water aquifers as well as surface waters. The Department supports this operational monitoring strategy and has recommended conditions reinforcing these commitments. The Department has also specified that the monitoring locations are determined in consultation with NOW and are representative of registered bores in the area to ensure that any impacts to these users from any extraction activities in the vicinity can be identified early. The Proponent has identified that the information gathered from the monitoring network would be used to continually update the hydro-geological model developed of the area to date as new information becomes available and enable its use as a predictive and verification tool as gas well development progresses. The Department supports this strategy and considers that it should be coupled with a precautionary approach of staged gas well development so as to enable potential impacts from a limited number of well development to be confirmed via monitoring prior to whole scale development of the area, which may lead to cumulative impacts that are more difficult to manage. The Department considers that this approach would also enable any adverse impacts to be quickly identified and acted upon, including amendment of the location of future wells. The Department has consequently recommended conditions of approval in this regard. The Department has also required a contingency strategy to form part of the Proponent's groundwater management strategy, such that adverse impacts attributable to the project can be addressed, including compensation to affected bore users, if applicable.

The Department considers that the above approach provides a prudent and robust framework for the development of the gas wells based on appropriate well location, ongoing information gathering and adaptive management. The Department notes that such a monitoring network and hydro-geological model will also form a strong basis for information gathering in relation to any future development in the concept plan area and has recommended assessment of groundwater issues for any future extraction wells in the concept plan area, on this basis. NOW has indicated that it can support project approval for the Stage 1 Gas Field Development Area (as well as concept plan approval for the broader project) subject to the conditions framework proposed by the Department.

Extracted Water Management

The Department is satisfied that with the implementation of appropriate lining at the storage ponds for untreated water extracted from the wells (including fraccing liquid) and evaporation ponds for the concentrated brine wastewater generated by the reverse osmosis plant (following treatment of the extracted water), these storage areas would not pose a significant risk of groundwater contamination (via leaching) to shallow aquifers. In addition, subject to appropriate design of pond capacity, the Department is satisfied that the storage and evaporation ponds would not pose a significant risk of surface water contamination through overtopping during periods of high rainfall. In this regard, the Department has recommended a condition of approval requiring the storage and evaporation ponds to be designed to meet a 1 in 100 year flood design level.

With respect to the disposal of treated waters, the Proponent has identified several potential options under consideration including aquifer re-injection, discharge to surface water, re-use via irrigation and/ or sale of water

to the market. Of these, the Proponent has identified that re-use as irrigation water constitutes the preferred option to date. However, the Proponent has also sought approval for the option to discharge treated waters to surface waters in situations of high rainfall, when treated water ponds are at capacity. The Proponent has identified that both waters for irrigated waters and for surface water discharge would be treated to a quality consistent with ANZECC water quality guidelines prior to any discharge. However, the exact water quality parameters to be monitored and (in relation to the surface water discharge option) the point of discharge and the water quality of the receiving environment, has not been identified. The Proponent has stated that these issues would be finalised at detailed design stage as part of the finalisation of the final option or suite of options that would be adopted in relation to the disposal of treated water.

Submissions raised specific concern regarding the potential water quality (groundwater and/ or surface water) impacts of the water disposal options identified by the Proponent. Furthermore, DECCW raised concerns that although discharge was identified as an option under consideration, the Proponent had not assessed the nature of that discharge including the water quality of the receiving environment and the location of the discharge point. The Department considers that the option of re-injection may pose additional risks of aquifer interference and considers that there has been insufficient assessment of this option to determine with any level of certainty whether this would comprise a safe and feasible option. Consequently, the Department does not support this option unless further assessment is presented as part of a separate modification application or similar, which assesses the risks to groundwater aquifers (including connectivity and interference with beneficial aquifers). The Department notes this does not form the preferred water re-use option identified by the Proponent.

Of the remaining options, the Department is satisfied, that based on the high level of water quality that can be feasibly achieved by reverse-osmosis plants, water quality to suit any of the disposal options identified can be achieved. This includes water quality of an appropriate standard so as to not pose a risk to stream or drinking water quality in relation to water discharged to waterways, a standard appropriate for selling to water to the market, and a standard appropriate for irrigation within rural land. Whilst concurring with DECCW that the Proponent has not provided sufficient information to recommend approval for a specific discharge point to waterways, the Department is satisfied that there are no significant water quality constraints to preclude the option of surface discharge from being included in a recommended approval.

In this regard, the Department has recommended that with the exception of groundwater re-injection, none of the water quality options identified should be precluded from an approval. Instead the Department has required the Proponent to further investigate and determine the final suite of disposal options in consultation with relevant agencies (including DECCW), prior to the commencement of construction. The Department considers that this water management strategy would need to provide details of the final disposal option and associated management strategy including information on: required water quality treatment parameters to suit the final disposal option (including associated monitoring requirements); the discharge point and water quality of existing receiving environment (if discharge to surface waters is proposed); information on likely customers (should water be proposed to be sold to the market such as Council water supplies or industrial uses); and optimal application rates to prevent over-irrigation and associated salinity issues (if irrigation is proposed). The Department considers that this approach would provide maximum flexibility for the full range of options and opportunities to be explored and an optimal suite of options to be determined.

With respect to the quantities of salt generated at the evaporation ponds (from the evaporation of brine concentrate generated by the reverse osmosis plant following the treatment of produced water extracted from the wells), the Proponent has proposed that this would either be disposed to an appropriately licensed waste disposal facility or sold to the salt market (if a suitable buyer is found). The re-injection of brine concentrate or salt quantities back to the deep bed rock aquifers is not proposed. The Department has included a condition requiring the Proponent to, as part of water management strategy discussed above, investigate beneficial re-use options for the salt produced (i.e. selling to market) in preference to disposal in landfill.

Conclusion

In summary, the Department is satisfied that the surface and groundwater impacts of the gas extraction component of the project can be managed so as to not result in unacceptable groundwater outcomes. Based on this, the Department is also satisfied there are no significant surface or groundwater constraints to the future development of wells within the broader concept plan area. The Department has incorporated comprehensive

further environmental assessment requirements in relation to surface and groundwater impacts as part of the recommended concept plan approval, which the Proponent must address in seeking any further approval for gas wells within the concept plan area.

5.2 Noise and Vibration

Issue

The project has the potential to generate noise and vibration impacts at nearest sensitive receptors during construction and operation. The Proponent has identified that gas wells within the Stage 1 development area would be located greater than 200 metres from nearest dwellings and that the nearest dwellings to the Central processing facility would be located approximately 1300 metres from site "1" and 460 metres from site "7". The pipeline is expected to traverse built up areas near Nelson, Duckenfield, Woodberry and Tarro and nearest sensitive receptors have been identified to occur generally greater than 200 metres from the corridor. However, some isolated residences are located within 30-100 metres of the corridor. The gas delivery station at Hexham would be located in an industrial zone with nearest dwellings located some 150 to 330 metres away along Punt Road and Old Maitland Road.

Gas wells

Construction

The Proponent has identified that the establishment of each well head (including site preparation, drilling, completion and clean up) would take between six to eight weeks per well site if 24 hour drilling is implemented or up to 10 weeks if daytime drilling is utilised. Accordingly, construction noise associated with the works has been assessed against both day and night time noise goals consistent with the *Interim Constriction Noise Guideline (DECC, 2009)* (Interim Guidelines), based on background noise levels measured at representative surrounding receptors. Noise goals were identified to range from 40 to 48 dBA for the daytime period, 35-45 dBA for the evening period and 35 to 42 dBA for the night time period, depending on the receptor. The higher noise goals generally applied to receptors located close to existing mining areas (where higher background noise levels were measured) than at representative rural receptors. Construction noise levels likely to be generated from a well site based on a worst case scenario of no mitigation and the co-construction of up to four wells at a single site is shown in Table 4 below, and indicates that exceedances of noise goals would be expected at most receptors located within three kilometres of the well site.

Table 4: Noise Levels from Well Construction (L_{Aeq} dBA)

Distance to Construction (metres)	25	100	250	500	1000	2000	3000
	Construction activities likely to be limited to the daytime/ evening period						
Access Track Construction	78	66	58	52	46	40	36
Site Clearing	83	71	63	57	51	45	41
Site Preparation/ Clean up	77	65	57	51	45	39	35
Gas gathering line installation	73	61	53	47	41	35	31
Fraccing (i.e. perforation of the coal seams)	91	79	71	65	59	53	49
	Construction activities likely to extend to the night time period						
Well construction including drilling	79	67	59	53	47	41	37

Operation

Noise generation from the gas wells during operation is expected to be limited to noise associated with the valves and pump-motor. The Proponent's assessment has indicated that even with the co-location of up to four wells at the same location noise levels from gas well operation would be no greater than around 29-32 dBA at a distance of 100 metres. As all gas wells are proposed to be located at least 200 metres away from nearest sensitive receptors, operational noise generated by these structures are expected to achieve the most stringent noise criteria under the NSW Industrial Noise Policy (EPA, 2000) (INP) (i.e. L_{Aeq} 35 dBA) at all surrounding receptors. The Proponent has also identified that the gas wells would not involve any peak noise generation and therefore would not pose a risk of exceeding the INP sleep disturbance criteria of L_{A1} 45 dBA (i.e. L_{A90} + 15 dBA)

Central Processing Facility

Construction

Construction of the central processing facility is expected to take approximately 12 months and be limited to daytime construction hours. Day time noise goals were derived for the three receptors nearest to each facility site option in accordance with the Interim Guidelines. Noise goals ranged from 40 to 42 dBA for site option 1 (rural) and 42 to 48 dBA for site option 7 (industrial/ mining), depending on the receptor. Noise levels likely to be generated by the construction of the facility (with no mitigation) are shown in Table 5 below, and indicate that exceedances of noise goals would be expected at the three closest receptors located within 1500 metres of site option 1 and at the three closest receptors located within 1100 metres of site option 7.

Table 5: Noise Levels from Central Processing Facility Construction (L_{Aeq} dBA)

Distance to Construction (metres)	25	100	250	500	1000	2000	3000
Access Track Construction	76	64	56	50	44	38	34
Site Preparation	80	68	60	54	48	42	38
Civil construction	83	71	63	57	51	45	41

Operation

As the facility is proposed to be operated on a 24 hour basis, the Proponent's assessment has derived operational noise limits in accordance with the INP at all nearest surrounding receptors for the day, evening and night time periods (on the basis of representative background noise measurement) and assessed noise impacts against the most stringent of these three criteria at each receptor. On this basis, the Proponent's assessment has identified that operational noise associated with the facility would achieve relevant noise criteria at all but two receptors at both site options "1" and "7" (refer Table 6).

Of the two receptors (P12 and P10) at which noise exceedances are predicted at Site "1" only marginal exceedance is predicted at receptor P12 (i.e. by one dBA) under one of the meteorological scenarios modelled. However, exceedances of between eight and 10 dBA are predicted at receptor P10, located approximately 1300 metres away, under each of the meteorological scenarios modelled. Similarly, of the two receptors (P6 and P3) at which noise exceedances are predicted at Site "7" only marginal exceedance is predicted at receptor P6 (i.e. by one dBA) under two of the meteorological scenarios modelled. However, exceedances of between two and nine dBA are predicted at receptor P3 (the closest receptor to Site "7" at 450 metres away) under each of the meteorological scenarios modelled. The Proponent has identified that the facility is expected to generate a generally constant noise source, not involving any peak noise events and therefore would not pose a risk of exceeding INP sleep disturbance L_{A1} criteria (i.e. L_{A90} + 15 dBA level). The Proponent has also identified that the facility would not involve any significant tonal or low frequency component.

Table 6: Operational Noise Emissions from the Central processing facility (L_{Aeq} dBA)

Receptor	Predicted Noise Levels							Noise Goal (dBA)
	Meteorological Conditions							
	1	2	3	4	5	6	7	
CPF Site 1								
P7	29	31	30	27	27	30	29	36
P8	34	34	32	30	30	34	32	36
P9	30	32	32	31	31	31	31	35
P10	44	45	46	45	45	45	46	36
P11	24	21	24	27	27	26	29	36
P12	31	27	29	34	34	35	37	36
P13	28	24	26	30	30	30	31	36
CPF Site 7								
P1	28	25	23	24	24	29	25	36
P2	38	42	41	36	36	41	37	42
P3	40	46	44	39	39	43	42	37
P4	26	32	32	30	30	30	31	35
P5	26	32	33	32	32	30	32	35
P6	31	35	36	35	35	34	36	35

Pipeline

Construction

Construction of the pipeline is proposed to occur on a 37 day cycle with 28 days of construction followed by nine days off, over a period of approximately 12 months. Construction would occur during daylight hours (7am to 6pm), seven days a week and is expected to last around three weeks at any given location. In the absence of specific background noise monitoring data across the length of the pipeline, the Proponent has derived relevant construction noise goals under the Interim Guidelines based on an assumed background noise level of 30 dBA. On this basis the relevant daytime noise goal would be 40 dBA for the daytime period. Noise levels likely to be generated by the construction of the pipeline (with no mitigation) are shown in Table 7 below, and indicates that exceedances of noise goals would be expected at receptors generally within two kilometres of the pipeline corridor, although vegetation clearing activities are predicted to result in exceedances to receptors beyond three kilometres of the pipeline.

The Proponent has also identified that some 24 hour construction works may be required in relation to horizontal directional drilling (HDD) activities at waterways and infrastructure crossings such as major roads and railways. However, as detailed design information on each HDD site is not yet available, the Proponent has not included a noise assessment of these works and has committed to investigating and confirming potential noise impacts and mitigation measures at nearest sensitive receptors, once site-specific details of the HDD works are known (including setback distances from each crossing and therefore the distance from nearest dwellings).

Table 7: Noise Levels from Pipeline Construction (L_{Aeq} dBA)

Distance to Construction (metres)	25	100	250	500	1000	2000	3000
Access Track Construction	72	60	52	46	40	34	30
Site Clearing	83	71	63	57	51	45	41
Earthworks	76	64	56	50	44	38	34
Pipe installation	77	65	57	51	45	39	35

Operation

The pipeline does not pose a source of operational noise.

Hexham Delivery Station

Construction

Construction of the Hexham Delivery Station is expected to occur over six months and be confined to day time hours. Daytime construction noise goals of 54 dBA have been derived in accordance with the Interim Guidelines, based on background noise monitoring undertaken at the nearest representative receptor. The Proponent's noise assessment (refer Table 8 below) indicates that without mitigation noise goals would be exceeded at nearest receptors along Punt Road and Old Maitland Road (i.e. 150-350 metres away) during the construction of the delivery station.

Table 8: Noise Levels from Hexham Delivery Station Construction (L_{Aeq} dBA)

Distance to Construction (metres)	100	250	500
Access Construction	58	50	44
Site Preparation	65	57	51
Civil construction	69	61	55

Operation

As with the central processing facility, the Proponent's assessment for the Hexham Delivery Station derived operational noise limits in accordance with the INP at all nearest surrounding receptors for the day, evening and night time periods (on the basis of representative background noise measurement) and assessed noise impacts against the most stringent of these three criteria at each receptor. On this basis, the Proponent's assessment identified that operational noise associated with the facility is likely to exceed noise levels at each of the nearest sensitive receptors under various meteorological conditions and/ or operational conditions for the station (i.e. either high or low gas flow conditions) (refer Table 9). Exceedances of between 3 and 27dBA were predicted at the receptors. In addition, the Proponent has indicated that noise criterion for industrial land use (i.e. 70dBA) is

likely to be exceeded at neighbouring industrial premises by 5-15 dBA under the "high flow volume" scenario, however achieve criteria at all neighbouring premises under the "low flow volume" scenario.

Table 9: Operational Noise Emissions from the Hexham Delivery Station (L_{Aeq} dBA)

Receptor	Distance	Predicted Noise Levels						Noise Goal (dBA)
		Meteorological Conditions						
		1	2	3	4	5	6	
High Flow Volume								
P15 – Caravan Park	1300 metres	34	30	30	44	38	49	45
P16 – Punt Road	150 metres	68	65	66	70	69	70	43
P17 – Maitland Road dwellings	350 Metres	59	59	60	63	60	65	43
Low Pressure Flow								
P15 – Caravan Park	1300 metres	14	9	10	24	19	30	45
P16 – Punt Road	150 metres	46	41	42	47	47	48	43
P17 – Maitland Road dwellings	350 Metres	35	34	36	41	36	43	43

The Proponent has identified that the facility is expected to generate a generally constant noise source, not involving any peak noise events and therefore would not pose a risk of exceeding INP sleep disturbance L_{A1} criteria (i.e. L_{A90} + 15 dBA level). The Proponent has also identified that the facility would not involve any significant tonal or low frequency component.

Other Impacts

The Proponent has also assessed the potential for traffic noise and vibration and blasting impacts associated with the project. The Proponent's assessment predicted that construction traffic pass-bys associated with the project would result in noise levels of around 51 dBA at 30 metres indicating that traffic noise goals of 55/60 dBA for local and collector roads, respectively under the *Environmental Criteria for Road Traffic Noise (EPA, 1999)* may be exceeded at receptors located close to (rather than well set back from) road ways. The Proponent did not carry out an operational traffic noise assessment on the basis that noise generated by the low level of operational traffic associated with the project is unlikely to be distinguishable from noise associated with existing traffic volumes on local and collector roads.

Vibration and blasting impacts would be limited to the construction phase as none of the project components are predicted to comprise a material source of ground vibration during operation. The Proponent's assessment has indicated that ground vibration levels from rock hammers (the main vibration related equipment to be used during construction) is likely to range up to 0.5mm/second at a distance of 20 metres and below 0.3 mm/second at a distance of 40 metres and is therefore likely to pose a low risk of structural damage to the majority of surrounding receptors which are expected to be located at a greater distance from the construction works. At a level of 0.3 metres/second, vibration associated with construction would be at levels considered to be "barely noticeable" with respect to human perception. In addition, the Proponent's assessment has identified that both the air-blast over pressure and ground vibration limits specified in the ANZECC guideline for blasting (*Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration, 1990*) can be achieved at a distance of 200 metres by employing a blast limit of 1-3 kilograms.

Consideration

Construction Impacts

The Department notes that the Proponent has undertaken a highly conservative construction noise assessment considering worst case construction scenarios and without consideration to any mitigation measures.

Gas wells

Noise predictions have been undertaken on the basis of the worst-case scenario of four wells being constructed simultaneously at the same location. In practice, the Department notes that this construction scenario would not occur at all locations and therefore the extent of noise generated and extent of receptors exposed to noise from a single well site is likely to be significantly lower in most cases than the worst case predicted. Furthermore, the

Department considers that with the implementation of standard mitigation measures (including the use of low noise plant and equipment, appropriate plant positioning away from sensitive receptors, staging of works so as to minimise the potential for cumulative impacts at a single location, and the use of temporary acoustic screening) significant noise reductions can be achieved. In this regard, the Proponent has suggested that through the appropriate positioning of plant and the use of temporary shielding, noise reductions of 6-8 dBA or greater could be achieved in relation to drilling and fraccing activities, which are identified as the activities likely to result in the highest generation of noise during gas well construction.

The Department also notes that given the spacing of well sites (i.e. up to 600 metres apart) and the relatively short duration of construction at each well site (i.e. six to eight weeks if 24 hour drilling is implemented or up to 10 weeks if daytime drilling is utilised), the overall exposure to construction noise at a specific locality is likely to be relatively short term (as construction would move on to the next well head) and interspaced by long periods of respite as overall well development is expected to occur over five years. Consequently, the Department considers that if the local community is kept well informed of construction scheduling and all reasonable and feasible measures are implemented to minimise site-specific construction noise impacts, the noise impacts of well construction can be appropriately managed. In particular, in relation to well drilling, the Department considers that whilst 24 hour drilling would have the advantage of reducing the overall construction period at each well site, given the potential for sleep disturbance and nuisance impacts at night, drilling should be undertaken during the night time period only if agreed to by potentially affected parties and has incorporated conditions in this regard in its recommended conditions of approval. The Department has also recommended conditions of approval requiring construction staging and mitigation measures to be developed with consideration to minimising cumulative impacts from nearby mining activity.

Central processing facility and Hexham delivery station

In relation to the construction of the central processing facility and Hexham delivery station, the Department accepts that standard construction mitigation measures (including the use of low noise plant and equipment, appropriate plant positioning away from sensitive receptors and the use of temporary acoustic screening) may not be sufficient to mitigate all construction noise impacts at the closest identified receptors (i.e. receptor P3 located approximately 450 metres from central processing facility Site "7" and receptors P16 and P17 representative of dwellings located within 350 metres of the Hexham delivery station along Punt Road and Old Maitland Road). Whilst the Department accepts that these receptors would already be exposed to existing industrial sources of noise (mining and associated rail unloader at receptor P3 and road traffic noise and noise from existing industrial and commercial activity at Hexham at dwellings along Punt Road and Old Maitland Road - P16 and P17), the Department considers that construction noise from the facilities has the potential to result in additional nuisance noise impacts at these receptors. Consequently, the Department has recommended conditions of approval requiring close consultation with these receptors to ensure that site specific measures are implemented (i.e. respite periods and notice prior to high noise generating works etc) to minimise noise impacts at these receptors as far as reasonable and feasible, with consideration to cumulative impacts from other noise sources such as mining. The Department considers that with the implementation of these measures, construction impacts can be managed to avoid unacceptable noise impacts at nearest receptors, in particular noting that impacts would be finite (i.e. 12 months for the central processing facility and 6 months for the Hexham delivery station) and limited to standard construction hours.

Gas Pipeline

In relation to the gas pipeline, the Department considers that whilst exceedances of noise goals have been predicted under worst case conditions, construction noise impacts are unlikely to be significant at nearby receptors given the progressive nature of the works which would mean that receptors at a specific locality are only exposed to noise for a relatively short period of time (i.e. three weeks) and due to construction works being confined to daytime hours. In this regard, the Department considers that the construction hours proposed by the Proponent (i.e. 7am to 6pm, 7 days a week on a 28 day cycle) are acceptable compared to standard hours (i.e. 7am to 6pm Monday to Friday, 8am to 1pm on Saturdays and no work on Sundays or public holidays) as this would ensure that construction is undertaken in a timely manner, ensuring that receptors are not exposed to construction works for longer than is required. The Department also considers that the Proponent should be required to implement all reasonable and feasible mitigation measures including comprehensive notification of nearby receptors of scheduled construction activity to ensure that construction noise impacts (during the period of exposure) are minimised as far as practicable, particularly at those locations where the pipeline is proposed to

traverse in close proximity (i.e. within 30-100 metres) to dwellings. The Department has recommended requirements in this regard in its recommended conditions of approval.

The only works proposed to be undertaken outside of daytime hours are horizontal directional drilling (HDD) activities which may need to be undertaken on a 24 hour basis for short periods. As the details of the extent of these works has not been provided (including likely duration at various locations), the Department does not support granting extended construction hours for these works at this stage. Nevertheless, given the likely short term nature of the work, the Department considers that such works would be acceptable, if subject to appropriate management measures to ensure no adverse impacts to surrounding receptors. In this regard, the Department has recommended conditions of approval requiring the Proponent to specifically request permission from the Director-General for any construction works outside of standard work hours, with each request to be accompanied by details of the need for the works and site specific mitigation measures proposed to ensure no unreasonable noise impacts at nearest receptors. Such a condition would provide flexibility for the Proponent to seek approval for the HDD works once further details of the works are known as well as for any other unforeseen out of hours works. The Department is satisfied that with the implementation of this requirement, noise impacts to affected receivers from works outside of daytime construction hours can be appropriately managed.

Other Construction Impacts

In relation to other construction noise and vibration impacts, the Department accepts that traffic generated during the construction has the potential to add to existing traffic noise levels along local and collector roads and thereby add to the noise exposure of dwellings located close to road sides. To minimise the project's impacts as far as practicable, the Department has recommended conditions of approval requiring the Proponent to develop its traffic and haulage routes with consideration to minimising impact to local/ residential streets as far as practicable and to implement appropriate controls during construction including ensuring that vehicles are well maintained and abide by the speed limit at all times. Based on the Proponent's assessment, the Department is satisfied that the vibration and blasting impacts of the project can be managed to be consistent with best practice criteria, and has recommended conditions of approval imposing these criteria on the works. The Department has also recommended conditions of approval requiring appropriate notification prior to blasting activities and complaints and contingency management procedures in the case where project related vibration generation or blasting activities results in damage to surrounding structures.

In relation to the two construction camps that may be required for the project, the Department notes that the Proponent has only identified one potential location for a camp (the Tiedemann property within the Stage 1 field development area) and has not identified the potential noise impacts of such a camp on nearby receptors. Notwithstanding, given the finite nature of impact (i.e. the camps would be limited to the construction period only) and the fact that the camps would themselves not involve any machinery or activity that would generate any industrial noise source, the Department is satisfied that noise associated with such a camp could be appropriately managed to avoid unacceptable noise impacts to surrounding receptors. The Department also notes that the camps have been determined as an appropriate solution for housing construction personnel close to the work site in order to minimise disturbance from potentially significant traffic movements (and associated noise impacts) from construction personnel travelling to the work site. The Department has incorporated conditions of approval requiring the location of the camp sites to be finalised with consideration to avoiding/ minimising amenity impacts to surrounding receptors as far as practicable and requiring the development of management procedures to minimise noise generation from the camp during its use.

Operational Impacts

In relation to operational impacts, the Department is satisfied that the project would not pose a significant risk of operational traffic noise or vibration impacts and has focused its assessment on operational noise generated by the built element associated with the project. In this regard, the Department is satisfied that the Proponent has undertaken a sufficiently robust and conservative assessment of likely operational noise impacts, consistent with INP procedures and commensurate with the likely noise risks of the respective project components. This includes consideration of the potential for meteorological conditions to exacerbate noise levels at the processing facility and gas delivery station (where there is a high risk of exceedances of criteria at nearest receptors) and consideration of potential cumulative impacts from mining by determining noise criteria at each receptor on the basis of representative background measures including at locations exposed to mining noise.

Gas Wells

In relation to the gas wells, the Department is satisfied based on the Proponent's assessment that operational noise generated by the gas wells would pose a low risk of exceeding the most stringent operational noise (i.e. L_{Aeq} 35 dBA) and sleep disturbance criteria (L_{A1} 45) under the INP and has consequently, imposed these criteria in the recommended conditions of approval. The Department has also recommended comprehensive operational monitoring requirements to measure and confirm the operational noise performance of the wells.

The Proponent has identified that there might be isolated instances where already operational wells may require re-drilling and re-fraccing to enable optimal functioning. Although undertaken within the operational phase, as these activities would comprise generally short-term construction related activities (with noise levels similar to that of the initial construction phase rather than being representative of normal operational noise from the gas wells), the Department considers that it would be unreasonable for operational noise limits to apply to these infrequent circumstances. The Department has consequently recommended conditions excluding the application of operational noise limits, to these specific circumstances, as long as the works are carried out subject to a specific noise management strategy developed in consultation with DECCW designed to manage short-term noise amenity impacts at surrounding receptors.

Central Processing Facility

In relation to exceedances predicted for receptors at the central processing facility site(s), the Department considers that the exceedances predicted at receptors P12 at Site "1" and P6 at Site "7" (i.e. by 1 dBA) are marginal and can be easily ameliorated with relatively minor design/acoustic adjustments to plant to achieve a better noise performance. Consequently, the Department considers the project specific noise limits identified at these receptors to be achievable and imposed these limits as part of the recommended noise conditions for the project. However, the Department considers that the exceedances predicted at receptors P10 at Site "1" and P3 at Site "7" (i.e. between 8-10 dBA) to be significant and would require significant at source control to be achieved.

The Proponent's assessment has indicated that a 10 dBA reduction could be achieved through the upgrade of the generator and compressor acoustic enclosures and the use of lower noise generating compressor cooling fans or their relocation to maximise screening by other on-site structures. Based on the information provided by the Proponent, the Department is satisfied that there are reasonable and feasible design controls available to reduce the noise generated by the facility at source, such as to achieve project specific noise goals at all surrounding receptors. Consequently, the Department has imposed the project specific noise limits identified at each surrounding receptor as part of the recommended noise conditions for the project. The Department has also recommended conditions of approval requiring a detailed design noise assessment to be prepared prior to the commencement of construction, to confirm the operational noise generated by the facility based on its final design configuration including confirmation of any low frequency or tonal noise characteristics. In addition, the Department has recommended comprehensive operational monitoring requirements to measure and confirm the noise performance of the facility once operational.

Hexham Delivery Station

The Proponent's assessment has identified the potential for significant operational noise impacts from the gas delivery station at the single dwelling located at the corner of Punt and Old Maitland Road (P16, approximately 150 metres away) and for dwellings located along Old Maitland Road (P17, approximately 350 metres away). These comprise exceedances of between 16 and 27 dBA at these dwellings under all meteorological conditions at high gas flow conditions at the station and exceedances of between 3 and 5 dBA under specific meteorological conditions at low gas flow conditions at the Punt Road dwelling. An exceedance of up to 4 dBA is also predicted at the Caravan Park located to the east of the Hunter River approximately 1300 metres away under a single meteorological scenario, under high gas flow conditions. Furthermore, exceedences of between 5-15dBA are predicted at surrounding industrial premises under the high gas flow scenario. The Proponent has identified that the detailed design of the station has not yet been completed and at this stage site specific design measures (including appropriate valves and fittings, design of pipe trains to reduce velocities and turbulence and acoustic rated compound walls and mounds) would be implemented to ensure that project specific noise goals are achieved at nearest receptors.

Whilst the Department accepts that the design measures identified by the Proponent are likely to result in some acoustic amelioration, the Department required further technical certainty that the magnitude of reduction required

could be achieved at detailed design as suggested by the Proponent and requested additional information in this regard. In response to the Department's concerns, the Proponent provided additional information outlining the acoustic amelioration that could be achieved by design measures (such as low noise control valves) to achieve noise reductions of around 18dBA and noted that building insulation or enclosures could be implemented if required to further reduce noise levels. The Department is satisfied that the Proponent has demonstrated that there are reasonable and feasible design controls available to significantly reduce noise generated by the facility from the worst case predicted. Notwithstanding, the Department considers that given that the design details are yet to be finalised, there is a reasonable residual risk that the final design details would exceed criteria at nearby dwellings.

Consequently, the Department has recommended a condition of approval requiring re-assessment of the operational noise impacts of the Hexham delivery station at least 6 months prior to the commencement of construction based on the final design configuration on site (including consideration of any low frequency or tonal noise characteristics). Should this assessment indicate that the delivery station is likely to result in noise levels greater than 5 dBA above project specific criteria at any surrounding receptors, following the implementation of all reasonable and feasible at source control measures, then the Proponent would be required (if requested by the landowner) to acquire the dwelling prior to the commencement of operation of the project or otherwise reach an alternative agreement with the landowner. In the case that project specific criteria are predicted to be exceeded by less than 5 dBA (and noise performance monitoring at operation confirms this), the Department has recommended that all affected receptors be entitled to receive at-receiver acoustic amelioration measures (i.e. architectural treatment such as double glazing) to minimise noise levels at these receptors as far as possible. The Department notes that this approach is consistent to that implemented for other major development (such as power stations and mining development), where exceedances generally no greater than 5 dBA above criteria are considered to be manageable and acceptable on this basis, whilst exceedances greater than this are normally subject to acquisition rights. Under the Department's recommended conditions, acquisition rights and at-receptor mitigation would also apply (as relevant) in the case that post-operational monitoring indicates exceedences, even if these were not predicted in the detailed design report.

The Department considers the above approach to be reasonable as it requires the Proponent to consider at-source design solutions as far as possible to achieve an acceptable noise outcome, with acquisition considered as a last resort. In determining the appropriateness of recommending acquisition rights, the Department has considered the need and benefits of the project in helping to strengthen gas supply security in NSW (and associated benefits to economic growth) and the associated need for the gas delivery station at the proposed location (within industrial zoned land and with ready access to the existing Sydney-Newcastle gas supply line) as a fundamental component of the overall project. On balance, the Department considers that the benefits of and need for the project outweigh the potential noise impacts predicted at surrounding receptors, and consequently, subject to the management approach as outlined above, should be approved. The Department considers that subject to appropriate at-source controls, acquisition rights are unlikely to extend to an extensive number of dwellings and would most likely only apply to the closest dwellings to the site. The Department considers that with the implementation of such at-source measures, project specific noise levels at distant receptors such as P15 (the Caravan Park) would be comfortably achieved under all meteorological conditions. Similarly, the Department considers that at source-measures would be able to comfortably achieve the much higher noise criteria required to be achieved at surrounding industrial premises.

Conclusion

In summary, the Department is satisfied that the construction and operational noise impacts of the project can be appropriately managed. Whilst some residual impacts may occur in relation to operational noise from the Hexham gas delivery station, the Department considers that these would not outweigh the overall need and benefits of the project and therefore do not warrant recommending its refusal. The Department notes that DECCW has confirmed that it is able to issue a licence for the components of the project which are scheduled activities (i.e. gas well production and central processing facility).

In relation to future development within the concept plan area, the Department is satisfied based on its assessment of construction and operational noise impacts of the gas wells within the stage 1 development area that there are no significant noise constraints to the future development of wells within the broader concept plan area. The Department has incorporated comprehensive further assessment requirements in relation to noise

impacts as part of the recommended concept plan approval for the project that the Proponent must address in seeking any further approval for gas wells within the concept plan area.

5.3 Flora and Fauna

Issue

The Proponent's ecological assessment has identified that the gas wells, central processing facility and gas delivery station components of the project would generally be confined to already disturbed areas (i.e. rural/ agricultural and grazing land in relation to the former and cleared industrial land with respect to the latter component). The Proponent has identified that whilst there is some scattered and isolated vegetation within the rural/ agricultural land wherein the gas wells would be located, it is expected that most native vegetation would be able to be avoided given the inherent flexibility of gas well design (where the final siting would be based on location principles of avoiding impacts where possible). With respect to the central processing facility sites, the Proponent has identified that there is some remnant vegetation existing within the south-eastern portion of land at Site "7", however this vegetation would not require clearing for the development of the facility. On this basis the Proponent has identified that these components of the project are not expected to result in any significant vegetation clearing and that the majority of biodiversity impacts would be associated with the gas pipeline easement.

With respect to the gas pipeline, the Proponent has identified that a total 100 metre wide pipeline corridor has been assessed to provide flexibility in the final location of the pipeline route, to accommodate ecology and other constraints, landowner preferences and constructability. The Proponent has identified that the final width of the pipeline construction corridor would be 30 metres (within the 100 metre wide assessment corridor) and would be reduced to 15 to 20 metres in sensitive areas to minimise clearing requirements. The Proponent has identified that the pipeline route has been aligned to avoid biodiversity impacts as far as practicable including: modification of the route alignment to avoid impacts to the *Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion* endangered ecological community (EEC) listed under the *Threatened Species Conservation Act 1995* (TSC Act) near the Karuah River; location of the route within existing disturbed infrastructure easements for approximately 30% of the route to minimise clearing requirements; and the use of horizontal directional drilling to cross major waterways (i.e. third order or greater including the Karuah, Williams and Hunter Rivers) and wetland areas listed under *State Environmental Planning Policy No 14 – Coastal Wetlands* (SEPP 14) to avoid impacts to important riparian and wetland areas.

Based on these measures to minimise the clearing requirements for the pipeline, the Proponent has identified that the residual vegetation clearing required for the pipeline would be approximately 18.17 hectares. Whilst six EECs (refer to Appendix A) have been recorded to occur within the 100 metre pipeline assessment corridor (nil EECs identified within the remainder of the project area including the gas extraction, central processing facility, or Hexham delivery station sites), the Proponent has identified that only the *Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions* is expected to be directly impacted by the project, with approximately 0.2 hectares of clearing expected for the pipeline easement. In addition, whilst no direct disturbance of SEPP 14 wetlands or third order or greater waterways are expected (due to their being crossed by horizontal directional drilling), the Proponent has identified that the pipeline would nevertheless involve up to 172 crossings of less than third order streams using open trenching with some associated unavoidable impacts to riparian vegetation. The vegetation communities proposed to be disturbed by the pipeline route are summarised in Table 10 below.

The Proponent's ecological assessment has also identified that native vegetation across the entire project site has the potential to provide suitable habitat for several species listed under TSC Act and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). These comprise (refer Appendix A for full species list):

- five endangered populations listed under the TSC Act, none of which were recorded in site surveys;
- 14 flora species listed under the TSC Act, of which 10 species are also listed under the EPBC Act. Of these a single species (small-flowered Grevillea), which is both TSC and EPBC Act listed, was recorded within the gas pipeline corridor extending for approximately 200 metres along an existing disturbed power line easement, which is subject to regular maintenance activities (slashing) and is traversed by a maintenance track;

- 47 fauna species listed under the TSC Act, of which 10 species are also listed under the EPBC Act. Of these a single species (the Grey-crowned Babbler), which is listed under the TSC Act, was recorded at three separate points along the gas pipeline corridor in site surveys in open and wooded landscapes; and
- 21 migratory birds listed under the EPBC Act, none of which were recorded in site surveys.

Table 10: Vegetation Clearing Associated with the Pipeline Corridor (AECOM, May 2010)

Vegetation	Area Removed (ha)
Dry foothills spotted gum	9.2
Rainforest	0.3
South Coast Shrubby Grey Gum	1.4
Ironbark	2.6
Redgum / apple	0.1
Spotted Gum - Ironbark Forest	1.5
Grey Gum – Stringybark – Bloodwood ± Spotted Gum Ironbark Forest	2.6
Riparian Communities	0.2
Wetlands (including SEPP 14 wetlands)	0
Total Area	**17.94 ha**
Forest Red Gum / Spotted Gum Woodland (corresponds to Hunter Lowland Redgum Forest EEC – listed under TSC Act)	0.2
Total Area	**18.17 ha**

The Proponent's assessment considered that the project was unlikely to significantly impact on the identified threatened species and populations as the project would generally be confined to already disturbed areas (i.e. rural/ grazing land or existing disturbed infrastructure easements) where significant fragmentation or loss of habitat is not expected. To further minimise and mitigate impacts, the Proponent has committed to implementing a range of measures including:

- pre-clearance surveys to identify the distribution and extent of sensitive areas and ensure absolute minimum construction width at each location;
- a small-flower Grevillea Management strategy (to identify the distribution and extent of the species, ensure absolute minimum construction width at the identified location and ensure appropriate corridor rehabilitation and monitoring measures during post-construction);
- a hollow bearing tree management strategy (to identify and minimise the clearance of hollow bearing trees);
- a landscape and rehabilitation management plan to ensure rehabilitation and re-vegetation of the pipeline corridor consistent with existing landuse (apart from restrictions to deep rooted vegetation along the final 10 metre width operational easement to avoid conflicts with the buried pipeline);
- appropriate erosion and sediment control and acid sulphate soil management to minimise potential water quality and contamination impacts along low lying and wetland areas; and
- the design and construction of waterway crossings with due consideration to riparian and instream values.

The Proponent also committed to offsetting residual impacts through the purchasing and securing of land in perpetuity for conservation purposes through dedication to an adjoining conservation area or other legal mechanism (such as a voluntary conservation agreement). In this regard, the Proponent identified the availability of a 134.9 hectare property adjacent to an existing National Park in the region, which initial ecological assessments have indicated has the potential to contain areas of *Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions* EEC; the threatened flora species Slaty Redgum, Small-flowered Grevillea, Tall Knotweed and Black-eyed Susan; and potential habitat for up to 23 threatened fauna species including the Grey-crowned Babbler. The Proponent has committed to finalising details of the offset strategy (including the area of the offset land parcel) following confirmation of the final ecological values impacted by the project at the detailed design stage.

Consideration

The Department concurs with the Proponent that the central processing facility and gas delivery station components of the project would not pose a material risk of biodiversity impacts as they would be located on

already disturbed sites which do not require vegetation clearing for proposal development. With respect to the gas wells and associated linear infrastructure (such as gas/ water gathering lines), the Department is similarly satisfied that these elements would pose a low risk of impact (including fragmentation) to existing remnant vegetation as this infrastructure would be developed on already disturbed rural land, with only isolated / scattered vegetation, which can be easily avoided given the inherent flexibility of well and associated gas/water line location. Furthermore, the Proponent has committed to ensuring that gas and water gathering lines are co-located along existing disturbed access roads and fence lines to further minimise the potential for impacts. Consequently, the Department has focused its assessment on the impacts of the pipeline route as the project component that is likely to pose the most risk of biodiversity impacts.

Avoidance of Impact

In relation to the avoidance of biodiversity impacts, the Department notes that Great Lakes Council has specifically raised concern regarding the proposed pipeline route within the Black Camp Creek area (which comprises an extended area of remnant native vegetation) and has queried why the pipeline does not follow the existing power line easement through this area rather than an alternative route which would require additional clearing and fragmentation of the area. The Proponent has stated that the pipeline route would not be able to follow the power line easement across its entire length due to terrain restrictions, which would make pipeline construction unfeasible along much of the length. The Proponent has indicated that the pipeline route identified at this location has been determined following extensive investigation into optimal routes balancing terrain and biodiversity constraints. In this regard, the Department notes that the pipeline corridor is proposed to follow an existing disturbed access track easement within this area, thereby confining fragmentation impacts as far as possible to an already disturbed area, by widening this existing corridor rather than through the creation of a completely new disturbance corridor. The Department notes that a similar attempt has been made to minimise biodiversity impacts across the route, with the entire route corridor either traversing across already cleared or scattered vegetation within rural and agricultural land, disturbed/ cleared vegetation along existing infrastructure easements or skirting along the boundary of (rather than through) remnant patches of vegetation. In consideration of the above, the Department is satisfied that the Proponent has given due consideration to avoiding biodiversity impacts wherever possible including minimising fragmentation of remnant and established native vegetation and their associated habitat by confining impacts to already disturbed infrastructure corridors wherever possible.

In the case of the single threatened flora species (small-flowered Grevillea) proposed to be impacted, the Department notes that this population was identified within an already disturbed transmission line easement, which is proposed to be traversed by the project so as to avoid impacts to extensive areas of remnant vegetation outside of the transmission line corridor in this area. Within the transmission line easement itself, the Proponent has committed to minimising its construction width in the vicinity of the Grevillea species to the minimum possible (i.e. 15 metres width) to avoid disturbance of these species as far as possible. Overall, the Proponent has identified that through reductions to construction width along sensitive areas which have already been incorporated into the pipeline design, potential vegetation clearance associated with the entire route has been reduced from 39 hectares (under a 30 metre construction corridor for the entire length) to the current predicted 18.17 hectares. The Department is satisfied that this demonstrates due consideration of design measures to avoid biodiversity impacts. The Department also considers that subject to appropriate re-vegetation measures, ongoing barrier effects from fragmentation can be minimised through the rehabilitation of the majority of the construction width of the pipeline corridor, such that the final easement width is not significantly greater than the existing disturbed road reserve.

Concerns have also been raised regarding potential impacts to two private properties on which property vegetation plans (PVP) are being negotiated; however, the Department is satisfied that the pipeline would be confined to the existing power line easements and already cleared areas within these properties such as to not require significant additional clearing. The HCRCMA also raised concerns regarding the potential impact of the project on biodiversity corridors between Chichester State Forest and Glenn Haven Nature Reserve through Craven and Chichester State Forest, Wallaroo State Forest and Myall River State Forest. The Proponent has identified that the pipeline would generally traverse already cleared areas at these locations, although some impacts are likely to small patches of remnant vegetation. On this basis, the Department is satisfied that the pipeline would not pose a significant barrier to connectivity (particularly following rehabilitation), noting that the corridors identified do not comprise unbroken vegetation corridors, but rather larger vegetated areas that are

broadly connected by scattered/ patchy vegetation within intervening cleared areas (the main areas proposed to be traversed by the project).

In summary, the Department is satisfied that the Proponent has given due consideration to the avoidance of biodiversity impacts wherever reasonable and feasible.

Assessment Methodology

Several submissions (including DECCW and HCRCMA) raised concerns regarding the level of survey effort for the project, including that it did not especially target cryptic and rare flora species. Whilst the Department accepts that the Proponent's ecological assessment did not cover all periods of the year in which the cryptic species may be detected, the Department is satisfied that the ecological surveys were undertaken during seasons (i.e. early winter: 8-12 June 2008 and early to late spring: 28 August – 5 September, 17 October and 19 November 2008) which are likely to coincide with suitable detection periods for the flora species of concern (i.e. both late flowering and early flowering species). The Department considers the total survey effort (i.e. approximately 11 days across the survey period) to be commensurate with the potential biodiversity risks of the project based on the landuse traversed, which comprises already disturbed rural/ agricultural land or existing disturbed infrastructure easements. The Department concurs with the Proponent that it would not be practical or reasonable to undertake ecological surveys across all seasons and along the entire corridor with the hope of detecting cryptic species, given variability across years (particularly in drought periods), which may mean that seasons are not representative. In this regard the Proponent has taken the conservative approach of undertaking an assessment of each threatened species identified as having the potential to occur, on the basis of available habitat regardless whether it was recorded on site or not. On this basis, the Department is satisfied that the Proponent has undertaken a conservative and robust ecological assessment that is sufficient to enable the potential impacts of the project to be ascertained and assessed.

Residual Impact and Offsets

In the absence of targeted surveys to confirm the presence or absence of threatened species, DECCW considered that it would have to assume that each of the threatened species identified as having the potential to occur on site is likely to be impacted by the project, where impacts to suitable habitat are predicted. On this basis, DECCW considered that significant impacts to threatened species are likely and would require significant offset measures. The Department accepts that the project has the potential to result in some residual impacts if not appropriately mitigated or offset, however considers that the project's impacts on the identified threatened species are unlikely to be significant such as to affect the long-term survival of local populations, given:

- the relatively low level of clearing associated with the project and the majority of clearing being confined to already disturbed, scattered patches of vegetation within rural/ agricultural land or infrastructure easements, thereby avoiding undisturbed, better quality areas of habitat;
- the potential for ongoing barrier effects from fragmentation to be significantly ameliorated through appropriate rehabilitation and re-vegetation of the construction corridor consistent with existing vegetation (with the exception of some restrictions within the final 10 metre wide operational easement);
- the high mobility of many of the identified threatened fauna species (i.e. 42 bird species including 19 migratory species) which would not be dependent solely on the habitat resources within the pipeline corridor;
- the availability of extensive areas of good quality habitat outside the pipeline corridor and in close proximity including Chichester State Forest, Wallaroo State Forest and National Park and Myall River State Forest, which can be utilised by species;
- the Proponent's commitment to implement construction measures (such as a hollow-bearing tree management strategy) to preserve important habitat resources on site which are utilised by threatened species; and
- the Proponent's commitment to avoid impacts on significant riparian, instream or wetland habitat through the use of horizontal directional drilling to cross major watercourses (third order or greater) and all SEPP 14 wetlands, thereby minimising the potential for impacts to important water-based species such as water birds and frogs.

In the case of the single threatened flora population identified on site (small-flowered Grevillea) that has the potential to be directly impacted by the project, the Department is satisfied that with the implementation of the Proponent's proposed mitigation strategy (including pre-clearance surveys to confirm the distribution and extent of the species; maintenance of an absolute minimum construction width at this location to avoid impacts as far as

possible; transplantation of individuals to which impacts are unavoidable; and appropriate corridor rehabilitation and monitoring measures during post-construction), the project is unlikely to threaten the survival of the local population of some 100-1000 plants. In this regard, the Proponent has submitted a draft small-flowered Grevillea management plan providing further details of the types of mitigation measures discussed above.

Notwithstanding the above, the Department accepts that the mitigation measures proposed by the Proponent would not be sufficient on their own to compensate for the biodiversity values affected by the project consistent with "maintain or improve" or "no net loss" principles. The Proponent has committed to offsetting residual impacts through the purchasing and securing of land for conservation purposes and has identified an approximately 160 hectare property located adjacent to a National Park in the region, which comprises mostly well established, good quality, largely weed free areas of re-growth of approximately 20 years in age. The Proponent has identified that approximately 134.9 hectares of this vegetation would be available for offset for the project, if required. Initial ecological assessments have indicated that the vegetation has the potential to contain suitable habitat for up to 27 threatened species potentially impacted by the project (including the small-flowered Grevillea and Grey-crowned Babbler) and areas of *Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions* EEC, which would be directly impacted by the project.

In its draft small-flowered Grevillea management plan, the Proponent has also identified that this species responds well to cultivation from seeds and cuttings. Therefore, the Proponent has proposed the option of propagating and cultivating a population of this species at a secure offsite location (such as at the offset location identified) as a potential offset measure to compensate for the disturbance of individuals by the project. The Department supports the protection of land containing established and good quality habitat of required ecological value, as an appropriate offset for the project, considering that this provides a more secure mechanism for achieving offsets than propagation and cultivation measures in themselves. Consequently, the Department considers that as a first preference, the Proponent should pursue the option of a land offset containing required habitat values including for the small-flowered Grevillea rather than relying on propagation techniques (although the Department has no objection to these measures being used as a supplementary measure to enhance the offset values of the secured site, should this be acceptable to DECCW and DSEWPAC).

With respect to the land based offset option, the Proponent, following discussion with DECCW, submitted additional information subsequent to its submissions report, committing to the following additional pre-construction measures to confirm the final area of offset land required for the project:

- undertaking further targeted surveys of up to 10 cryptic flora species (specifically identified by DECCW as requiring further survey to provide certainty of project impacts) to confirm the project's impacts on these species including associated need for offsets. This would include further surveys for the small-flowered Grevillea species to confirm the occurrence of this species along other locations of the pipeline;
- undertaking detailed surveys of the proposed offset property consistent with DECCW's "BioBanking Methodology" to confirm the ecological values of the offset site in greater detail; and
- matching the final offset area (i.e. whether the whole or part of the 134.9 hectare area) with the final confirmed impacts of the project as identified through these surveys, including where required, investigating further offset sites to cover any residual habitat impacts not offset by the identified property.

The Department has assessed the offset site identified by the Proponent and whilst noting that habitat for each species identified as having the potential to occur on site (i.e. 14 flora species, 47 fauna species and 21 migratory bird species) has not been identified to date within the site, considers that the property is nevertheless suitable as an offset site for the project. This is due to the low potential the project has of significantly impacting on each of the species identified, given the low quantity of clearing (on an overall and locational basis) and the modified nature of vegetation and habitat that is likely to be impacted by the majority of the project. In this context, the Department considers that the proposed offset property would provide significant compensation for the direct quantity of native vegetation impacted (i.e. with each area lost offset at an up to 7.4 to 1 ratio) as well as impacted habitat values (such as nest and foraging resources) that are likely to be important to the majority of threatened species identified, which comprise fauna species. Importantly, the Department notes that the offset site has been identified as having the potential to contain the specific EEC and threatened flora species predicted to be directly impacted by the project (*Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions* and small-flowered Grevillea) as well as habitat for the single fauna species (Grey-crowned Babbler) recorded within the project footprint. The Department also notes that the identified property provides for broader

biodiversity benefits (over and above direct "like for like" habitat compensation) by providing the opportunity for increasing regional biodiversity connectivity and security though dedication of the land to the adjacent National Park. With respect to the flora species that DECCW has sought additional surveys to confirm the project's impacts and associated offset requirements, the Department considers that the inherent flexibility of the pipeline design and the 100 metre wide assessed corridor, would enable impacts to localised threatened flora populations (if recorded) to be avoided in the majority of cases, such that the likely requirement to seek additional offset land (should the current property not provide the required habitat values) would be low.

Based on the above, the Department is satisfied that the Proponent has demonstrated that there are feasible options available for offsetting the biodiversity impacts of the project, based on the known impacts of the project to date, and for the securing the offset in perpetuity. The Department is also satisfied that with the implementation of the offset strategy in conjunction with the proposed mitigation measures, the project can be managed to ensure a biodiversity outcome consistent with the principles of improve and maintain. On this basis, the Department has recommended approval requiring the offset strategy for the project to be finalised and secured prior to the commencement of construction of the project (based on targeted surveys of the pipeline corridor and the offset site as agreed to with DECCW and further investigation into residual offset sites, if required). DECCW identified a preference for the specific management measures to be implemented within the offset area (to maintain its biodiversity values) to be determined at the pre-approval stage. However, the Department is satisfied that these details can be finalised at detailed design stage in consultation with relevant agencies and has incorporated conditions of approval in this regard. The Department has also recommended conditions of approval reinforcing the mitigation measures committed to by the Proponent including construction related control measures and rehabilitation and re-vegetation requirements. DECCW indicated its satisfaction with the conditions framework proposed by the Department.

Impacts to Waterways and Wetlands

In relation to impacts on riparian and instream habitat and wetland areas (including habitat to sensitive frog species such as the Green and Golden Bell Frog, Stuttering Frog and Giant Barred Frog), the Department is satisfied that the Proponent has demonstrated due consideration of avoiding impacts on these areas in its pipeline design, in particular committing to cross major waterways (third order or greater) and all SEPP 14 wetlands through the use of horizontal directional drilling. The Department is satisfied that through this measure the Proponent would avoid all direct impacts to important wetland areas and associated habitat. In relation to the waterway crossings where horizontal directional drilling is not proposed (i.e. up to 172 crossings), the Department notes that each of these comprise second order or lower level water bodies, indicating lower habitat sensitivity (including smaller scale of waterway, greater disturbance and less sensitive riparian vegetation). In particular, the Department notes that the vast majority of these water bodies (i.e. 150) comprise minor, unnamed creeks, many of which exhibit intermittent or ephemeral water flow and are classified as first order creeks or lower (i.e. the lowest habitat classification generally exhibiting low quality or highly disturbed riparian values).

Notwithstanding, the Department accepts that sensitive species (such as the Green and Golden Bell Frog species) can often occur in disturbed context. Therefore, the precautionary approach should be taken to construction at waterways comprising the pre-clearance survey of all waterways to determine habitat sensitivity (including for any sensitive frog species) and matching construction methodology to site-specific habitat conditions including implementation of specific measures during construction to avoid or minimise impacts to frog species (should a high likelihood for their presence be identified). Measures may include: avoiding construction at breeding times or during periods of creek flow (in the case of ephemeral waterways), retaining and re-instating important habitat features within or close to waterways such as logs and rocks, and implementing appropriate erosion and sediment control and acid sulphate soil management measures (refer below) to protect water quality.

Based on its assessment, the Department is satisfied that subject to appropriate construction control measures and post-construction rehabilitation, the proposed direct disturbance of up to 172 waterways is unlikely to cause significant or unacceptable impacts to in-stream habitat/ riparian values or drainage patterns/ creek structural integrity. In this regard, the Department has recommended conditions of approval requiring:

- base line surveys of all creek crossing sites to identify the extent and conditions of riparian vegetation and structural and flow characteristics of the site;
- design and construction of all waterway crossings in consultation with and to the satisfaction of NOW and DII (Fisheries) consistent with best practice design; and

- rehabilitation and stabilisation of all disturbance (including revegetation of affected riparian vegetation) to a standard equal to or better than the existing including monitoring and independent verification of the success of rehabilitation measures.

The Department is satisfied that with the implementation of the above measures direct impacts at waterway crossings can be appropriately managed. In relation to indirect impacts, the Department considers that the main risk of impact would be through water quality impacts from soil disturbance or the uncovering of acid sulphate soils during waterway and wetland crossings (both through horizontal directional drilling and trenching methods). Whilst the project at its closest point (i.e. the southern end of the pipeline) would be approximately one kilometre upstream of the nearest Ramsar listed wetland (Hunter Estuary Wetland), the Department accepts that if not appropriately managed there is the risk for water quality impacts to extend to this wetland area. To ensure that water quality impacts are appropriately managed at waterway crossings and wetland areas, the Department has incorporated stringent requirements in relation to the adaptive management of water quality during construction in its recommended conditions of approval (which would apply to all relevant areas of the project and not just waterway crossings) including:

- pre-construction investigations including: soil testing to determine the likely potential for uncovering acid sulphate soils; investigation of the risk of groundwater interception (particularly, shallow perched groundwater tables) during pipeline trenching or horizontal directional drilling; and identification of any sites of potentially contaminated soils which require remediation prior to the commencement of construction (such as previous industrial land use or intensive agricultural activity);
- base-line water quality monitoring (both up stream and down stream of the construction sites) and where required pre-construction monitoring of groundwater quality (particularly where there is a high risk of groundwater interception coupled with potential acid sulphate soils);
- development of a management strategy to control acid sulphate soil impacts should they be uncovered during construction (including measures for testing, treatment, and disposal; protection and treatment of groundwater; protection of surface waters; and contingency measures in the case of an incident);
- development of site specific erosion and sediment control plans (detailing measures to control and protect waterways from runoff, control measures in the case of groundwater interception, measures to minimise the extent and duration of soil disturbance, measures for ground stabilisation including progressive rehabilitation, and contingency measures in the case of an incident);
- development of a strategy for contaminated soil management should any such areas be uncovered during construction (including measures for pre-construction testing, treatment, and disposal; measures for surface groundwater protection; and contingency measures in the case of an incident); and
- an ongoing water quality monitoring strategy to monitor downstream impacts on water quality during the construction phase, including a program for monitoring groundwater quality (where required) and trigger and hold points for compliance actions should adverse water quality be detected.

The Department is satisfied that with the implementation of the above requirements, indirect impacts on waterways and wetland areas can be appropriately managed so as to ensure no unacceptable risks to water quality. In this regard, the Proponent has submitted an indicative acid sulphate management plan providing further details of the likely mitigation measures that would be implemented on site.

Other Project Components

The Department is satisfied, given the minimal biodiversity constraints identified within the Stage 1 field development area (i.e. comprising largely cleared rural grazing land), that a temporary construction camp as proposed by the Proponent can be located within this area (i.e. within the Tiedeman property) without significant impacts to biodiversity. The Department has incorporated conditions of approval requiring the final location of the camp to be located in an area that does not require any additional clearing. The Department notes that the second potential location for a construction camp (for construction personnel associated with the pipeline) has yet to be determined, however it is proposed to be sited consistent with similar location principles of avoiding biodiversity impacts as far as practicable. The Department supports this and has incorporated conditions in this regard, including the requirement for any additional construction camp site to be located within the already assessed development footprint of the project.

In relation to the development of future gas wells in the concept plan area, the Department is satisfied given the generally disturbed context within which any future gas wells would be developed (i.e. rural / agricultural landuse)

and the inherent flexibility of gas well location (which would enable most impacts to be avoided) that future gas well development within the concept plan area can be undertaken without posing a significant risk to biodiversity values. The Department is therefore further satisfied that there are no unacceptable biodiversity constraints to future development within the concept plan area. The Department has incorporated comprehensive further assessment requirements in relation to flora and fauna as part of the recommended concept plan approval, which the Proponent must address in seeking any further approval for gas wells within the concept plan area.

Conclusion

In summary, the Department is satisfied based on its assessment that the residual biodiversity impacts of the proposal can be appropriately managed, mitigated or offset and is therefore satisfied that there are no unmanageable biodiversity constraints to the development of the project.

5.4 Air Quality

Issue

The key air quality emissions associated with the project relate to:

- general dust and exhaust emissions from construction activities including ground disturbance and exhaust from plant, machinery and vehicles;
- emissions from the flaring of gas wells during gas well commissioning. Flaring would be limited to an approximate one month period per gas well and approximately five to eight wells are likely to be flared simultaneously;
- emissions from the operation of the central processing facility including combustion products formed during the compression, cleaning and flaring of gas at the facility and emissions from the burning of gas by the proposed 15 megawatt power plant attached to the central processing facility for electricity generation; and
- emissions from the operation of the water bath heater at the Hexham Delivery Station.

In relation to construction related air quality emissions, the Proponent has noted that this would constitute a short term impact and has committed to managing these through the implementation of standard mitigation measures (such as appropriate maintenance of plant and equipment, covering of loads, minimising areas of ground disturbance, use of water carts where appropriate and progressive rehabilitation) as part of a construction environmental management plan.

In relation to emissions from gas well flaring and the operation of the central processing facility and the Hexham delivery station, the Proponent has undertaken a quantitative air quality assessment consistent with the *Approved methods for the modelling and assessment of air pollutants in NSW* (DEC, 2005) (Approved Methods) considering all pollutants of concern including Nitrogen dioxide (NO_2), carbon monoxide (CO), particulate matter (PM_{10}), volatile organic compounds (VOCs) and formaldehyde. The assessment has compared predicted emissions generated by the project coupled with existing background pollutant concentrations (where available) against the ground/ receptor level air quality assessment criteria specified under the Approved Methods. The Proponent's assessment utilised background air quality data from the existing air quality monitoring station at Wallsend (near Newcastle), which monitors NO_2 and PM_{10} concentrations, in undertaking its predictions. The assessment of gas well flaring has only considered the short-term air quality assessment criteria under the Approved Methods due to the short term nature of the impact (i.e. limited to the commissioning phase only and for approximately one month per well). A summary of the air quality modelling undertaken in relation to gas well flaring and the operation of the central processing facility and the Hexham delivery station is provided in Tables 11 to 14 showing predicted project emissions and cumulative emissions from project emissions plus background levels (where available) in parentheses. The modelling indicates that with the exception of 24 hour PM_{10} cumulative concentrations for gas flaring, the gas well flaring and the operation of the central processing facility and the Hexham delivery station would achieve all relevant air quality limits for all required averaging periods.

The Proponent has also undertaken an assessment of the minimum spacing required between flaring wells within a cluster of wells to achieve DECCW NO_2 criteria (so as to minimise the potential for cumulative impacts) considering a maximum worst case gas flow rate of 0.1639 metres^3/ second. On this basis the Proponent has identified that a minimum spacing of 500 metres for flaring wells positioned in a straight line and 800 metres for flaring wells positioned in a triangular grid would be required to achieve DECCW criteria. The Proponent's

assessment also recommended a distance of four kilometres between clusters of flaring wells (with a maximum of five flared wells in each cluster at the above recommended spacing) to achieve DECCW criteria.

Some minor emissions are also expected during the commissioning phase of the gas wells from the operation of small diesel or gas-fired generators at well sites for approximately 6-8 months (up to 20 generators at a time) as part of dewatering activities. However, due to the short term nature of impacts and likely minor level of emissions, the Proponent has not undertaken a quantitative assessment of these emissions. Notwithstanding this, the Proponent has committed to managing potential emissions through the implementation of appropriate controls (such as maintenance of plant and equipment) as part of an operational environmental management plan. The pipeline is not expected to constitute a source of air quality emissions and has not been assessed. With respect to odour, the Proponent has stated that an odorant is not proposed to be added to the gas at the central processing facility prior to transport (which is a traditional method for detecting leaks along pipelines from the otherwise tasteless and odourless gas), with pipeline safety proposed to be managed through other methods. The project would not involve any other odour generating activities and is consequently not expected to constitute a source of offensive odour during project construction or operation.

Table 11: Air Quality Emissions from Gas flaring (µg/m^2) (AECOM, November 2009)

Pollutant	Averaging Period	Maximum GLC (µg/m^3)	Criteria (µg/m^3)
NO_2[1]	1 hour	113.9 (207.9)	246
CO	15 minute	3,982	10,000
	1 hour	3,180	30,000
	8 hour	1,730	10,000
PM_{10}	24 hour	10.8 (**54.8**)	50
VOCs (as benzene)[2]	1 hour	0.0123	29
Formaldehyde	1 hour	0.422	20

Table 12: Air Quality Emissions from Central processing facility Site 1 (µg/m^2) (AECOM, November 2009)

Receptor Number	X	Y	NO_2		CO			PM_{10}		1 hour Formaldehyde	1 hour Benzene
			1 hour	Annual	15 min	1 hour	8 hour	24 hour	Annual		
1	401181	6450985	18 (112)	0.5 (35.3)	10	10.2	6.3	0.6 (44.6)	0.03 (20.63)	1.7	1.6
2	402744	6450767	27 (121)	0.3 (35.1)	11.6	15.5	7.6	0.5 (44.5)	0.02 (20.62)	3	2.8
3	401074	6450498	31 (125)	0.6 (35.4)	16.5	18	7.5	0.6 (44.6)	0.04 (20.64)	3	2.7
4	403698	6450518	49 (143)	0.3 (35.1)	15.6	28.5	8.3	0.6 (44.6)	0.02 (20.62)	5.1	4.8
5	402847	6450249	34 (128)	0.3 (35.1)	12.3	19.4	7.4	0.6 (44.6)	0.02 (20.62)	3.2	2.8
6	402911	6450039	22 (116)	0.5 (35.3)	10.9	12.6	11.9	0.7 (44.7)	0.03 (20.63)	2.1	1.9
7	404027	6450015	39 (133)	0.4 (35.2)	12.1	22.9	7.3	0.4 (44.4)	0.03 (20.63)	3.9	3.6
8	400809	6449726	27 (121)	0.5 (35.3)	14.1	15.2	8.6	0.6 (44.6)	0.03 (20.63)	2.5	2.3
9	403496	6449750	33 (127)	0.6 (35.4)	14	19.4	9.4	0.5 (44.5)	0.04 (20.64)	3.3	3
10	400271	6449421	39 (133)	0.4 (35.2)	18.1	22.5	9.1	0.5 (44.5)	0.02 (20.62)	3.8	3.6
11	403817	6449350	34 (128)	1.2 (36)	14.9	19.9	11.3	0.8 (44.8)	0.08 (20.68)	3.5	3.2
12	400374	6448270	39 (133)	0.5 (35.3)	18.5	22.7	7.1	0.7 (44.7)	0.04 (20.64)	3.9	3.6
13	401569	6447708	32 (126)	0.4 (35.2)	12.8	18.8	5.7	0.3 (44.3)	0.03 (20.63)	3.1	2.7
14	402420	6447680	36 (130)	0.6 (35.4)	15.9	20.5	6.9	0.4 (44.4)	0.05 (20.65)	3.3	2.9
15	402384	6447708	37 (131)	0.6 (35.4)	16.5	21.2	7.1	0.4 (44.4)	0.05 (20.65)	3.5	3.1
16	403552	6447169	49 (143)	0.8 (35.6)	19.3	27.9	11.6	0.6 (44.6)	0.06 (20.66)	4.6	4.1
17	400670	6447059	25 (119)	0.4 (35.2)	12.9	14.5	5.6	0.4 (44.4)	0.03 (20.63)	2.5	2.3
18	400845	6447027	30 (124)	0.4 (35.2)	13.3	17.5	4.5	0.3 (44.3)	0.03 (20.63)	3.1	2.9
All modelled locations			100 (194)	3.2 (38)	36.5	57.9	28.1	2.2 (46.2)	0.19 (20.79)	9.6	8.8
Criteria			*246*	*62*	*100000*	*30000*	*10000*	*50*	*30*	*20*	*29*

Table 13: Air Quality Emissions from Central processing facility Site 7 (µg/m^2) (AECOM, November 2009)

Receptor Number	X	Y	NO_2		CO			PM_{10}		1 hour Formaldehyde	1 hour Benzene
			1 hour	Annual	15 min	1 hour	8 hour	24 hour	Annual		
1	400085	6445061	27 (121)	0.4 (35.2)	14.4	15.7	7.7	0.7 (44.7)	0.03 (20.63)	1.8	2.4
2	401471	6445045	22 (116)	0.3 (35.1)	8.9	12.5	8.2	0.5 (45)	0.02 (20.62)	2	1.8
3	400052	6444843	29 (126)	0.5 (35.3)	15.7	16.9	7.4	0.6 (45)	0.03 (20.63)	1.8	2.4
4	400023	6444786	29 (126)	0.5 (35.3)	15.8	16.8	6.7	0.6 (45)	0.04 (20.64)	1.7	2.4
5	400019	6444736	30 (126)	0.5 (35.3)	16.2	17.1	6.7	0.6 (45)	0.04 (20.64)	1.8	2.4
6	399982	6444699	29 (123)	0.6 (35.4)	15.9	16.6	6.9	0.6 (45)	0.04 (20.64)	2	2.3
7	399945	6444629	26 (120)	0.6 (35.4)	14.7	14.9	8.1	0.6 (45)	0.04 (20.64)	2.3	2.2
8	399970	6444621	27 (121)	0.6 (35.4)	15	15.3	7.7	0.5 (45)	0.04 (20.64)	2.2	2.1
9	400019	6444613	31 (125)	0.6 (35.4)	17	17.7	6.8	0.6 (45)	0.04 (20.64)	2	2.4
10	399768	6444526	33 (128)	0.8 (35.6)	18.5	19.1	10.7	1 (45)	0.05 (20.65)	1.9	2.9
11	399805	6444489	32 (127)	0.8 (35.6)	18.1	18.6	10.9	0.9 (45)	0.05 (20.65)	2.1	2.9
12	399797	6444432	37 (131)	0.8 (35.6)	20.4	21	11.5	1 (45)	0.06 (20.66)	2	3.1
13	399073	6444452	31 (126)	0.6 (35.4)	16.5	17.9	9.2	0.9 (45)	0.04 (20.64)	2.6	2.6
14	399797	6444403	38 (133)	0.8 (35.6)	21	21.7	11.7	1 (45)	0.06 (20.66)	2	3.2
15	399994	6443626	39 (135)	0.9 (35.7)	17.5	22.5	16.9	0.9 (45)	0.06 (20.66)	3.2	3.3
16	398740	6443243	28 (123)	0.5 (35.3)	14.5	16.3	8.4	0.5 (45)	0.04 (20.64)	2.1	2.6
17	399427	6443161	31 (126)	0.9 (35.7)	16.5	18	9.5	0.7 (45)	0.06 (20.66)	2.3	2.7
18	399616	6442482	36 (131)	0.6 (35.4)	15	20.6	7.2	0.4 (44)	0.04 (20.64)	2.8	3.3
19	400912	6441199	44 (141)	0.6 (35.4)	17.8	25.4	6.3	0.5 (45)	0.05 (20.65)	3.5	3.6
All modelled locations			97 (202)	3 (37.8)	47.8	55	33.4	2.1 (46)	0.18 (20.78)	5.5	6.6
Criteria			***246***	***62***	***100000***	***30000***	***10000***	***50***	***30***	***20***	***29***

Table 14: Air Quality Emissions from the Hexham Delivery Station (µg/m^2) (AECOM, November 2009)

Pollutant	Averaging Period	Concentration	Criteria
NO_2	1 hour	96.5 (190.5)	246
	Annual	7.2 (42.0)	62
CO	15 min	29.8	100,000
	1 hour	29.5	30,000
	8 hour	22.0	10,000
PM_{10}	24 hour	1.7 (45.7)	50
	Annual	0.19 (20.8)	30
Benzene[1]	1 hour	0.14	29

[1] All VOC assumed to present as Benzene

Consideration

Revised Assessment

In response to concerns raised by DECCW that the NO_2 and formaldehyde assessment presented in the Environmental Assessment for the central processing facility was likely to have been based on inaccurate volumetric flow rate information, the Proponent presented a revised assessment of central processing facility emissions in its Submissions Report. The new assessment presented a revised assessment of NO_2 and CO as these pollutants were originally modelled based on volumetric flow rate, whilst formaldehyde emissions were modelled based on fuel usage (which has not changed) and therefore an additional assessment on formaldehyde was not undertaken. DECCW nevertheless considered that the revised volumetric rate would be relevant in relation to formaldehyde emissions and recommended re-confirmation of formaldehyde emissions based on the revised volumetric flow rate and associated exit velocity data. In response to ongoing concern by DECCW, the Proponent undertook additional assessment of formaldehyde emissions from the central processing facility, subsequent to the submissions report stage.

The Proponent's revised assessment on NO_2, CO and formaldehyde (refer Tables 15-17 below) indicated compliance with relevant NO_2, CO and formaldehyde criteria in all cases for all averaging periods. DECCW nevertheless, raised concern that the revised assessment for CO (whilst now based on accurate volumetric flow rate data), appeared to have been modelled based on a higher CO emission concentration of 950 mg/m^3, compared to the regulated limit of 125 mg/m^3 under the *Protection of the Environment Operations (Clean Air) Regulation*. DECCW noted that the Proponent would need to demonstrate that the central processing facility can

be designed to achieve a CO emission limit of 125 mg/m^3 or an equivalent volatile organic compound (VOC) limit of 40 mg/m^3.

Table 15: Ten Highest Predicted Cumulative 1 Hour NO_2 Concentrations - Central processing facility (from AECOM, May 2010)

Rank	Sensitive Receptors – CPF Site 1		Sensitive Receptors – CPF Site 7	
	Background NO_2 (µg/m^2)	Cumulative NO_2 (µg/m^2)	Background NO_2 (µg/m^2)	Cumulative NO_2 (µg/m^2)
1	9.4	63.7	11..3	69.6
2	1.9	54.8	11.3	67.9
3	9.4	62.1	11.3	66.8
4	1.9	54.4	3.8	58.8
5	3.8	52.4	9.4	63.1
6	9.4	57.5	3.8	57.3
7	3.8	49.6	13.2	66.1
8	3.8	48.8	9.4	62.2
9	1.9	45.7	7.5	58.0
10	16.9	60.3	15.0	65.4
Criterion	246			

Table 16: Predicted Annual NO_2 Concentrations and CO Concentrations - Central processing facility (from AECOM, May 2010)

Receptor	CPF Site 1				CPF Site 7			
	CO 15 Min (µg/m^2)	CO 1 Hour (µg/m^2)	CO 8 Hour (µg/m^2)	NO_2 Annual (µg/m^2)	CO 15 Min (µg/m^2)	CO 1 Hour (µg/m^2)	CO 8 Hour (µg/m^2)	NO_2 Annual (µg/m^2)
1	93.78	97.2	60.8	18.6	141.6	189.9	93.7	18.8
2	114.4	213.0	74.8	17.9	159.3	151.6	87.0	18.0
3	146.4	156.9	70.1	19.0	218.6	224.8	92.8	19.3
4	153.1	320.4	75.5	18.0	224.0	212.7	98.9	19.4
5	111.7	194.4	76.4	18.1	211.7	203.6	104.0	19.6
6	119.6	139.3	113.7	18.5	234.6	236.4	108.2	19.7
7	117.1	218.2	63.7	18.3	215.5	226.7	117.7	20.0
8	121.1	127.6	72.1	18.7	213.1	232.6	114.4	20.0
9	117.7	193.3	86.3	18.9	233.4	236.7	111.1	19.9
10	17107	213.2	85.6	18.2	205.4	192.7	110.6	20.4
11	11.6	215.6	96.2	20.7	199.3	196.0	115.8	20.5
12	173.6	211.5	79.3	18.8	214.1	197.8	120.8	20.6
13	117.3	150.8	70.5	18.4	176.2	193.4	95.0	19.4
14	146.1	214.9	81.0	19.3	212.2	201.7	122.3	20.6
15	151.4	187.0	81.1	9.4	200.3	265.4	161.9	21.4
16	173.7	250.0	85.1	19.7	222.0	203.9	93.5	18.9
17	118.3	143.1	47.4	18.2	226.0	242.3	129.5	20.4
18	128.6	186.1	37.3	18.2	247.0	288.8	74.0	19.5
19	-	-	-	-	212.1	266.2	75.8	19.5
All locations	424.3	728.0	249.1	26.9	732.2	1278.0	587.5	29.1
Criteria	100,000	30,000	10,000	62	100,000	30,000	10,000	62

Table 17: Predicted 1-hour Formaldehyde Concentrations (µg/m^2) from the Central Processing Facility (from AECOM, November 2010)

Receptor	CPF Site 1	CPF Site 7
1	1.7	1.9
2	2.3	2.0
3	2.2	1.8
4	2.8	1.8
5	2.3	1.8
6	2.2	2.0
7	3.3	2.3
8	2.5	2.2

9	3.1	2.0
10	2.3	1.9
11	3.5	2.1
12	3.4	2.0
13	2.4	2.6
14	3.1	2.1
15	3.5	3.3
16	4.3	2.2
17	2.6	2.3
18	2.8	2.8
19	N/A	3.5
Criteria	20	20

Operational Impacts

The Department concurs with the Proponent's assessment that the key operational air quality risks associated with the project relate to emissions from gas well flaring at the commission stage, the operation of the central processing facility and gas delivery station. The Department also concurs with the Proponent's assessment that the proposed use of generators at the gas wells during the commission stage is unlikely to pose a significant or long-term air quality risk or that the project would not pose a risk of adverse of odour impacts.

In relation to impacts from gas well flaring and the operation of the central processing facility and gas delivery station, the Department is satisfied that the Proponent has undertaken an appropriately robust and conservative operational air quality assessment consistent with the requirements of the Approved Methods. Based on this assessment, the Department is satisfied that (with the exception of 24 hour PM_{10} limits for the flaring of the gas wells) the project would achieve all relevant air quality limits at surrounding receptors and would not pose a significant risk of air quality impacts to the local or regional air shed.

The Department notes DECCW's concerns that the Proponent's assessment had likely overestimated nitrogen dioxide emissions from the Hexham Delivery Station by assuming NO_2 emissions of 393 mg/m^3 from the water bath heater of the delivery station (compared to the regulatory limit of 350 mg/m^3) and overestimated CO emissions by assuming emissions of 950 mg/m^3 from the electricity generating component of the processing facility (compared to the regulated limit of 125 mg/m^3). The Department notes that as NO_2 and CO assessment criteria at receptors are predicted to be satisfied under the over-estimated emission limits, if emissions were reduced at source to the regulatory limit of 350 mg/m^3 for NO_2 and 125 mg/m^3 for CO (or the equivalent volatile organic compound (VOC) limit of 40 mg/m^3), then nitrogen dioxide and carbon monoxide impacts at surrounding receptors are likely to be even lower than predicted. The Proponent has raised no difficulty with the water bath heater for the Hexham Delivery Station being designed to achieve the regulatory NO_2 limit of 350 mg/m^3, and for the central processing facility to achieve the regulatory VOC limit of 40 mg/m^3. Therefore, Department has recommended these lower NO_2 and VOC emission limits in its recommended conditions of approval for these components of the project. The Department has also recommended at source emission limits for all other relevant pollutants at the Hexham Delivery Station and central processing facility, consistent with DECCW recommendations, to ensure that acceptable air quality outcomes from these facilities are achieved at surrounding receptors in relation to all relevant pollutants at all times.

In relation to the exceedance of 24 hour PM_{10} limits identified for the flaring of the gas wells, the Department notes that these exceedances are based on the highly conservative background data used in the predictions, which have been sourced from Wallsend and which is expected to present a higher background concentration of particulate matter than the rural areas near Stroud and Gloucester in which the gas wells are proposed to be developed, due to its more built up nature (near Newcastle) and proximity to the Pacific Highway. The conservative nature of background data has also been noted by DECCW. Consequently, the Department considers that the use of Wallsend background data is likely to have overestimated impacts with actual PM_{10} concentrations in the subject rural areas likely to be significantly lower, meaning that cumulative PM_{10} limits are likely in practice to be comfortably achieved at surrounding receptors. In this regard, the Department notes that the actual contributions from the well sites themselves (excluding background levels) are predicted to be very low (i.e. 10.8 μg/m^2) and well below the DECCW criteria of 50 μg/m^2 for the 24-hour period; and even when added to conservative background PM_{10} data from Wallsend are only expected to exceed DECCW criteria very close to the source and would fall away rapidly with distance from the well and be below DECCW criteria within 150 metres of

a well site (noting that well sites are proposed to be located at least 200 metres from nearby receptors). Consequently, the Department is satisfied that the flaring of individual gas wells would not pose a high risk of exceeding short-term PM_{10} criteria at surrounding receptors.

Nevertheless, public submissions raised concerns regarding potential cumulative particulate matter impacts from the project (gas well flaring and the operation of the central processing facility) and surrounding mining operations on receptors in the Gloucester area. Submissions raised particular concern regarding potential health impacts from small particulate matter (i.e. $PM_{2.5}$) emissions, which are strongly correlated with respiratory health effects. Given the short term nature of gas well flaring (i.e. limited to the commissioning stage, when the central processing facility would not be operating at full capacity) and the low contribution of particulate matter predicted to be emitted by the gas wells (i.e. 10.8 $\mu g/m^2$ for the 1-hour period) and the central processing facility (i.e. < 1 $\mu g/m^2$ for the 24-hour period and <0.1 $\mu g/m^2$ for the annual period), the Department is satisfied that the project would not be a significant contributor of particulate matter to the air-shed and therefore would not pose a significant risk of cumulative impacts even in localities where existing mining activities are contributing emissions to the local air-shed.

Furthermore, the Department notes that the Proponent has identified the minimum spacing required to be maintained between flaring wells to avoid the potential for cumulative air quality impacts from gas well flaring (i.e. 800 metres for triangular positioning and 500 metres for straight line spacing and 4 kilometres between clusters of flared wells). The Department notes that the Proponent's assessment was based on the conservative assumption of worst case gas flow rates at each well (i.e. 0.1639 m^3/second), although actual gas flow rates are expected to be significantly lower (i.e. around 0.0983 m^3/second). This means that cumulative air quality impacts are likely to be avoided even under reduced spacing between flared gas wells (i.e. 300 metres for triangular positioning and 100 metres for straight line spacing and one kilometre between clusters of flared wells). Therefore, relevant air quality criteria are expected to be comfortably achieved under the Proponent's nominal well spacing of 600 x 600 metres. The Department is therefore satisfied that subject to appropriate spacing between flaring wells, cumulative air quality impacts from the commissioning phase of the gas wells can be avoided and has recommended conditions of approval in this regard.

With respect to $PM_{2.5}$ impacts, the Department notes that whilst particulate matter smaller than 10 micrograms in diameter is not regulated in NSW, the Proponent has nevertheless compared the maximum concentrations of particulate matter predicted to be emitted by the project (on the conservative basis that all particulate matter emitted would constitute particles of < 2.5 micrograms in diameter) and determined these to be well below the advisory $PM_{2.5}$ limits published by the *National Environment Protection Council* as well as the regulated DECCW criteria for PM_{10} (refer Table 18 below). On this basis, the Department is satisfied that the project would not pose a risk of health impacts with the respect to particulate emissions.

Table 18: Comparison of PM_{10} and $PM_{2.5}$ Limits

Criteria ($\mu g/m^2$)		Predicted Maximum Concentrations ($\mu g/m^2$)		
		Gas Well Flaring	Central processing facility	Hexham Delivery Station
DECCW 24-Hour PM_{10}	50	10.8	1	1.7
DECCW Annual PM_{10}	30	-	0.08	0.19
NEPM 24-Hour $PM_{2.5}$	25	10.8	1	1.7
NEPM Annual $PM_{2.5}$	8	-	0.08	0.19

Construction Impacts

The Department is satisfied that construction related air quality impacts can be appropriately managed through the implementation of mitigation measures as identified by the Proponent and therefore would not result in unacceptable impacts to surrounding receptors. The Department has incorporated conditions of approval requiring all reasonable and feasible measures to be employed to minimise construction related air quality impacts.

Conclusion

In summary, the Department is satisfied that the construction and operational air quality impacts of the project can be managed so as to not result in unacceptable impacts to surrounding receptors. In relation to future development within the concept plan area, the Department is satisfied based on its assessment of construction

and operational air quality impacts of the gas wells within the stage 1 development area that there are no significant air quality constraints to the future development of wells within the broader concept plan area. The Department has incorporated comprehensive further assessment requirements in relation to air quality impacts as part of the recommended concept plan approval, which the Proponent must address in seeking any further approval for gas wells within the concept plan area.

5.5 Visual Amenity

Issue

The project would involve the construction of new above ground infrastructure including up to 110 gas wells in the first instance, a central gas processing facility and a gas delivery station at the termination of the gas pipeline. The scale of each gas well following rehabilitation would comprise a hard stand area of approximately 15 x 15 metres within which the gas well itself would comprise an area of approximately six by four metres and 2.5 metres in height. The central gas processing facility is expected to require a footprint of approximately six hectares, within which most infrastructure would be less than 10 metres in height, with the exception of two components. These comprise approximately 13 x 12 metre high compressor engine stacks and two x 30 metre high lightning diverter poles. The gas delivery station is expected to require a footprint of approximately 0.27 hectares within which all infrastructure would be less than 4.5 metres in height. The remaining key infrastructure associated with the project (gas/ water gathering lines for each gas well and the gas transport pipeline between the central processing facility and the delivery station) would be underground and are therefore not expected to pose a significant risk of visual impacts (following rehabilitation of construction related disturbance). The proposal would also require the development of up to two construction camps. However these would be temporary structures only and would be fully decommissioned and rehabilitated following construction.

The Proponent has undertaken a visual impact assessment of the key above ground infrastructure (gas wells and central processing facility) associated with the project, which are likely to pose a visual impact on surrounding receptors, due to their scale and location in a generally open rural landscape. The Proponent's assessment identified that the stage 1 gas wells are likely to be visible at a number of receptors located within 600 metres of the wells. The assessment found that there would be two receptors at which four wells would be visible, seven receptors at which three wells would be visible, 19 receptors at which two wells would be visible and 30 receptors at which only a single well site would be visible. The visual assessment of the central processing facility sites indicated that within a two kilometre radius, the highest structure at the site (the lightning diverter poles) is likely to be visible at up to 9 receptors at site "1" and at up to 18 receptors at site "7". The infrastructure proposed to be buried (gas/ water gathering lines and gas transport pipeline) was assessed as only likely to result in visual impacts during the construction period prior to rehabilitation works. The gas delivery station was not specifically assessed on the basis of the low potential for visual impacts, as it would be confined within industrial land amongst other similar infrastructure.

The project would traverse various landuses including generally rural/ agricultural dominated landscapes to the north (the Gloucester, Great Lakes and Dungog Local Government Areas) transitioning into more urbanised, residential and industrial landuse further to the south (Maitland, Port Stephens and Newcastle Local Government Areas). The gas wells and central processing facility are proposed to be located within an area known as the "Vale of Gloucester" between approximately Gloucester and Craven, which is subject to an indicative (but not full) listing under the no longer active Register of National Estate on the basis of scenic and historical values. The register was made inactive before the Vale was subject to a full listing. The listing for scenic value states *"the town of Gloucester is surrounded by a series of low hill ranges which dominate the valley floor and provide a spectacular backdrop to the agricultural activity that takes place in the valley"*.

Consideration

The Department concurs with the Proponent's identification of the gas wells and central processing facility as the project elements most likely to pose an ongoing visual impact to surrounding receptors. The Department is satisfied that subject to appropriate rehabilitation measures, the buried gas/ water gathering lines and gas transport pipeline are unlikely to pose a significant risk of ongoing visual impacts through disturbance 'scarring' of the landscape. The Department is also satisfied that the gas delivery station would not result in visual impacts, as it would be developed within an industrial precinct at Hexham amongst other industrial infrastructure of a similar function and scale (including the Sydney-Newcastle trunk gas pipeline) and would be consistent with the

industrial character of the site. The Department also considers that given their temporary nature, the construction camp sites would not pose a long-term visual impact to surrounding receptors or the landscape following appropriate rehabilitation post-construction.

With respect to the gas wells and central processing facility, the Department considers that the Proponent's visibility assessment of these components is likely to be highly conservative as it was based solely on topographic and distance factors and did not account for any screening factors such as vegetation (including wind breaks around rural properties) and built landform (such as farm buildings). Consequently, in practice these project components are likely to be less visible to receptors in many cases when taking into account intervening barriers such as vegetation and built landform, than the worst case predicted. In relation to the gas wells (for the stage 1 development area and the concept plan area), the Department notes that due to their relatively small scale, the visual prominence of these structures diminishes quickly with distance, with the wells not being visually obvious at approximately 200 metres (refer Figure 5) and being significantly blended into the landscape beyond 500 metres. The Proponent has identified that there are no residential receptors located within 200 metres of any wells within the Stage 1 development area and has committed to maintaining a similar minimum buffer distance to nearest receptors for any future gas well development in the concept plan area. The Department is satisfied that at distances greater than 200 metres, the gas wells would not pose an intrusive or significant visual impact on nearest receptors. The Department is also satisfied that the project would not significantly impact on scenic views along surrounding roads and tourist drives, given the transient nature of views and the dispersed nature of the well sites and intervening screening which would make views of multiple well sites rare. In relation to concerns raised in submissions regarding visual impacts from lighting and flaring at the well heads, the Department notes that lighting at well heads would only be temporary at the construction stage and flaring would only be required during the commissioning stage (when the flares would be confined within an enclosed structure and therefore not visible at nearest receptors). Consequently, lighting impacts are not considered to pose a significant or long-term risk of visual impact.

Figure 5: View of a Gas Well at 200 metres (AECOM, May 2010)

With respect to the central processing facility, the Department considers that (as with the well heads) intervening distance would provide visual attenuation to the majority of surrounding receptors. In this regard, the Department notes that no receptors are located within one kilometre of site option "1" and only one receptor is located within one kilometre of site option "7" (i.e. at approximately 400 metres). At distances greater than one kilometre, the

Department is satisfied that whilst some parts of the tallest structures of the facility may still be visible, the majority of the facility site would not pose an intrusive or dominant visual influence on surrounding receptors. Whilst the central processing facility at site "7" would be located relatively close to a single receptor (i.e. within 400 metres), the Department notes that at this location the facility would be sited on industrial zoned land, consistent with other existing industrial landuses including the Stratford coal mine and rail loop. The Department considers that subject to appropriate landscape and urban design the facility site would not pose an unacceptable visual impact at the nearest receptor to site "7" and has recommended conditions of approval in this regard. The Department's recommended conditions would ensure that the facility site (at whichever location) would incorporate appropriate urban design and landscaping to minimise visual intrusion and maximise visual screening of the site. With respect to lighting impacts, the Department notes that the facility would require exterior lighting as it would be operational on a 24 hour basis. However, the Department is confident that given separation distances from receptors and subject to appropriate lighting design, light spill from the facility can be appropriately managed so as to not cause nuisance or obtrusive impacts on surrounding receptors, and has recommended conditions in this regard.

With respect to impacts on the scenic and landscape values, the Department is satisfied that the siting of gas wells (within the stage 1 development area or in the future within the concept plan area) would not significantly affect broad scale rural vistas, as at distance and because of the dispersed nature of the wells, the structures would blend in with the landscape and existing rural and built infrastructure such as farm sheds, access roads and power lines. Similarly, the central processing facility, subject to appropriate landscape planting and screening, is unlikely to pose significant visual intrusion on the landscape, in particular at the proposed location near the existing Stratford coal mine, where the central processing facility would be located close to infrastructure of a similar function, scale and nature. When seen from long distance views such as from the Kia Ora lookout (some 8.9 kilometres away from the stage 1 development area) and the Buckett Scenic walk (some 5.1 kilometres from the stage 1 development area), the project components as a whole are considered unlikely to be especially intrusive or distinguishable from other built infrastructure in the area which are of a similar scale (including mining, farm dams and storage ponds, farm sheds, access roads and power lines). Consequently, the Department is satisfied that the project would not significantly alter the rural character or landscape values of the Gloucester area or impose an industrialising effect on the landscape over and above other existing built structures in the area.

With respect to specific impacts on the scenic value of the Vale, the Department notes that as the project components would be confined to the valley floor, it would have no material impact on the scenic values of the "*series of low hill ranges which dominate … and provide a spectacular backdrop to the…valley floor*"". Furthermore, as discussed above, at distance, the project components (most of which would be undergrounded) would blend in with the landscape and not compromise views of the valley or change the essential rural nature of these views by compromising the ongoing use of the valley for agricultural activity (refer Table 2, section 4.4 of this report). Consequently, the Department is satisfied that the project would not pose a risk to the scenic values of the Vale with respect to the "*agricultural activity that takes place in the valley*". On this basis, the Department is satisfied that the project would not pose an unacceptable risk to the scenic values of the Vale, which form part of its listing under the Register of National Estate.

In summary, the Department is satisfied that there are no significant visual constraints to the development of the project (including any future gas wells within the concept plan area), subject to appropriate landscaping and urban design measures and appropriate siting of project components with consideration to surrounding receptors. The Department has incorporated comprehensive further assessment requirements in relation to visual impacts as part of the recommended concept plan approval (including location criteria when siting any future gas wells), which the Proponent must address in seeking any further approval for gas wells within the concept plan area.

5.6 Heritage

Issue

Indigenous Heritage

The Proponent's indigenous heritage assessment recorded a total of 27 items across the site: six within the Stage 1 field area and 21 within the pipeline corridor (refer Table 19). The Proponent's assessment identified that no impacts were anticipated on the six sites identified within the Stage 1 field area (including two previously

registered items in the DECCW aboriginal heritage register). In relation to the items identified within the pipeline corridor, impacts were considered to be unavoidable to two surface artefact scatter sites with associated potential archaeological deposits (PADs) and to five potential sub-surface archaeological deposits (PADs), which are not associated with surface scatter. The Proponent's assessment has recommended that the PAD sites not associated with surface scatters be managed through the implementation of an Aboriginal Heritage Management Plan. The plan would detail procedures for dealing with any items uncovered during construction along these sites, and for the implementation of test excavation and salvage measures prior to the commencement of construction for the two artefact scatter sites with associated PADs to ensure that as much archaeological material as possible was collected prior to construction.

The Proponent has also identified that the pipeline route has the potential to impact on two additional sites, both of which comprised previously registered items in the DECCW Aboriginal heritage register: a bora/ceremonial ground and an isolated find associated with a massacre site. The Proponent's assessment has identified that impacts to these sites would be avoided as long as the pipeline is confined within the existing disturbed road easement in this area and has recommended that an archaeologist and Aboriginal community representative be on site to monitor the construction works to ensure that this occurs.

Whilst no items were recorded within either of the proposed sites for the central processing facility, the Proponent identified that Forster Local Aboriginal Land Council (FLALC) had advised that three isolated finds had previously been recorded (although not registered with DECCW) within the central processing facility site "1". The exact locations of these sites were not specified by FLALC and the sites were not uncovered during the site surveys for the current proposal. Should site "1" be developed for the central processing facility, the Proponent has committed to ensuring that the items are salvaged in accordance with procedures developed under the Aboriginal Heritage Management Plan.

Table 19: Impacts to Aboriginal Heritage Items

Aboriginal Heritage Items	Stage 1 Field Area		Central processing facility		Pipeline including Delivery Station	
	Recorded	Impacted	Recorded	Impacted	Recorded	Impacted
Scarred Trees	1	Nil	Nil	Nil	1	Nil
Isolated finds	1	Nil	Nil	3 (potential)	2	Nil
Artefact Scatter	1	Nil	Nil	Nil	3	2
Previously Recorded AHIMS	2 (Bora Ring and Isolated Find)	Nil	Nil	Nil	2 (Bora/ Ceremonial site and isolated find associated with massacre site)	2 (potential)
PAD	1	Nil	Nil	Nil	13	5
Total	6	Nil	Nil	3 (potential)	21	9 (2 potential and 7 likely)

European Heritage

The Proponent's assessment identified 11 historic items of potential European heritage value within the pipeline route for the project, none of which are currently listed as heritage items in local or State instruments. Of these, three items (a stock yard and two bridges) were identified as having the potential to be impacted during construction, through either direct disturbance or indirect impacts during construction close to the site. All three items were assessed as exhibiting no heritage significance.

Whilst no other historic items were identified within the proposed footprint of other project components, the Proponent's assessment identified that the stage 1 field area, central processing facility and parts of the future concept plan gas development area would be located within the area known as the "Vale of Gloucester" (approximately between Gloucester and Craven), which is subject to an indicative (but not full) listing under the no longer active Register of National Estate on the basis of scenic and historical values. The register was made

inactive before the Vale was subject to full listing. The listing for historical values states *"the Vale of Gloucester was discovered in 1826 by the chief agent of the Australian Agricultural Company, Mr Robert Dawson. During development of the Vale for sheep raising and later for cattle, the homestead was built"*. The Proponent's assessment has identified that the development of the project would have no effect on the historical basis for the nomination of the Vale of Gloucester under the Register of National Estate (which is not active).

Consideration

Indigenous Heritage

The Department is satisfied that the Proponent has undertaken a robust assessment of indigenous heritage impacts associated with the project, providing due opportunity for relevant Aboriginal stakeholders to take part in the assessment and development of mitigation measures for the project consistent with the *Guidelines for Aboriginal Cultural Impact Assessment and Community Consultation* (DEC, July 2005) (DECCW guidelines). Whilst the Department accepts that the Proponent's assessment did not identify the cultural heritage values of each of the items identified within its assessment, the Department is satisfied that relevant Aboriginal stakeholders were provided the opportunity to comment on cultural heritage values as part of the assessment of the project, consistent with the requirements of the DECCW guidelines, and that the Proponent's assessment reflected comments received by the community.

The Department accepts that all indigenous heritage items would be of value to Aboriginal stakeholders. Notwithstanding, in the absence of specific comment by the stakeholders on the particular cultural heritage values of each indigenous heritage item recorded in the Proponent's assessment, the Department has based its assessment of indigenous heritage impacts on the archaeological assessment (scientific/ educational values) provided in the Proponent's assessment and on advice by DECCW. In this regard, the Department notes that the two artefact scatters identified to be impacted by the project have been identified as exhibiting low scientific/ educational values, on the basis that they comprise examples of stone artefacts which are relatively widespread in the landscape and not representative of rare or unique archaeological value in a local or regional context. The Department considers that any subsurface deposits associated with these surface scatters are likely to be representative of artefacts of a similar nature. In this regard, the Department considers that whilst the site would not pose an unacceptable heritage constraint to the development of the project, the sites should be subject to appropriate excavation procedures to ensure adequate opportunity for salvage by indigenous heritage stakeholders. Salvage measures would ensure that the items are not destroyed and educational values are not lost.

With respect to the PAD sites, which are not associated with surface artefact scatters, the Department supports these sites being managed in accordance with appropriate procedures developed under the Aboriginal Heritage Management Plan. This is due to the areas being identified as PADs on conservative grounds, on the basis of landform rather than the presence of surrounding surface artefacts (which is an indicator of sub surface material), and may not in all cases warrant pre-construction subsurface investigations. The Department has incorporated conditions of approval requiring the Aboriginal Heritage Management Plan to be developed in consultation with indigenous heritage stakeholders and to identify management procedures for each PAD site including where pre-construction test excavation has been considered appropriate for likely higher risk sites (such as deep alluvial sediments close to waterways).

In relation to the previously registered items in the DECCW Aboriginal heritage register (a bora/ceremonial ground and an isolated find associated with a massacre site), the Department concurs with the Proponent's assessment that these sites are likely to exhibit high scientific values and would be expected to hold high cultural values to the Aboriginal community. In this regard, the Department supports the Proponent's intention to ensure that the pipeline is confined to the existing disturbed road reserve so as to avoid impacts on these items and to ensure an archaeologist and Aboriginal community representative are on site to monitor construction works near these sites. The Department has recommended conditions of approval to reinforce these commitments.

In relation to the three isolated artefacts that may be present within site option "1" for the central processing facility (based on FLALC advice), the Department is satisfied given the isolated nature of the items, that these would not pose an unacceptable constraint to development at this site, subject to all reasonable attempts being made to relocate and salvage the sites in consultation with the FLALC. The Department has recommended conditions in this regard, should the central processing facility be located at site "1".

The Department is satisfied given the minimal indigenous heritage constraints identified within the Stage 1 field development area (i.e. comprising largely cleared rural grazing land) that a temporary construction camp as proposed by the Proponent can be located within this area (i.e. within the Tiedeman property) without significant impacts on heritage value. The Department has incorporated conditions of approval requiring the final location of the camp to be located in an area that does not require any additional impact on heritage items as identified in the current assessment. The Department notes that the second potential location for a construction camp (for construction personnel associated with the pipeline) has yet to be determined, however it is proposed to be sited consistent with similar locational principles of avoiding heritage impacts as far as practicable. The Department supports this and has incorporated conditions in this regard, including the requirement for any additional construction camp site to be located within the already assessed development footprint of the project.

The Department is also satisfied, given the generally disturbed context (i.e. rural / agricultural landuse) within which any future gas wells would be developed and the inherent flexibility of gas well location, that future gas well development within the concept plan area is unlikely to pose a significant risk to indigenous heritage values. The Department has incorporated comprehensive further assessment requirements in relation to indigenous heritage values as part of the recommended concept plan approval, which the Proponent must address in seeking any further approval for gas wells within the concept plan area, to assess the indigenous heritage values and demonstrate that impacts to any identified objects have been avoided as far as possible.

In summary, the Department is satisfied that with the implementation of the above recommended conditions, the project can be managed so as to avoid unacceptable indigenous heritage impacts.

European Heritage

Based on the Proponent's assessment, the Department is satisfied that the three European heritage items likely to be impacted by the project do not pose a constraint to the development of the project, as all three items have been assessed as not exhibiting any heritage values or of conservation significance. As with indigenous heritage values, the Department is satisfied given the inherent flexibility of design, that any future gas well development within the concept plan area is unlikely to pose a significant risk to any European heritage values. The Department has incorporated further assessment requirements in relation to European heritage values as part of the recommended concept plan approval, which the Proponent must address in seeking any further approval for gas wells within the concept plan area. Based on the Proponent's assessment, the Department is also satisfied that the Stage 1 field development area would not pose any significant European heritage constraints for the development of a temporary construction camp at this location.

With respect to impacts to the heritage values of the "Vale of Gloucester", the Department is satisfied that the project would not result in any direct impacts to the historical basis for the nomination of the Vale of Gloucester under the Register of National Estate, as this is based purely on a historical occurrence (i.e. the discovery of the Vale and the building of a homestead) that is unrelated to the project. With respect to concerns raised in submissions regarding the impact of the project on the heritage values and cultural significance of the Vale on the basis of its visual impacts, the Department is satisfied based on its assessment of visual and landscape values (refer section 5.5) that the project (including any future development of wells within the concept plan area) would not result in unacceptable impacts on the rural/ agricultural character or associated scenic values of the Vale and therefore would not pose an unacceptable risk on the historical or cultural values of the Vale.

6. CONCLUSIONS AND RECOMMENDATIONS

The Department accepts the need for the Gloucester Gas Project with respect to helping to meet existing and future demand for natural gas, strengthening gas supply security and capacity in NSW, and providing opportunities for associated economic growth. Furthermore, by helping to secure less-greenhouse gas intensive fuel resources, the Department considers that the project would help meet the greenhouse gas priorities and targets of the NSW State Plan including "achieve a 60% cut in greenhouse gas emissions by 2050 in line with the Federal Government targets".

The key environmental issues associated with the project relate to surface and ground water, noise and vibration, flora and fauna, air quality, visual amenity and heritage impacts. Submissions on the project mainly reflected these issues. Other concerns raised included traffic and transport, rehabilitation, construction camps and development contributions.

The Department has assessed the Proponent's Environmental Assessment, Preferred Project Report and Statement of Commitments and submissions received on the project. Based on its assessment, the Department is satisfied that the Proponent has undertaken an appropriate and conservative level of assessment covering all aspects of the project including the concept plan area, both central processing facility site options and the 100 metre wide assessment corridor for the gas pipeline. The Department is further satisfied that the project can be constructed and operated consistent with best practice and acceptable environmental and amenity standards. Whilst some residual impact may occur in relation to operational noise from the Hexham gas delivery station, the Department considers that this would not outweigh the overall need and benefits of the project and therefore does not warrant refusal of the project. The Department has recommended acquisition rights to protect landowner interests, in the event that detailed design investigations confirm that operational noise emissions from the delivery station are likely to significantly exceed criteria.

In summary, the Department's assessment concludes that there are no significant environmental or amenity constraints to the development of the project as proposed. Consequently, the Department has recommended concept plan approval for the proposal as a whole. The Department is also satisfied that the Proponent has undertaken sufficient assessment of all project elements for which project approval has been sought (i.e. the stage 1 field development area of 110 gas wells, the two site options for the central processing facility, the 100 metre wide gas pipeline corridor, the gas delivery station at Hexham and potential constraints associated with temporary construction facilities). Consequently, the Department has recommended full project approval for these project elements. The Department considers that granting project approval for the two site options for the central processing facility and the 100 metre wide gas pipeline corridor would provide the Proponent with maximum flexibility during the detailed design phase of determining the final facility option and pipeline route with consideration to operational efficiencies, environmental and amenity constraints, landowner preferences and constructability (the latter issues are particularly relevant in relation to the pipeline corridor). The Department has formulated stringent recommended conditions of approval in relation to surface and ground water, noise and vibration, flora and fauna, air quality, visual amenity and heritage impacts as part of its recommended project approval to ensure that these project elements achieve acceptable environmental standards and to ensure that public amenity is protected and residual impacts are offset, as far as practicable.

It is noted also that the Proponent has not sought project approval for further stages of gas extraction beyond the first stage of 110 wells at this stage. The Department has required any future approvals for future gas extraction in the concept plan area be progressed under Part 3A of the *Environmental Planning & Assessment Act 1979*. Furthermore, the Department has incorporated comprehensive further assessment requirements in relation to surface and ground water, noise and vibration, flora and fauna, air quality, visual amenity and heritage impacts as part of the recommended concept plan approval, which the Proponent must address in seeking any further approval for gas wells within the concept plan area.

On balance, the Department considers the project to be justified and in the public's interest and should be approved subject to conditions in relation to the concept plan and project components, and the Proponent's Statement of Commitments.

The proposal requires determination by the Planning and Assessment Commission pursuant to the Minister's delegation dated 15 November 2008 in relation to project applications which are the subject of reportable political donations and pursuant to the Minister's delegation dated 28 September 2010 in relation to the concept plan application for the Gloucester Gas Project.

It is therefore, recommended that the Planning Assessment Commission:

a) pursuant to Section 75I(2) of the EP&A Act, **consider** the matters contained in the Director General's Environmental Assessment Report (this report) including all associated appendices;
b) having considered all relevant matters under the EP&A Act in accordance with a) above, in accordance with the delegation dated 28 September 2010 by the Minister for Planning, **approve** Concept Plan Application (MP 08_0154) pursuant to Section 75O of EP&A Act, by signing the attached instrument of concept plan approval (tagged **1**); and
c) having considered all relevant matters under the EP&A Act in accordance with a) above, in accordance with the delegation dated 15 November 2008 by the Minister for Planning, **approve** Project Application (MP 08_0154) pursuant to Section 75J of EP&A Act, by signing the attached instrument of project approval (tagged **2**).

Dinuka McKenzie
Senior Planner - Energy and Water
Infrastructure Projects

30/11/10

Daniel Keary
Director
Infrastructure Projects

20.12.10

Chris Wilson
Executive Director
Major Project Assessments

21/12/10

Richard Pearson
Deputy-Director General
Development Assessment and Systems Performance

APPENDIX A – SPECIES LIST

Species/ Populations/ Endangered Ecological Communities	*Environment Protection and Biodiversity Conservation Act 1999 (Cth)*	*Threatened Species Conservation Act 1995 (NSW)*
Endangered Ecological Communities		
Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	N/A	Y
Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions	N/A	Y
Lower Hunter Spotted Gum - Ironbark Forest in the Sydney basin Bioregion	N/A	Y
Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion	N/A	Y
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	N/A	Y
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	N/A	Y
Endangered Populations	N/A	Y
Weeping Myall *(Acacia pendula)*	N/A	Y
Tiger Orchid *(Cymbidium Canaliculatum)*	N/A	Y
Parramatta Red Gum *(Eucalyptus parramattensis)*	N/A	Y
Narrow-leaved Red Gum *(Eucalyptus seeana)*	N/A	Y
Eastern Australian Underground Orchid *(Rhizanthella slateri)*	N/A	Y
Flora		
Trailing Woodruff *(Asperula asthenes)*	Y	Y
Netted Bottle Brush (*Callistemon linearifolius)*	-	Y
Leafless Tongue Orchid *(Cryptostylis hunteriana)*	Y	Y
White-flowered Wax Plant *(Cynanchum elegans)*	Y	Y
Slaty Red Gum (*Eucalyptus glaucina*)	Y	Y
Eucalyptus parramattensis subsp. *decadens*	Y	Y
Guthrie's Grevillea (*Grevillea guthrieana)*	Y	Y
Small-flower Grevillea (*Grevillea parviflora* subsp. *parviflora*)	Y	Y
Maundia triglochinoides	-	Y
Tall Knotweed *(Persicaria elatior*)	Y	Y
Scant Pomaderris (*Pomaderris queenslandica)*	-	Y
Eastern Australian Underground Orchid (*Rhizanthella slateri)*	Y	Y
Black-eyed Susan *(Tetratheca juncea)*	Y	Y
Zannichellia palustris	-	Y
Fauna		
Green and Golden Bell Frog (*Litoria aurea*)	Y	Y
Stuttering Frog (*Mixophyes balbus*)	Y	Y
Giant Barred Frog *(Mixophyes iterates)*	Y	Y
Pale-headed Snake (*Hoplocephalus bitorquatus*)	-	Y
Stephens' Banded Snake *(Hoplocephalus Stephensii)*	-	Y
Magpie Goose (*Anseranas semipalmata*)	-	Y
Australasian Bittern (*Botaurus poiciloptilus*)	-	Y
Bush Stone-curlew (*Burhinus grallarius)*	-	Y
Gang-gang Cockatoo (*Callocephalon fimbriatum*)	-	Y
Glossy Black-cockatoo (*Calyptorhynchus lathami*)	-	Y
Brown Treecreeper (eastern subspecies) (*Climacteris picumnus victoria*)	-	Y

Barred Cuckoo-shrike (*Coracina lineata*)	-	Y
Black-necked Stork (*Ephippiorhynchus asiaticus*)	-	Y
Comb-crested jacana (*Irediparra Gallinacean)*	-	Y
Black Bittern (*Ixobrychus flavicollis*)	-	Y
Swift Parrot (*Lathamus discolor*)	Y[M]	Y
Square-tailed Kite (*Lophoictinia isura*)	-	Y
Hooded Robin (*Melanodryas cucullata*)	-	Y
Black-chinned Honeyeater (*Melithreptus gularis gularis)*	-	Y
Turquoise Parrot (*Neophema pulchella*)	-	Y
Barking Owl (*Ninox connivens*)	-	Y
Powerful Owl (*Ninox strenua*)	-	Y
Grey-crowned Babbler (*Pomatostomus temporalis temporalis)*	-	Y
Speckled Warbler (*Pyrrholaemus saggitatus*	-	Y
Painted Snipe (*Rostratula benghalensis*)	Y	Y
Diamond Firetail (*Stagonopleura guttata*)	-	Y
Masked Owl (*Tyto novaehollandiae*)	-	Y
Sooty Owl (*Tyto tenebricosa*)	-	Y
Regent Honeyeater (*Xanthomyza phrygia*)	Y	Y
Eastern Pygmy-possum (*Cercartetus nanus*)	-	Y
Large-eared Pied Bat (*Chalinolobus dwyeri)*	Y	Y
Spotted-tailed Quoll (*Dasyurus maculatus maculatus*)	Y	Y
Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)	-	Y
Parma Wallaby (*Macropus parma*)	-	Y
Little Bentwing-bat (*Miniopterus australis)*	-	Y
Common Bent-wing bat (*Miniopterus schreibersii))*	-	Y
Eastern Freetail-bat (*Mormopterus norfolkensis*)	-	Y
Large-footed Myotis (*Myotis macropus*)	-	Y
Yellow-bellied Glider (*Petaurus australis*)	-	Y
Squirrel Glider (*Petaurus norfolcensis*)	-	Y
Brush-tailed Phascogale *(Phascogale tapoatafa)*	-	Y
Koala (*Phascolarctos cinereus*)	-	Y
Common Planigale *(Planigalae maculata)*	-	Y
Long-nosed Potoroo (*Potorous tridactylus tridactylus*)	Y	Y
Grey-headed Flying-fox (*Pteropus poliocephalus*)	Y	Y
Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)	-	Y
Greater Broad-nosed Bat (*Scoteanax rueppellii)*	-	Y
Migratory Birds		
Painted Snipe (*Rostratula benghalensis*)	Y	N/A
White-bellied Sea-Eagle (*Haliaeetus leucogaster*)	Y	N/A
Great Egret (*Ardea alba*)	Y	N/A
Cattle Egret (Ardea ibis)	Y	N/A
Latham's Snipe (*Gallinago hardwickii*)	Y	N/A
Ruddy Turnstone (*Arenaria interpres*)	Y	N/A
Sharp-tailed Sandpiper (*Calidris acuminate*)	Y	N/A
Curlew Sandpiper (*Calidris ferruginea*)	Y	N/A
Pacific Golden Plover (*Pluvialis fulva*)	Y	N/A
Common Greenshank *(Tringa nebularia)*	y	N/A
Bar-tailed Godwit (*Limosa lapponica*)	Y	N/A
Eastern Curlew (*Numenius madagascariensis*)	Y	N/A
Whimbrel (*Numenius phaeopus*)	Y	N/A
Fork-tailed Swift (*Apus pacificus*)	Y	N/A
White-throated Needletail (*Hirundapus caudacutus*)	Y	N/A
Rainbow Bee-eater (*Merops ornatus*)	Y	N/A
Swift Parrot (*Lathamus discolor*)	Y	N/A
Regent Honeyeater (*Xanthomyza phrygia*)	Y	N/A
Black-faced Monarch (*Monarcha melanopsis*)	Y	N/A
Spectacled Monarch (*Monarcha trivirgatus*)	Y	N/A
Satin Flycatcher (*Myiagra cyanoleuca*)	Y	N/A
Rufous Fantail (*Rhipidura rufifrons*)	Y	N/A

APPENDIX B – RECOMMENDED CONDITIONS OF APPROVAL

APPENDIX C – STATEMENT OF COMMITMENTS

APPENDIX D – ENVIRONMENTAL ASSESSMENT

APPENDIX E – RESPONSE TO SUBMISSIONS

APPENDIX F – ADDITIONAL INFORMATION

1. Groundwater – Conceptual Hydro-geological Model of Stage 1 Gas Field Development Area

2. Flora & Fauna – Additional information on pre-construction surveys and offset sites (Note: commercial in-confidence)

3. Indicative Management Plans – Acid Sulphate Soil and Small-flower Grevillia Management

4. Additional air quality assessment (Note: commercial in-confidence)

APPENDIX G – POLITICAL DONATIONS DISCLOSURE

Refer Department of Planning's Website:

- http://majorprojects.planning.nsw.gov.au/files/51429/Political%20Donations%20Disclosure%20.pdf
- http://majorprojects.planning.nsw.gov.au/files/51430/Political%20Donations%20Disclosure%20.pdf

APPENDIX H – PAC DELEGATION

1. Minister's delegation dated 15 November 2008

2. Minister's delegation dated 28 September 2010