



Department of
Infrastructure, Planning and Natural Resources

CAMDEN GAS PROJECT - STAGE 2

COAL SEAM METHANE EXTRACTION

PROPOSAL BY SYDNEY GAS OPERATIONS PTY LTD

Report on the Assessment of a Development Application (DA 282-6-2003 -i) Pursuant
to Section 79C of the Environmental Planning and Assessment Act 1979

File: S02/02299

NSW DEPARTMENT OF INFRASTRUCTURE, PLANNING AND NATURAL
RESOURCES

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TABLE OF CONTENTS

1. SUMMARY	1
2. EXISTING GAS EXTRACTION - CAMDEN GAS PROJECT STAGE 1.....	2
2.1 Stage 1 Infrastructure.....	2
2.2 Existing Gas Production Operations.....	2
2.3 Operating Hours.....	3
2.4 Workforce	3
2.5 Production from Stage 1.....	3
3. PROPOSED DEVELOPMENT – CAMDEN GAS PROJECT STAGE 2	3
3.1 Infrastructure.....	3
3.2 Project Stages.....	4
3.3 Gas Wells.....	4
3.4 Proposed Gas Production Operations	4
3.5 Gas Gathering System	6
3.6 Gas Treatment Plant.....	6
3.7 Flare	6
3.8 Waste Management.....	7
3.9 Energy Requirements.....	7
3.10 Proposed Construction and Operating Hours.....	7
3.11 Proposed Workforce.....	7
3.12 Production from Stage 2.....	7
3.13 Petroleum Exploration Lease	7
3.14 Project Closure and Rehabilitation.....	8
3.15 Justification of the Proposal.....	8
4. STATUTORY CONTEXT.....	8
4.1 Environmental Planning and Assessment Act 1979	8
4.2 Commonwealth Approvals.....	10
5. CONSULTATION	11
5.1 Government Agency Submissions.....	12
5.2 Submissions from Elected Representatives.....	18
5.3 Council Submissions.....	18
5.4 Interest Group Submissions.....	20
5.5 Business Submissions	20
5.6 Private Submissions.....	20
5.7 Commission of Inquiry.....	22
6. DEPARTMENTS CONSIDERATION OF KEY ISSUES	23
6.1 Socio-economic / Community Impact.....	23
6.2 Land Use Conflict and Future Urban Release Areas.....	25
6.3 Statutory Approval Process.....	30
6.4 Visual Amenity.....	32
6.5 Flora and Fauna.....	38
6.6 Noise and Vibration.....	42
6.7 Air Quality and Odour.....	48
6.8 Non-indigenous Heritage	56
6.9 Indigenous Heritage	59
6.10 Safety / Hazard	61
6.11 Water Resources.....	64

6.12	<i>Justification / Proven Gas Resource.....</i>	67
6.13	<i>Potential Impacts on the Elizabeth Macarthur Agricultural Institute Property...</i>	68
6.14	<i>Potential Impacts on the Mount Gilead Property.....</i>	72
6.15	<i>Commission of Inquiry.....</i>	80
7.	79C EVALUATION.....	81
7.1	<i>Matters for Consideration - General.....</i>	81
8.	RECOMMENDED CONDITIONS OF CONSENT.....	82
9.	CONCLUSION	82
10.	RECOMMENDATION	83

APPENDICIES

APPENDIX A – Independent Review of Visual Impact Assessment

APPENDIX B – Photomontages of the Proposed Facilities at Rosalind Park

1. SUMMARY

Sydney Gas Operations Pty Limited (the Applicant) is proposing to develop Stage 2 of the Camden Gas Project which includes the production of coalbed methane gas from 43 wells and the pressurisation and treatment of the gas at a new Gas Treatment Plant. The Applicant has developed a similar proposal, identified as "Stage 1" (through Development Applications DA 15-1-2002-i and DA 246-8-2002-i) which were approved by the Minister for Planning on 23 July 2002 and 2 September 2002, respectively.

The current application is seeking approval for the construction of 20 gas wells, production of methane from 43 gas wells, construction of a gas gathering system of underground polyethylene and steel pipes and construction of a gas treatment plant with a maximum gas production of up to 14.5 petajoules per annum. The Stage 2 proposal subject of this Development Application is within the Camden, Campbelltown and Wollondilly Local Government Areas. Additionally, the Applicant is seeking to convert part of its Petroleum Exploration Licence 2 into a Production Lease, for a period of 21 years.

The proposal has a capital cost of \$28 million. The Stage 2 project will require the employment of approximately 15 additional full time personnel. It would also provide the approximate employment equivalent of 50 full time positions for contractors, during the construction stage of the project.

Under the NSW *Environmental Planning and Assessment (EP&A) Act* 1979, the proposal is State Significant, integrated and designated development and the Minister is the consent authority.

The Applicant lodged a Development Application (DA) and Environmental Impact Statement (EIS) for the proposal with the Department on 20 June 2003. The Department subsequently notified and exhibited the DA and EIS in accordance with the requirements of the *Environmental Planning and Assessment (EP&A) Regulation 2000*.

During the exhibition period, the Department received submissions on the proposal from Government agencies, local Councils, Elected Representatives, special interest groups, businesses and from members of the public. These submissions raised concerns about the potential impacts on:

- Land use conflict;
- Statutory approval process;
- Visual amenity;
- Noise levels;
- Odour and air quality;
- Heritage; and
- Safety and hazard.

The issues of concern have been examined in this assessment report including the concerns of local residents and the three local Councils. In this regard an independent and comprehensive assessment of these issues has been undertaken.

Also, the Macarthur region is undergoing change as pressure for rural-residential development increases. In view of the potential for residential and other development in the vicinity of existing and future operating coalbed methane gas wells and the desirability of developing a locally produced source of energy, the Department has prepared locational guidelines for the siting of such development to ensure an appropriate balance between development on the land and community safety.

The guidelines are based on systematic hazard identification and quantified risk assessment of typical existing and future operating CSM well installations. The application of the guidelines' land use and technical controls should ensure that development in the vicinity of existing and future operating CSM well installations having design and operational controls consistent with the configurations described in these guidelines will not be exposed to an unacceptable level of risk.

Subsequently, the Department is satisfied that all issues have been or will be adequately addressed through the application of the guidelines and additional information provided by the Applicant (as required by the consent conditions) or the recommended Conditions of Consent.

The recommended Conditions of Consent include safeguards for visual amenity, noise management and monitoring, air quality, water management, heritage protection and appropriate environmental monitoring, auditing and reporting.

The Department has assessed the EIS and various submissions on the proposal and is satisfied that the proposal has social and economic benefits and can be managed in an acceptable manner on environmental grounds. The Department recommends that the Minister approve the DA subject to the recommended Consent Conditions.

2. EXISTING GAS EXTRACTION - CAMDEN GAS PROJECT STAGE 1

The Sydney Gas Camden Gas Project - Stage 1 is located 60 kilometres south-west of Sydney, near Camden. The Stage 1 project includes approximately 48 square kilometres and is located 4 to 8 kilometres south of Camden on rural agricultural land.

Coalbed methane gas is currently being produced from Stage 1 wells within Petroleum Production Leases 1 and 2.

2.1 Stage 1 Infrastructure

Infrastructure for the Stage 1 project includes:

- 25 gas production wells (23 of which have been completed);
- operation of an underground gas gathering system of underground polyethylene and steel piping;
- operation of a gas treatment plant, flare, associated site office and depot facility;
- fuel storages;
- pollution control ponds and drainage works; and
- sale of gas from the gas treatment plant to the existing AGL gas network.

2.2 Existing Gas Production Operations

The then Minister for Planning approved the gas production for Stage 1 of the Sydney Gas Camden Gas Project (DA 15-1-2002-i and DA 246-8-2002-i) from 25 wells, and three (3) wells at Kay Park. Production from Stage 1 wells commenced in 2002.

The general sequence of development in Stage 1 was:

- Development and production of gas exploration wells;
- Fracturing of coal beds by high pressure techniques to release methane gas;
- Construction of the gas gathering system and gas treatment plant;
- Transfer via the gas gathering system to the plant;
- Gas treatment including dewatering and addition of odorant; and
- Followed by transfer at sale to the AGL main pipeline.

2.3 Operating Hours

The Stage 1 project operates 24 hours a day, seven days a week. Construction was limited to 7am to 6pm Monday to Friday and from 8am to 1pm Saturdays with no construction and site preparation on Sunday and public holidays.

2.4 Workforce

The current workforce consists of approximately 30 full time staff. There are also approximately 50 contractors who are employed during the drilling, completion and construction phases.

2.5 Production from Stage 1

The DA for the Stage 1 Project indicated that the operation of the production wells, gas gathering system and gas treatment plant would result in production of up to 93,000 GJ/month from the treatment plant. This gas is sold and distributed to the AGL gas network.

The EIS submitted for the Stage 2 Project reports daily gas sales to AGL Wholesale Gas Ltd from Stage 1 are within the range 2,500 – 2,700 GJ/day, generating approximately \$3,000,000 per annum in sales revenue. Stage 2 is expected to expand on this production level. The Annual Environmental Performance Report for the Stage 1 Project for the 2002-2003 year, states that daily gas production levels are 2,330 GJ/day.

3. PROPOSED DEVELOPMENT – CAMDEN GAS PROJECT STAGE 2

The Applicant is seeking approval from the Minister for Infrastructure and Planning for methane gas production from forty-three (43) gas wells to the east of the existing Stage 1 development. The proposal is approximately 5 kilometres south west of Campbelltown (see **Figure 1**) located predominantly on agricultural land and land held by several Government agencies including the Elizabeth Macarthur Agricultural Institute (EMAI).

The proposed development includes the construction of 20 gas wells, the production of methane from 43 gas wells, construction of a gas treatment plant and a gas gathering system and the treatment and pressurisation of methane within the gas treatment plant. The rate of production of methane gas through the gas treatment plant would be up to 14.5 petajoules per annum. The proposal involves production of methane gas for a period of 21 years.

The proposed development is also located in the general vicinity of future urban release areas such as Menangle Park and Spring Farm.

3.1 Infrastructure

The proposed infrastructure for the Stage 2 Project includes:

- forty-three (43) gas production wells (23 of which have been drilled);
- construction and operation of an underground gas gathering system of underground polyethylene and steel piping;
- pipeline marker signs along the surface of the gas gathering system;
- construction and operation of a new gas treatment plant, associated workshop, pipe yard and office facilities; and
- operation of a horizontal flare over an evaporation pond.

3.2 Project Stages

The development is proposed to be conducted in stages as follows:

- Drilling of each gas well (20 new wells are proposed to be drilled in this Development Application) to a total depth of 800 metres, logging of the well bore, clean-up of well bore and perforation/slotting of casing over the production zone;
- Fracture stimulation of the coal seams away from the well bore to stimulate the flow of gas;
- Production testing of the well to ascertain quantities of gas flow;
- Construction of the gas gathering system and the gas treatment plant;
- Completion of the well and connecting to the gas gathering system;
- Separation of water from the gas at the wellhead location (if required);
- Transportation of gas to the Gas Treatment Plant via the gathering system;
- Treatment, odorising and pressuring of gas to achieve marketable quality in terms of water content and calorific value; and
- At the end of the Project's life, all components will be plugged, capped and abandoned (wells and subsurface infrastructure) and decommissioned and removed (surface infrastructure).

3.3 Gas Wells

The DA includes the production of methane from 43 gas wells. Of the 43 gas wells, the Applicant has drilled 23 gas wells under the provisions of the existing Petroleum Exploration Licence (PEL) held by the Applicant. The DA includes the drilling and fracturing of 20 gas wells as shown in **Table 1**.

Table 1 - Drilling Status of Gas Wells

Gas Well	Gas Well has been drilled (under the PEL)	Drilling of Gas Well included in this DA
RP 1 - RP 12	Yes	No
GL 5, GL 7, GL 8, GL 9 and GL 10	Yes	No
WG 1, WG 2, WG 3, WG 4, WG 5, WG 6	Yes	No
EM 1 – EM 20	No	Yes

As the Applicant proposes to apply to convert its Petroleum Exploration Licence to a Petroleum Production Lease (PPL), 20 gas wells (EM 1 – EM 20) are proposed to be drilled within the PPL if granted.

3.4 Proposed Gas Production Operations

Once the wells have been drilled, the targeted coal seams are hydraulically fractured to allow the gas to flow back to the well bore and to the surface. The fracturing process known as “fracking” involves the pumping of a water and sand mixture at pressure to fracture the coal seams. The sand enables the fractures to remain open and as water is removed from the coal, the reservoir pressure decreases and methane is desorbed. The fracture channels allow the methane to flow to the well bore.

The EIS does not provide an exact volume of gas recovery expected from the gas wells.



3.5 Gas Gathering System

As part of the development, the Applicant proposes to construct and operate an underground gas gathering system. The gas gathering system will consist of a network of underground polyethylene and steel piping, linking the gas wells to the gas treatment plant.

The system will be predominantly located in road easements and along property boundaries. All components of the system will be buried to a depth of 0.75 to 1.0 metre below ground level.

3.6 Gas Treatment Plant

The gas treatment plant will be located on rural land, that has been leased by the Applicant. The leased site comprises approximately six hectares adjacent to an existing quarry and approximately 300 metres from the AGL Pipeline. The Gas Treatment Plant will consist of three compressor engines, a dehydration unit, storage tanks for odorant and a horizontal flare. The three compressor engines will be brought on line in a staged manner. The plant will initially operate on one compressor, the second compressor will be installed six to nine months after the first compressor and the third compressor will be brought on line about six to nine months after the second compressor has been commissioned.

Incoming gas will be delivered to the compressor engines, which raises the pressure of the gas to enable delivery to the AGL gas network. The compressors will operate 24 hours per day, 7 days per week, except during planned maintenance shutdowns or in the case of equipment failure. During compressor shutdowns, excess gas will be burned in the flare. Following compression, the gas will pass through the dehydrator to remove excess water and the water vapour will be discharged through a vent. Prior to delivery to the AGL network, gas will be odorised as a safety measure. Dilution into the AGL trunk main will ensure a consistent product in terms of the calorific value of the gas to the end-user.

The plant has a maximum capacity of 14.5 petajoules per annum (which would require the operation of three compressor engines). The plant will operate 24 hours per day, seven days per week.

3.7 Flare

The proposed development includes the construction and operation of a horizontal flare, located over an evaporation pond.

The EIS provides data on the frequency of flaring based on the operation of the Pilot Stage 1 Ray Beddoe Treatment Plant. However, the Applicant contends that flaring does not occur for the entire duration that the Treatment Plant is shutdown and that flaring occurs for 75% of the total Plant downtime and during this time, the gas production rate is reduced by 90% due to gas wells being shut in or choked back.

The Applicant has advised that the Stage 2 Gas Treatment Plant is designed to run at an efficiency of 95%, therefore there will be a 5% downtime. The Applicant anticipates that flaring at the Stage 2 Plant will occur for 60% of the downtime, or 3% of the total time. The Applicant considers that the flare rate during the downtime will be 1% of the normal production rate although some flaring will occur at higher rates closer to the normal production rate of the plant. The Applicant expects these circumstances to be infrequent and of short duration (for example, a total duration of these types of flares is predicted to be 0.14% per annum).

3.8 Waste Management

The proposed development will generate a range of wastes during the life of the Project. Wastes will be produced from the construction, drilling, workover and fracking operations and during the construction of the Gas Treatment Plant and associated facilities. Wastes will also be generated from the Office and Gas Treatment Plant during the operation of the project. The Applicant's management of waste will be prioritised using the "Reduce, Re-use, Recycle" hierarchy basis with disposal of wastes as the last option.

3.9 Energy Requirements

During the well site establishment phase, the Applicant will use fuel driven equipment, on average 900 litres of diesel fuel for the establishment of one well site. Vehicles are also used during the operational life of the project for rehabilitation of sites, inspections, site maintenance and monitoring.

The EIS for the Project states that as the objective of the Project is the production of natural gas, where possible this gas is used as a source of energy for general operating conditions. Equipment within the Gas Treatment Plant that will consume natural gas includes the compressor engines, dehydrator, the flare (pilot light), instrument gas and the TEG reboiler. Natural gas consumed at the facility is estimated to be 5% of the total throughput of the Plant.

Infrastructure items at the plant that will utilise mains electricity include well site pumps (when needed) and the Plant Office.

3.10 Proposed Construction and Operating Hours

The drilling of the gas wells will require approximately 20 days at each site. Construction of the Gas Treatment Plant will require between 12 to 20 weeks. Operating hours will be 24 hours per day, seven days a week. The Applicant's proposed operations will have a minimum 21 year time frame.

All construction activities for the Project will take place between 7am to 6pm Monday to Friday, 7am to 1pm Saturday (inaudible activities) and 8am to 1pm Saturdays (audible activities). No work will be undertaken on Sundays and Public Holidays.

3.11 Proposed Workforce

The Stage 2 proposal will require approximately 50 construction full-time equivalent jobs. Operation of the entire project (that is both Stages 1 and 2) requires 45 full time staff. The Applicant currently employs approximately 30 staff in Stage 1. Therefore Stage 2 will require an additional 15 full time personnel. The total workforce will comprise 20 corporate staff, 7 plant and 7 field staff as well as maintenance staff, managerial staff and support staff.

3.12 Production from Stage 2

Production in the Stage 2 development would be limited by the capacity of the gas treatment plant of 14.5 petajoules per annum.

3.13 Petroleum Exploration Lease

The DA area for Stage 2 is located largely within Petroleum Exploration Licence (PEL) 2. However, two gas wells (that have been drilled for the Stage 2 Project) are located within the Stage 1 Project area, within Petroleum Production Lease (PPL) 1.

The Applicant has drilled 20 exploration gas wells under PEL 2. These wells were approved by the Department of Mineral Resources (DMR), as the Determining Authority under the *Petroleum (Onshore) Act 1991*. The Applicant conducted an environmental assessment of the drilling of the wells (under Part 5 of the EP&A Act) which was submitted to the DMR, prior to approval being granted for the drilling of the wells.

The Applicant is seeking to convert part of PEL 2 into a Petroleum Production Lease for which development consent is required in accordance with the *Petroleum (Onshore) Act 1991*.

3.14 Project Closure and Rehabilitation

The life of the project is estimated at being 21 years. The decommissioning of the project will involve the following activities:

- Decommissioning of the wellhead by plugging and abandoning the wells in accordance with the requirements of the DMR. The wellhead assembly and near surface casing would be removed and backfilled. The area around each wellhead would be returned to the landholder for pastoral use or revegetated using native seed;
- The gas gathering system and gas pipeline would be purged with air to remove the remaining gas, sealed and left in position;
- The access tracks used during the operation of the Project would be offered for use to each landholder. Where not required, access tracks would be removed and revegetated with local seed.
- Rehabilitation of the plant would be finalised approximately five years prior to closure. It is likely that equipment, buildings and facilities would be salvaged and sold and all hardstand areas would be removed, the land reprofiled and topsoil applied for revegetation.

3.15 Justification of the Proposal

The Applicant provides justification for the project in terms of strategic, biophysical, economic and social considerations. The Applicant states that the project is needed to:

- Meet future demands for natural gas;
- Provide more efficient and reliable energy availability;
- Address commonwealth, State and Regional energy initiatives; and
- Provide regional, economic and social benefits.

4. STATUTORY CONTEXT

The proposal requires approvals under State legislation and consideration of Commonwealth legislation is also required.

4.1 Environmental Planning and Assessment Act 1979

4.1.1 State Significant Development

The production of natural gas from coalbed methane has the potential to provide a significant alternative energy source in New South Wales with the potential to reduce greenhouse gas emissions supporting the Government's policy of promoting sustainable development. The Stage 2 Project would increase the diversity of energy sources in New South Wales, and could generate significant economic and environmental benefits for the State.

Subsequently the Minister declared the project State Significant development under s.76A(7)(b) of the *EP&A Act* which was gazetted on 13 June 2003.

The Declaration includes Stages 1 and 2 of the Sydney Gas Coalbed Methane Project that are permissible with consent under relevant planning instruments in the Camden, Campbelltown and Wollondilly local government areas. The Minister is the consent authority for State Significant development under s.76A(9) of the *EP&A Act* and therefore the Minister is the consent authority for the proposal.

4.1.2 Integrated Development

The proposal is classified as integrated development under s.91 of the *EP&A Act* because it requires additional approvals from the following agencies:

- Environment Protection Authority under the *Protection of the Environment Operations Act 1997* for an Environment Protection Licence;
- Department of Infrastructure, Planning and Natural Resources under the *Rivers and Foreshore Improvement Act 1948* for Part 3A Permits; and
- Mine Subsidence Board under the *Mine Subsidence Compensation Act 1961*.

4.1.3 Designated Development

The proposal is classified as designated development under s.77A of the *EP&A Act* because it meets the criteria for petroleum works in Schedule 3 of the *EP&A Regulation 2000*. Therefore, an EIS is required to be submitted with the DA.

4.1.4 Permissibility – Local Planning Instruments

The proposal is located on land zoned as follows:

- Zone 1(a) – Rural “A” Zone – Camden LEP No.48
- Zone No.1 – Campbelltown IDO No.15 and Campbelltown LEP No.36
- Zones No.1 (a2) & (a3) – Rural “A2” & “A3” Zone – Wollondilly LEP 1991.

For the purposes of permissibility the Department has characterised the project as “Petroleum works that refine natural gas” or “petroleum works that produce methane”. Neither “Petroleum works that refine natural gas” nor “petroleum works that produce methane” are listed in the nominate prohibited purposes in any of the above instruments. The Department is therefore of the view that the project is permissible in all three local government areas.

4.1.5 Environmental Planning Instruments – State Environmental Planning Policies

The following planning instruments are relevant to the proposal under s.32 of the *EP&A Act*:

- *State Environmental Planning Policy No.26 – Littoral Rainforests*
SEPP 26 provides for the protection of littoral rainforests by considering proposed developments with a view to preserving littoral rainforests where a potential impact is identified. The proposal will not affect land under SEPP 26;
- *State Environmental Planning Policy No.33 – Hazardous and Offensive Development*
This SEPP applies to development applications under Part 4 of the *EP&A Act* that, without mitigating measures, pose a significant hazardous risk and/or offensive impact in the local area. The proposal is considered potentially

hazardous. A Quantitative Risk Assessment (QRA) and HAZOP study have been undertaken for the project by Planager Ptd Ltd (2002) and presented in the EIS. The Applicant's QRA determined that the project does not fit the definition of potentially hazardous industry and therefore SEPP 33 does not apply;

- *State Environmental Planning Policy No. 44 – Koala Habitat Protection*

This SEPP applies to development applications under Part 4 of the *EP&A Act* that are located on land that is potential koala habitat. Potential koala habitat is defined as areas of vegetation where trees providing food for koalas comprise at least 15% of the total number of trees. The EIS states that the proposed development does not meet the requirements of SEPP 44. The Department concurs with this position as the land the subject of the DA does not constitute core koala habitat as defined in the SEPP.

- *State Environmental Planning Policy No.55 – Remediation of Land.*

SEPP 55 states that land must not be developed if it is unsuitable for a proposed use because it is contaminated. The proposed activities of Stage 2 are not considered to necessitate any site remediation works. Therefore, SEPP 55 does not apply to the proposed development.

The Department is generally satisfied that the proposal satisfies the relevant requirements of the applicable environmental planning instruments.

4.1.6 Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act 1995* (TSC Act) would apply to the proposal under s.5A if a significant impact on threatened species or ecological communities is identified as a result of the proposal. Flora and fauna studies undertaken during preparation of the EIS did not identify any significant impacts on any threatened or vulnerable species listed under the TSC Act. Eight part tests were undertaken for Shale Sandstone Transitional Forest, Sydney Coastal River Flat Forest and Cumberland Plain Woodland. Surveys and eight part tests were also conducted for *Phascolarctos cinereus* (koala), *Meridolum corneovirens* (snail), *Pimelea spicata*, *Pomaderris brunnea*, *Ninox strenua*, *Xanthomyza Phrygia* (Regent Honeyeater) and *Petaurus norfolcensis* (Squirrel Glider). It was concluded that the proposed development poses no significant impact and therefore a Species Impact Statement (SIS) is not required. The Department concurs with the Applicants position.

4.2 Commonwealth Approvals

4.2.1 Environment Protection and Biodiversity Conservation Act 1999

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), approval is required from the Commonwealth Minister for the Environment for any activities that may pose a significant impact on matters of national environmental significance. The Applicant has assessed the proposal in relation to listed threatened species and communities. The Cumberland Plains Woodland community is listed as a threatened ecological community under the EPBC Act and is present in the proposed development area. Some raptor species present on the Elizabeth Macarthur Agricultural Site (EMAI) are also listed on the EPBC Act (under migratory species). The Applicant has assessed the proposed activities and considers that the proposal will not cause any impacts on the Cumberland Plains Woodland community and raptor species. With regard to other matters of national environmental significance, the proposed development does not involve any World Heritage properties, Ramsar wetlands, Commonwealth marine areas or nuclear actions.

5.1 Government Agency Submissions

The Department received submissions from 13 Government agencies, including the integrated approval bodies. Submissions from the government agencies highlighted a number of concerns and in some cases requested further information be provided about the proposal. No government agencies objected to the proposal.

Submissions were received from the following Government agencies or State owned Corporations:

- Department of Mineral Resources
- Landcom
- Mine Subsidence Board (Integrated Approval Body)
- Environment Protection Authority (Integrated Approval Body)
- National Parks and Wildlife Service
- NSW Heritage Office
- NSW Agriculture
- Sydney Water
- Department of Infrastructure, Planning and Natural Resources (Land and Water) (Integrated Approval Body)
- Royal Botanic Gardens
- NSW Police
- Roads and Traffic Authority
- Rail Estate

These submissions are discussed in detail below.

5.1.1 Department of Mineral Resources (DMR)

The DMR made the following comments in relation to the proposal:

- It was unable to comment on the likely methane gas resources in the area of the proposed PPL due to the lack of supporting data. More accurate data on potential yields of the coal seam and on the quality of methane gas that can be economically recovered through the project is required to allow full assessment by the DMR;
- Based on information provided in the EIS, DMR cannot evaluate the proportion of the methane gas *in situ* that could be economically recovered and therefore cannot evaluate the gas reserves within the project area;
- It requests that Sydney Gas comply with:
 - o The requirements of the 'Schedule of Onshore Exploration and Production Safety Requirements' published by the DMR in August 1992 (which may be amended from time to time), where equipment / pipeline is on a production lease;
 - o All identified AS/NZS standards for design, burial and maintenance of pipelines and facilities;
 - o Recommendations made in the Quantitative Risk Assessment (QRA) and the Hazard and Operability (HAZOP) studies in the EIS;
- A Safety Management Plan should be in place for the proposed development (if approved);
- It will require a formal Production Operations Plan (POP) and Annual Environmental Management Plan (AEMP) throughout the life of the project and through the Mining Rehabilitation and Environmental Management Process (MREMP) the Department will require the timely submission of the POP and AEMRs to ensure compliance with all conditions and licences;

- If additional wells are required (and not covered in the EIS) proposed drilling and connection to the gas gathering system would require variation to the development consent and approval by DMR; and
- A variation of the existing development consent for activities carried out on PPL 1 will be required before the wells can be drilled.

5.1.2 Landcom

Landcom's submission noted the following:

- The EIS shows the gas gathering line as traversing 'Menangle Park' however, the land appears to have been omitted from the EIS;
- It would seek to ensure that conditions in any development consent granted will apply to all the Applicant's operations on "Menangle Park";
- Landcom is currently negotiating with the Applicant to finalise the Licence Access Agreement for the gas gathering lines. A condition of this agreement will be confirmation that the pipeline corridor will not restrict Landcom's ability to develop the remainder of the site outside that Licence area; and
- It would seek to ensure that the Development Consent and Environmental Management Plan are incorporated into the final Licence Agreement between Landcom and the Applicant before it enters into force.

5.1.3 Mine Subsidence Board (MSB - Integrated Approval Body);

The Mine Subsidence Board has provided its General Terms of Approval (GTAs) for the proposal. The GTAs include a requirement for:

- The final drawings to be submitted prior to commencement of construction are to contain a certification by a qualified structural engineer to the effect that any improvement constructed will meet the specifications of safe, serviceable and repairable taking into account the following subsidence parameters:
 - o Maximum vertical subsidence of 1.2 m;
 - o Maximum ground strains of plus or minus 2.5 mm/m;
 - o Maximum tilt of 6 mm/m;
 - o Maximum radius of curvature of 10 kms;
- Consideration be given to the design of drill holes as they may be subjected to higher than anticipated horizontal strains and therefore they should be designed so that they do not increase the Board's liability by requiring redrilling of boreholes;
- The above conditions do not apply to structures or drill holes that will not exist at the time of mining; and
- The approval is current for a period of two years.

5.1.4 Environment Protection Authority¹ (EPA - Integrated Approval Body)

The EPA has provided its General Terms of Approval for the proposal. These General Terms of Approval include requirements for:

- Monitoring of air emissions, water quality and noise emissions;
- The Applicant to not exceed specific emission limits on air quality parameters including oxides of nitrogen, sulphur dioxide, sulphuric acid mist and/or sulphur trioxide;
- Waste management and waste limits;
- Noise limits (and specific limits for noise from flaring) at surrounding residences that the Applicant is required to achieve;
- Noise management for construction and well maintenance;
- Setting the hours of operation;

¹ The EPA is incorporated within the Department of Environment and Conservation.

- Preparation of a flare design report;
- Noise mitigation measures for the flare and specific monitoring of noise from the flare; and
- An evaluation program for the integrity of the evaporation pond liner.

The EPA also raised several issues for consideration by the Department. These issues were of concern to the EPA, however are outside of the EPA's jurisdiction. The issues raised include:

- Potential hazards for members of the public in the vicinity of operating coal seam wells and also the correct boundary definition of the coal seam wells;
- Potential discharges of mercaptan odorant;
- Community relations program;
- Changes to the project between the EIS and the Final documentation;
- Construction of wellheads under the Petroleum Exploration Licence;
- Operational performance of the Stage 1 Pilot Ray Beddoe Treatment Plant; and
- Visual impacts from the operation of the flare.

5.1.5 National Parks and Wildlife Service² (NPWS);

The following matters were raised in the initial submission by NPWS:

- With regard to the approval process, if a Heritage Impact Permit is required under s90 of the *National Parks and Wildlife Act*, the proposal will be an integrated development and general terms of approval will be required from NPWS;
- If the proposal is found to have a significant impact on threatened species, populations or ecological communities, concurrence of the Director-General of NPSW would be required; and
- Additional assessment should be undertaken to confirm the potential impact on Aboriginal heritage values. Once this is complete, NPWS will determine their statutory role in the approval process.

9. The Applicant provided additional information in response to the comments from NPWS. NPWS has reviewed this information and considers that it satisfies the initial concerns regarding Indigenous Heritage Assessment. The NPWS has requested the Applicant provide a report on the indigenous monitoring (that was requested by the Aboriginal community). In accordance with the recommended conditions of consent that Applicant must provide the results of monitoring to NPWS and the Director-General within two months of the Heritage Monitoring being completed.

5.1.6 NSW Heritage Office

The NSW Heritage Office required the Applicant to prepare an assessment of the potential effect on the cultural heritage landscape of the Elizabeth Macarthur Agricultural Institute. The Applicant commissioned a Statement of Heritage Impact report and forwarded this to the Heritage Office, the Department and NSW Agriculture. The NSW Heritage Office has reviewed the Statement of Heritage Impact Report and considers that it satisfactorily addresses the impacts of the proposed development provided all the mitigatory measures listed under Sections 7.1, 7.2 and 7.3 of the report are implemented by Sydney Gas. The NSW Heritage Office also suggested a number of minor amendments be incorporated to form part of the approval for the development. These suggestions included:

² The NPWS is incorporated within the Department of Environment and Conservation.

- The EMAI Well Locations and Access Roads Map and EMAI Well Locations and Gathering System Map be included in the approval process;
- Species for roadside plantings should be stated;
- Roadbase material should not be introduced for new access roads to Gas well sites EM 1 to EM 4 and EM 6;
- Ensuring the existing access road between Sites EM 6 and EM 8 are for light vehicles only; and
- Roadside plantings are strengthened for sites EM 16, EM 18, EM 19 and EM 20 as per the species outline in Sections 6.2.8 and 6.2.10 in the Report.

5.1.7 NSW Agriculture

The following comments and issues were made in the submission by NSW Agriculture:

- It is the responsibility of NSW Agriculture to preserve the Elizabeth Macarthur Agricultural Institute (EMAI) property (including Camden Park Estate) in its present form, due to its important history and the presence of regionally significant stands of Cumberland Plain Endangered Ecological Communities (CPEEC) and important bird habitat;
- The development has the potential to significantly compromise the agricultural, heritage and environmental management of the EMAI property. Specifically the following issues were raised:
 - o The proposal must state whether the drilling and fracking processes are once only operations. Repeat operations may detrimentally affect soil compaction and the surrounding environment;
 - o Further assessment of alternatives is required, including evaluation of the 'do nothing' option in terms of preventing environmental impacts;
 - o In terms of Ecologically Sustainable Development (ESD), the development is not consistent with the principles of biological diversity or ecological integrity. In particular, noise disturbance to bird species and negative impact on the recovery of remnants of the Cumberland Plain Endangered Ecological Community (CPEEC) are predicted at the EMAI property. Strict guidelines are required to protect these sensitive environments;
 - o Further assessment of flood risk is required, in particular the potential for structural damage to gas wells and subsequent loss of methane to atmosphere and the impact of flood behaviour and ability to access the site during floods;
 - o Further assessment is required for the disposal of saline water. Based on predicted volumes and concentrations of saline water that will be generated, irrigation is not best agricultural practice and dilution will be required;
 - o Use of heavy vehicles around well sites and proposed wet weather operations have not been adequately addressed;
 - o With regard to flora and fauna, reference is only made to threatened species and no recognition is given to other protected species or to flora or heritage significance. Potential impact on historical plants near the EMAI Orchard and disturbance to protected birds which is contrary to the NPW Act (s.98(a)) must be considered;
 - o The EMAI property should be considered holistically for cultural heritage significance, rather than only considering localised impacts on individual items. Overall assessment of the project should include cumulative impacts of each well, documented in an environmental management plan. There is no report on the development from NSW Heritage Office;
 - o The whole EMAI property is within the definition of environmental heritage according to the *Heritage Act 1977* and is listed on the State

- Heritage Register with various structures. Approval by the Heritage Council is therefore required. In addition, EMAI is currently being assessed to be listed as a NSW Heritage Site by the NSW Heritage Council;
- o There is a risk of damage and reduction of heritage values at EMAI due to the presence of Aboriginal and European heritage items.
- o NSW Agriculture believes that the proposal will impact upon sensitive heritage sites. This is denied in the EIS;
- o Revegetation should be to pre-European settlement vegetation consistent with the CPEEC recovery plan and acceptable to community and legislative standards. Revegetation must be to a minimum of 20 m from the top of a riverbank in accordance with the *Rivers and Foreshore Improvement Act 1948*;
- o The stockpiling of soil for future rehabilitation should form part of the operational management plan proposed in the DA;
- o The rehabilitation plan has not been clearly defined. This must consider drainage and changes to water flow;
- o The EIS does not demonstrate whether the project will be economically sustainable. Projected returns on investment are not provided;
- o Development on the EMAI property is inconsistent with the zone 1(a2) objectives of the Wollondilly LEP 1991;
- o Conditions on access agreements to EMAI for the development require further discussion between NSW Agriculture and the Applicant;
- o A hazard risk assessment is required for the closest dwelling to gas infrastructure at EMAI (staff housing at Menangle Farm) including noise impacts, dust generation during drilling, and impact on wildlife due to gas flaring;
- o Potential impacts on infrastructure associated with Sydney Water's proposed sewage pipeline from Menangle to West Camden have not been discussed. Consultation is required with Sydney Water;
- o The development does not comply with Zone 12 (Orchard Area) Conservation requirements for Camden Park Estate. This area has high cultural significance.
- Conditions are proposed to minimise potentially significant negative impacts on the agricultural heritage and biodiversity of the EMAI property;
- No consultation has been conducted with the NSW Heritage Office regarding the EMAI property; and
- Advice should be sought from the NSW Heritage Office to determine the most appropriate protective measures.

5.1.8 Sydney Water

Sydney Water noted that:

- It will require the Applicant to apply for a Section 73 Compliance Certificate under the *Sydney Water Act 1994* should the remediation works be approved. Once this application is lodged, Sydney Water will undertake a detailed review of the proposal;
- It has no proposed works in the vicinity of the Applicant's proposal. However gas reticulation lines may impact on existing Sydney Water infrastructure; and
- the Applicant will need to consult with Sydney Water and Macarthur Water and meet their requirements in regard to main laying across and adjacent to the water mains.

5.1.9 NSW Department of Infrastructure, Planning and Natural Resources (Natural Resources)

The Department has provided General Terms of Approval for the Part 3A Permits required by this proposal. The GTAs include various conditions for proposed stream crossings by the gas gathering system, site rehabilitation and site water and sediment runoff management. These conditions require the Applicant to:

- Ensure that beds and banks of watercourses that are to under-bored will not be disturbed;
- Provide final crossing designs for streams that will be trenched;
- Undertake works within 20 m of a watercourse during dry weather conditions;
- Keep disturbance of the stream bed and bank to a minimum during the construction and reinstatement of the site;
- Restore natural bed and bank profiles to their original condition for all trench crossings, following installation of the gas pipe;
- Stabilise and rehabilitate soil surfaces as soon as possible with sterile exotic cover crops and local native grasses;
- Maintain and monitor all rehabilitated riparian zones for a period of at least two years after planting;
- Prepare a Soil and Water Management Plan (SWMP) for all works on protected land and in protected waters. The SWMP must meet the requirements of the NSW Department of Housing's publication "Managing Urban Stormwater: Soils and Construction (3rd Edition) (1998);
- Implement all relevant site drainage and sediment and erosion control works and measures and any other pollution controls prior to the commencement of any other works at the site; and
- Document the decommissioning of all sediment and erosion controls.

5.1.10 Royal Botanic Gardens (Mount Annan Botanic Garden)

The Royal Botanic Gardens sought further information regarding the proposal including:

- Dimensions of the permanent wellhead;
- Anticipated life span of the gas reserve and wellheads;
- Potential for odour emissions associated with the gas wells; and
- Possible restrictions on vegetation that may be established following construction of the gas gathering system.

The Royal Botanic Gardens noted that gas wells GL 4, GL 5 and GL 10 and the interconnecting gas gathering system are close to the Mount Annan Botanic Garden boundary and the Banksia Garden picnic area and therefore may have the potential to cause visual impacts. The Royal Botanic Gardens also noted that it is supportive of projects that seek to regenerate and replant local native vegetation to form viable bush corridors (particularly between the Garden and the Nepean River) and as defined in Camden Council's Natural Assets Policy.

5.1.11 NSW Police

The NSW Police conducted an informal crime risk assessment of the proposal including the proposed treatment plant and gas wells. The NSW Police considered that the proposal would not create undue crime risk. However, several recommendations were provided regarding proposed security measures for the treatment plant and the gas well sites.

5.1.12 Roads and Traffic Authority

The Roads and Traffic Authority (RTA) provided comments in relation to the proposed M5 underbore and requested further information be provided.

5.1.13 Rail Estate

Rail Estate noted that the Applicant has lodged an application to drill two underbores, north and south of Menangle Park Station. Rail Estate also advised that a preliminary review of the application is currently underway and that there are no further comments at this time.

5.2 Submissions from Elected Representatives

The proposal is within the State electorates of Southern Highlands and Camden. The respective local members are Ms Peta Seaton, the MP for Southern Highlands and Mr Geoff Corrigan, the MP for Camden.

The Department received three representations from the two Elected Representatives as discussed below.

Ms Peta Seaton made a representation on behalf of residents in the Menangle Area and requested that:

- consideration of the DA be deferred until the NSW Heritage Office completes work to assess the remnant Cultural Landscapes in the Sydney Region;
- consideration of the DA be deferred until the NSW Heritage Office has completed its assessment of the application to list the EMAI for NSW Heritage listing;
- the NSW Heritage Office be asked to comment on the potential effects of the proposal on the historic orchard, unique plantings and location where Governor Lachlan Macquarie landed and camped on the Macarthur site within the EMAI; and
- the Department of Natural Resources provide a report on the impact of the existing and proposed site access road construction on local water catchment and soil conservation issues.

Mr Geoff Corrigan made two representations on the project.

One representation was made regarding an agreement made by the Applicant to delay proposed drilling of gas wells EM 8 and EM 11 until February/March 2004, to ensure minimum disturbance to breeding raptor bird species in the area.

A second representation was made on behalf of the Camden Historical Society, regarding the lands of the EMAI. In particular, the representation included the Camden Historical Society's opposition to any further proposed expansion on the neighbouring privately owned historic property "Camden Park".

5.3 Council Submissions

The Department received submissions from three (3) Local Councils, which are located in the area of the proposed development. Submissions were received from:

- Camden Council
- Campbelltown Council
- Wollondilly Shire Council

The views of each Council are summarised below.

5.3.1 Council of Camden

Camden Council raised the following issues:

- Landscaping should include the planting of native species only;
- Request that a structural report be prepared of “Glenlee” to establish a benchmark prior to drilling;
- Considers that the wells and gas gathering pipelines should be identified as an easement on the property title; and
- The EIS should provide a basis for calculating the security deposit.

5.3.2 Campbelltown Council

Campbelltown Council raised the following issues:

- Although the proposal is legally permissible as a State Significant development, Council considers that extractive industries are not appropriate within a rural zone;
- Given the location of the proposal on bushfire prone land, a bushfire impact assessment is necessary. A bushfire hazard report is required under the EP&A Act;
- The noise assessment should consider future urban development in Menangle Park and at Mount Gilead;
- Consultation with Wollondilly Council indicates noise concerns are being experienced by residents due to the existing treatment plant at Westbrook Road. The noise impact assessment for Stage 2 should consider existing conditions and noise complaints;
- The air quality assessment did not consider emissions from leaks which would include a range of pollutants;
- The hazard and risk assessment is based on existing conditions and has not considered the future urban development of the area. Potential impacts on urban development are considered unacceptable given planned development for Menangle Park;
- The proposal does not involve the creation of easements over the land where gathering lines will be constructed. A potential land use conflict may arise in Menangle Park where sporting fields are planned where gathering lines will be placed;
- Landowner's consent for the proposal has not been obtained from Council;
- Guidelines for urban development within the 200 metre buffer zone of existing wells are planned but were not prepared at the time of the application;
- The application does not identify how many wells would ultimately be located within the Campbelltown Council area;
- Any lots affected by gathering lines and/or gas wells should contain an appropriate notation on the Section 149 planning certificate;
- Concern regarding the potential for vandalism on gas wells and responsibility for repair and maintenance;
- Concern regarding impacts should landowners inadvertently dig up gathering lines; and
- The residents of Campbelltown will not be provided with any local benefits from the proposal but will have adverse impacts.

5.3.3 Wollondilly Shire Council

Wollondilly Shire Council raised the following issues:

- Council supports a part of the proposal that involves relocation of a bulk treatment plant from Westbrook Road to the Cleary Bros quarry site;

- Council requests that the depot site located at Johndillo, Old Razorback Road, Cawdor be relocated in conjunction with relocation of the bulk treatment plant. It is not clear if the proposal includes this from the documentation;
- The current bulk treatment plant site and depot site should be subject to contamination investigation and remediation undertaken as required in accordance with SEPP 55;
- The bulk treatment plant site and depot site should be restored to their pre-development condition as part of the relocation work. A small dam on the Westbrook Road site can be retained provided it doesn't breach any harvesting rights under the Water Act;
- The EMAI property is of national significance. It must be ensured that the development does not comprise the heritage significance of the site;
- An Environmental Management Plan (EMP) should be prepared in consultation with Council for the installation of gas pipeline networks within public road reserve areas, including erosion and sediment control and traffic control plans. Of particular concern, any proposed strapping of pipelines to the Menangle Bridge must be undertaken in consultation with Council;
- Consideration should be given to potential mine subsidence issues as the works are located within a Mine Subsidence District; and
- The Department should undertake a review of the separation distance required in the Petroleum (Onshore) Act (200 m) as studies indicate this may be an overestimate of the required distance. The Department should establish the appropriate separation distance, if 200m is not the appropriate distance.

5.4 Interest Group Submissions

The Department received submissions from one (1) interest group. A submission was received from Camden Historical Society Inc. The concerns of this interest group included:

- Inadequate assessment in the EIS on the potential impacts of the proposal on the heritage values of EMAI;
- Fauna studies did not identify threatened species recorded on the EMAI property since 1988; and
- A condition of approval should be the need for a range of monitoring and further flora and fauna surveys.

5.5 Business Submissions

Two submissions were received from businesses as follows:

- Menangle Sand and Soil Pty Ltd; and
- Illawarra Coal Holdings Pty Ltd on behalf of BHP Billiton Illawarra Coal and Endeavour Coal Pty Ltd.

The issues raised in these submissions were regarding the compatibility and potential conflicts of the proposal with sand resources along the Nepean River and coal seams within the Camden, Campbelltown and Wollondilly areas.

5.6 Private Submissions

The Department received a total of 1342 submissions from private individuals during the exhibition period. Of these submissions, the number that supported and objected to the proposal is detailed in **Table 3**. Two original submissions expressed concerns regarding the proposal, however they did not expressly object to the proposal.

Table 3 – Submissions from Private Individuals

Type of submission	Number of submissions	
	Objected to the proposal	Supported the proposal
Original submissions	10	2
Form Letters	65	1263
TOTAL	75	1265

Note: Two submissions did not support or object to the proposal.

In addition, 101 submissions in support of the proposal were received following the exhibition period (100 of these were form letters).

All submissions received during the exhibition period have been considered in the assessment of the proposal.

A summary of the key issues raised in submissions from private individuals is provided in **Table 4**.

Table 4 – Key Issues Raised in Individual Submissions

Key Issues
Socio-Economic/Community impacts - Insufficient information about the impact of the proposal on the local amenity and lifestyle. - Will compensation be paid to landowners for loss in land value and potential mine subsidence. - There are no direct benefits of this project to the local community. - There has been insufficient consultation with the local community and insufficient information provided regarding the project. - Concern about impacts of the gas treatment plant as it will be a continuous operation. - Insufficient assessment of the economic viability of the project in the EIS There is a need for rehabilitation plans, especially if the project fails. - Previous work by the Sydney Gas has resulted in negative impacts in the local area.
Land use conflict - The location of this heavy extractive industry is not appropriate in the existing quiet, rural/ residential area. - Concern regarding industry exclusions in the vicinity of the project and what type of industries will be affected. - Imposition of the 200m buffer zone around each gas well by Wollondilly Shire Council will sterilise land and prevent future rural and residential development in the area. - There is no buffer zone provided around the gas treatment plant. - The EIS does not include an assessment of future land use conflict.
Statutory Approval Process - Concern due to the commencement of drilling and access road construction before approval for the project was granted. - Request a Commission of Inquiry for the proposal. - The EIS provides an inadequate assessment in some areas and further studies are required. - The EIS is not of sufficient standard for a State significant development. It must meet all regulatory requirements. - Why was the location of the gas treatment plant changed? The EIS assessment of the siting of the gas treatment plant is inadequate as it was a late change.
Visual Amenity - Visual impact will be high due to the location of the gas treatment plant on a rising exposed slope, close to Menangle village. - There will be minimal opportunity to screen the gas treatment plant from view. - Concern regarding the visual impact of the flare and external lighting at the gas treatment plant.

Key Issues	
Flora and Fauna	- Field surveys undertaken for the EIS were insufficient in terms of areas surveyed, field work (trapping) and species identified. - Several flora species known to exist in the proposed development area were not identified in the EIS.
Noise	- Insufficient noise assessment is provided in the EIS. It is not clear whether explosion testing devices were used. There is concern that wind data used is insufficient for long term averages. - Noise impacts on fauna of the gas treatment plant have not been considered.
Air Quality	- Potential impacts from the Gas Treatment Plant such as odour leaks. - Potential "smells" from the Plant.
Non-indigenous Heritage	- The historical significance of the Mount Gilead property (Appin Road, Campbelltown) has not been considered. - The historical significance of the Mount Gilead property would be destroyed if the development proceeded.
Safety	- Potential safety risks include service vehicles on access roads, and the risk of leak and explosion at the wells. - The risk assessment report for the gas treatment plant is inadequate.
Water Resources / Groundwater	- Concern regarding water usage and its impact on local water supply. - There is risk of contamination of the water table.

Table 5 sets out the number of times each issue was raised by private individuals (excluding Form Letters).

Table 5 - Summary of issues raised by Private Individuals

Issues	Number of Times Issue Raised
Socio-economic / community impact	12
Land use conflict	16
Statutory approval process	14
Visual amenity	10
Flora and fauna	7
Noise	7
Odour/Air Quality	8
Non-indigenous heritage	11
Indigenous heritage	2
Safety	9
Water resources including groundwater	10
Project Justification/ proven resource	8

The Department has considered and assessed the concerns raised in these submissions in **Section 6** of this report.

5.7 Commission of Inquiry

The Department received two requests from one private individual for a Commission of Inquiry to be held into the proposal. This issue is discussed further in **Section 6.15** of this report.

6. DEPARTMENTS CONSIDERATION OF KEY ISSUES

The Department has assessed the proposal, EIS and submissions on the proposal and believes the following issues require further consideration:

- Socio-economic / community impact;
- Land use conflict;
- Statutory approval process;
- Visual amenity;
- Flora and Fauna;
- Noise;
- Air Quality / Odour;
- Non-indigenous heritage;
- Indigenous Heritage;
- Safety/ hazard;
- Water resources;
- Justification / proven gas resource;
- Potential Impacts on the Elizabeth Macarthur Agricultural Institute (EMAI) property;
- Potential Impacts on the Mount Gilead property; and
- Commission of Inquiry.

These issues are discussed in the following section.

6.1 Socio-economic / Community Impact

6.1.1 Socio-economic and Community Impact Assessment

The EIS provides an outline of the social and economic characteristics of the Camden, Wollondilly and Campbelltown local government areas and predicts potential impacts on these communities. Information was sourced from the Australian Bureau of Statistics, Councils, research bodies and the wider community.

The EIS identified several positive economic benefits from the project. This included the provision of employment being:

- Approximately 50 full-time construction staff (contractors)
- an additional 15 full-time operational staff (in addition to the 30 staff hired in the Stage 1 Project,

The EIS also states that indirect economic effects include the flow-on effect of cash into the local economy through increased employment opportunities for local retail shops, businesses and service companies.

The EIS states that the Applicant will spend approximately \$28 million over the next 12 months within the Stage 2 Project. The expenditure will include:

- employment of local persons by the Applicant;
- Royalties to the State;
- Payments to landowners for the lease of their land for the siting of gas wells and the gas treatment plant; and
- Payments to contractors and suppliers.

The EIS states that the project expenditure will include purchases in the local area of tyres, plant parts, magnetite, flocculant, equipment hire, plant and equipment purchase, consumables, safety goods and services, fuel and lubricants.

The EIS lists the community consultation activities that have been conducted by the Applicant since January 2000. These activities have included consultation with affected landowners, information days and site tours, local media releases, a complaints hotline from Stage 1, and community action panel meetings comprising representatives from Councils, environment groups and the gas action group. A Community Consultative Committee (CCC) was formed (as a result of the Stage 1 consent conditions).

6.1.2 Issues Raised in Submissions

The Department received 12 submissions on socio-economic and community issues, one from Campbelltown Council and 11 private submissions.

The submissions stated that there would be no local benefits for the community while there will be adverse environmental impacts from the proposal on the local area. Issues raised also included compensation, negative effects on the lifestyle and land value in the local area, effects on other future uses such as residential development and lack of community consultation. Some submissions stated that there was no consultation with some landowners who have proposed infrastructure on or close to their property, no information provided regarding the proposal and insufficient opportunity for landowners to raise their concerns.

6.1.3 Consideration of Key Issues

The Department considers the proposal will have a positive economic impact on the local and regional economy through local employment and purchase of goods and services from local contractors and businesses. The Department notes that the gas production will provide royalties to the State of NSW.

The Department considers that the separation distances for future residences from operating gas wells (**refer to Section 6.2**) will ensure that potential effects for adjoining landowners will be minimised.

One of the emerging issues from the exhibition period included comments from the local community that the Applicant was drilling gas wells in the area, while the EIS was on exhibition and that this seemed to be against the requirements of the planning legislation. The Applicant sought approval for the drilling of 23 wells in its Petroleum Exploration Licence from the DMR, under the provisions of the *Petroleum (Onshore) Act 1991*. This was a separate approval process (**discussed in Section 6.3**) to the current DA and EIS (which is seeking approval for gas production, drilling of 20 wells, the gas gathering system linking 43 wells and the new Gas Treatment Plant and associated facilities).

The Sydney Gas Camden Gas Project has a Community Consultative Committee which meets to discuss the project and its environmental performance. The Department considers that the CCC is an appropriate forum for the community to raise issues about the existing project and the Stage 2 project.

The Department understands that if the Applicant wishes to locate infrastructure on a private property that is not owned by the Applicant, the Applicant must enter into an Access Compensation Agreement with the landowner under the *Petroleum (Onshore) Act 1991*. Therefore, landowners who have infrastructure (gas wells, gas gathering systems etc) located on their land must first agree to do so with the Applicant.

6.1.4 Conclusion

The Department is satisfied that the Project offers significant social and economic benefits to the region and NSW, through local employment, purchase of goods and services and royalties from gas production. There would also be indirect job creation from local contractors and businesses used by the Applicant.

In addition, the production of natural gas from coalbed methane, albeit small, has the potential to provide a significant alternative energy source in New South Wales with the potential to reduce greenhouse gas emissions. This is consistent with the Government's policy of promoting sustainable development and increasing the diversity of energy sources in New South Wales.

These socio-economic benefits should be weighed against the potential environmental effects of the proposal.

The Department's recommended consent conditions for the proposal will require that additional community representatives from the PEL 2 area are appointed to the Community Consultative Committee (CCC). This will ensure that landowners that are directly in the Stage 2 project area will have the opportunity to participate in the CCC.

6.2 Land Use Conflict and Future Urban Release Areas

6.2.1 Land Use Assessment

The EIS provides a description of existing land uses, which include industrial, small rural landholdings, agricultural land and an expanding residential area.

According to the EIS, land use impacts of the proposal are expected to be minimal as the individual sites have been selected on previously disturbed land or adjacent to industrial uses. Possible sensitive areas have been avoided. Gas wells will be located on small parcels of land. Gathering lines are predominantly located in road easements and along property boundaries to minimise impact and are located underground. The EIS considers that there is no anticipated land use conflict from the gas treatment plant as it will be located within land that the Applicant has leased from a private landholder and is not currently being used for other purposes.

6.2.2 Issues Raised in Submissions

The Department received 16 submissions on potential land use conflict impacts: one from Landcom, one from Sydney Water, one from NSW Agriculture, one from Campbelltown Council, one from Wollondilly Shire Council and 11 private (original) submissions and 65 private (form) submissions.

These submissions raised concern over land use conflicts and land being sterilised by the development. Such issues included potential land use conflict of the proposal with the agricultural, heritage and biodiversity values of EMAI; potential conflict of the proposal with sand and coal resources (underground coal mining) in the area; and potential conflict as extractive industries are not appropriate within the rural area of the proposal. An issue included potential conflict with other public infrastructure such as access problems for Sydney Water.

Several submissions highlighted concern regarding future rural and residential development that will be prohibited within the 200m buffer zone of a gas well that has been set by Wollondilly Council. Also, there is no buffer provided for the gas treatment plant and no easement over the gathering system. Issues from the exhibition process stated that the EIS did not include an assessment of future land

use conflict. The submissions also stated that the location of this heavy extractive industry is not appropriate in the existing quiet, rural/ residential area.

Some submissions sought clarification of the proposal with respect to the location of the proposed future Urban Release Areas in south-western Sydney.

6.2.3 Consideration of Key Issues

Buffer Distances between Operating Gas Wells and Future Development

During the Stage 1 Camden Gas Project, Wollondilly Shire Council raised concern regarding the safe distance between residences and gas equipment and established a 200m buffer zone. The Department has noted that there is no statutory basis to this figure and no significant environmental impacts from gas wells within the Stage 1 operation. The *Petroleum (Onshore) Act* prohibits the location of a well (and other mining related works) within 200m of a dwelling, unless the owner has given consent. In Stage 1, the Department considered that impacts of the development could be managed through the consent conditions which set performance criteria and reporting and monitoring requirements.

Wollondilly Shire Council's submission for Stage 2 (see **Section 5.3.3**) stated that studies have indicated 200m may be an overestimate of the required separation distance from gas wells. It is clear from the submissions received for Stage 2 that this distance may impact on future development rights of land within 200m of a well. Therefore, Council has requested the Department to initiate a study and conclusively establish the required separation distance.

Campbelltown Council's submission also noted that the proposal would be located within the Menangle Park urban release area and that future dwellings would be located within a 200 metre radius of existing wells. Campbelltown Council also requested that guidelines be prepared to provide for the siting of future dwellings within the vicinity of gas wells.

Additionally, several private submissions expressed concern regarding the application of the 200 m buffer rule and how this may affect future development on their own land, if a gas well was located on an adjoining property boundary.

The Department recognises that the Campbelltown/Menangle/Camden area is undergoing change as increased pressure for rural-residential development increases. In response to the issues raised to this proposal by the local Councils and the community and due to the potential for future residential and other development to be located in the vicinity of operating coal seam methane wells, the Department has recently prepared a guideline titled "Locational Guidelines - Development in the Vicinity of Operating Coal Seam Methane wells". The purpose of the guidelines is to provide advice to consent authorities and other stakeholders on development in the vicinity of operating coal seam methane wells.

The guideline is based on a systematic hazard identification and quantified risk assessment of typical coal seam methane well installations. The land use and technical controls in the guidelines should ensure that development in the vicinity of operating coal seam methane wells (with consistent design and operational controls as specified in the guidelines) will not be exposed an unacceptable level of risk.

There are three well configurations assessed in the guideline, which can be described as follows:

1. Manually controlled wells that have local instrumentation. A pump and/or water separator are optional for this configuration.

2. Automatically controlled wells (with separator/optional pump). The well has a water separator and is remotely monitored and automatically controlled. A pump is optional for this configuration.
3. Automatically controlled wells (no separator/pump). The well is remotely monitored and automatically controlled. There is neither a pump or a separator.

At the date of preparation of the guidelines, the operating wells in the Camden/Wollondilly area (in the Sydney Gas Stage 1 Coal Seam Methane Project) were all manually controlled (being Configuration 1). The automatically controlled well configurations (Configurations 2 and 3) have been proposed as being representative of two typical future well configurations.

The guideline describes the use of separation distances to ensure an appropriate buffer between a development and operating coal seam methane wells. The separation distances result in circular areas around the well within which controls should apply to the development. The guideline also specifies the technical and operational controls that must be present on each well configuration in order for the guidelines to be applicable.

There are two types of separation distances in the guidelines:

- A sensitive uses separation distance. Uses such as schools, hospitals, aged persons accommodations and other uses where vulnerable people are concentrated should not be permitted on areas within this distance from the well.
- A residential separation distance. Dwellings or places of regular occupancy on residential properties or sensitive uses should not be permitted on areas within this distance from the well.

The guideline notes that maximum pressures associated with coal seam methane wells reduce significantly over the first two years of a well's operating life. This results in a reduction in overall risks in the vicinity of a well. The guideline recommends two sets of separation distances. The first is for wells in the early stages of operation (up to two years) and the second is for established wells (after two years). The separation distances are shown in **Table 6** and should be measured from the well head.

The Department considers that the guideline will provide direction to consent authorities for future proposed development located in the vicinity of coal seam methane wells.

The Department notes the concern raised by members of the community regarding the proposal and the potential application of the 200 metre exclusion zone, previously applied by Wollondilly Council. The Department considers that with the publication of the guideline, the land that will be affected, or potentially sterilised from the future construction of dwellings in the general vicinity of coal seam methane wells will not be unduly compromised.

Table 6 – Separation Distances for Operating Gas Wells (metres from well)

Well Configuration	Separation Distance (m)	
	Residential Use	Sensitive Use
Early Operation Wells (Typically up to 2 years)		
Manual	15	25
Automatically Controlled (With Separator/Optional Pump)	15	25
Automatically Controlled (No Pump/Separator)	10	20
Established Wells (Typically after 2 years)		
Manual	10	20
Automatically Controlled (With Separator/Optional Pump)	10	20
Automatically Controlled (No Pump/Separator)	10	15

The separation distances in **Table 6** show for example, that a separation distance of 10 metres from the wellhead to a residential use is considered appropriate for an automatically controlled well (with no pump/separator) during early operation or once established after a two year period. However, if a sensitive use is proposed in proximity to this well, a separation distance of 20 metres is considered appropriate during early operation and is reduced to 15 metres once the well has been established (after a period of two years).

Proximity to Future Urban Release Areas

The Department has reviewed the location of the proposal with respect to the future Urban Release Areas of “Menangle Park” and “Spring Farm”. These urban release areas have been approved by Government and are categorised within the Fast Track program. The Mount Gilead urban release area has been identified by Government but it has not been prioritised and is not on the Fast Track program.

The Department notes that the existing gas wells (in this Development Application) closest to the Menangle Park Urban Release Area (being Gas Wells RP 1 and RP 12) are approximately 300 metres from the boundary of the Urban Release Area. Similarly, the existing Gas Well GL 7 is over 300 metres from the boundary of the Spring Farm Urban Release Area. The proposed Gas Well EM 1 is also approximately 300 metres from the boundary of the Spring Farm Urban Release Area. Based on the findings of the Department's locational guideline discussed above, the Department considers that the existing and proposed gas wells in this DA will not sterilise land within the two proposed Urban Release Areas.

The Department has also considered the safety and hazard risk of the proposed gas gathering system in proximity to the Spring Farm and Menangle Park Urban Release Areas. The proposed gas gathering system is located along the western boundary of the Menangle Park Urban Release Area and approximately 50 metres from the eastern boundary of the Menangle Park Urban Release Area. The closest point of the gas gathering system to the Spring Farm Urban Release Areas is about 300 metres from the boundary of the Urban Release Area. The Department's hazard assessment is discussed in detail in **Section 6.10** which shows that the estimated individual risk of fatality at a distance of 5 metres from the gas gathering pipeline is less than one in a hundred million per year, which represents a negligible level of risk to all land uses along the gas gathering pipelines.

The Department has also reviewed the potential for noise and air emissions to affect the two urban release areas. This assessment is discussed in **Section 6.6** and **Section 6.7** respectively and shows that the project will not generate noise and air emissions that exceed criteria at proposed receivers in the Menangle Park and Spring Farm Urban Release Areas.

Potential Conflicts with other Resources

The proposal is located in an area which contains coal resources and sand resources. The Applicant has submitted further information regarding potential conflict with coal resources. The area shown as proposed Production Lease areas in the DA and EIS includes an area on 10 hectares which overlaps with Coal Mining Lease 767 (south of the Wandongong property). The proposed Production Lease area has been amended and the Applicant does not intend to apply for a Petroleum Production Lease over any coal mining leases for this proposal. The Applicant also submits that it has had a number of discussions with BHP Billiton (convened by DMR) regarding the potential overlap of underground coal mining resources and coal seam methane extraction. The Applicant has agreed to run verticality logs for each well within coal exploration titles to accurately locate the downhole position of gas wells within coal seams. The accurate positioning of the well in relation to future coal mining operations would aid in developing and implementing suitable safety measures.

The Applicant has also undertaken studies with Geo Mechanics International and CSIRO regarding potential fracturing of the strata above and below the coal seam. The Applicant has stated that these studies show that the fracc process utilised by the Applicant in the southern coalfields are confined within the coal seam and do not propagate into the floor and roof of the coal seam. The Applicant therefore states that the fracturing process does not adversely affect the integrity of the surrounding strata.

The Applicant does not comment on the commercial feasibility of future coal mining operations but considers that “pre-drainage” of the methane by the Applicant will make future coal mining operations safer and therefore improve the economic viability of those operations.

The initial submission from Menangle Sand and Soil raised concerns regarding the potential conflict of proposed gas wells EM 6 and EM 8 with the company's sand and soil reserves located beneath and adjacent to the wells. The Department received a further submission stating that Menangle Sand and Soil supported the DA and did not consider that the proposed activities would interfere with its reserves or operations.

The Department considers that the DMR is the relevant government agency to make decisions regarding the potential future conflict or sterilisation of resources, that may occur as a result of this proposal. The DMR is the agency responsible for the resources held by the Crown and issues exploration, mining and production titles with conditions as appropriate. The DMR has not commented on the potential conflicts of the proposal with coal and sand resources in the area and therefore the Department is satisfied that this issue has been satisfactorily resolved.

Potential Conflicts with EMAI and Mount Gilead

The Department has assessed the issues regarding the potential land use conflict of the proposal with EMAI and the Mount Gilead property in **Section 6.13** and **Section 6.14** respectively.

Potential Conflicts with Public Infrastructure

The proposal is located in proximity to roads, railway lines and public infrastructure such as water mains. The Applicant will be required to obtain the necessary licences and permits from each of these authorities to undertake proposed works. For instance, the Applicant will need to apply for licences and permits from the Roads and Traffic Authority, Rail Estate and Sydney Water, to undertake activities in proximity to or below (underboring) public infrastructure.

The Department considers that the proposal should not affect the operation of existing or future public infrastructure.

6.2.4 Conclusion

The Department has prepared a Guideline to provide direction to consent authorities considering future development applications in the vicinity of operating coal seam methane wells. This Guideline demonstrates that the appropriate separation distance for development from operating coal seam methane wells will range from 10 m – 25 m (depending on the type of proposed use and age of the well), rather than 200 m which has been previously applied by local Councils. Therefore, the Department considers that the revised separation distances will provide appropriate separation of land uses (to minimise exposures to an unacceptable level of risk) whilst not compromising future development in the area.

To assist consent authorities and other stakeholders in implementing the Guideline, the Department has recommended a consent condition requiring the Applicant to provide the co-ordinates of the wellhead and the type of each wellhead configuration to the relevant local Council in which the wellheads are located. Therefore, each Council will be able to consider the location of the wellhead, the type of wellhead configuration and the period of operation of the well, in respect of future development applications made to Council.

The Department considers that the potential conflict between mineral, coal and gas resources is a matter for the DMR. The DMR has not commented on this issue, however, the Department has recommended a consent condition that requires the Applicant to run verticality logs for each new gas well within coal exploration titles.

The Department has also recommended consent conditions for the protection of public infrastructure. These conditions require the Applicant to repair or pay the full costs of repairing any public infrastructure that is damaged by the proposal and relocating or paying the full costs of public infrastructure that needs to be relocated as a result of the proposal.

6.3 Statutory Approval Process

6.3.1 Assessment of Statutory Approval Process

At the time that the DA and EIS were lodged, the Applicant had drilled 23 gas wells of the 43 wells shown in the EIS. The Applicant has been operating the current proposal under its Petroleum Exploration Licence (PEL) 2. The Applicant holds the exploration rights under the PEL and is therefore permitted to undertake certain activities on the PEL provided it obtains the necessary approvals.

6.3.2 Issues Raised in Submissions

The Department received 14 submissions on potential issues or matters regarding the statutory approval process: one from DMR, one from EPA, one from NPWS, one from

NSW Agriculture, one from Sydney Water, one from the Department (Natural Resources), one from Campbelltown City Council and 7 private submissions. Some of the government submissions sought clarification on the statutory process and post consent approvals required by the project. One of these issues sought clarification on whether a gas well is fraced on more than one occasion.

Several public submissions raised concerns about the approval process, particularly that wells and access roads were being drilled during the exhibition of the EIS, and prior to the approval for the whole project being granted.

6.3.3 Consideration of Key Issues

Several submissions raised concerns about the approval process for the construction of wells and associated access roads prior to the granting of development consent for the Stage 2 project.

The 23 existing wells and associated access roads were approved under the *Petroleum (Onshore) Act 1991* by the DMR. Under that Act, proposed activities to be carried out under a PEL are considered to fall under Part 5 of the *EP&A Act*, and the DMR is the Determining Authority. The Applicant prepared a Statement of Environmental Effects (SEE) to assess the potential environmental impacts of drilling the 23 gas wells and the construction of associated access roads. This SEE and application were considered by the DMR (as the Determining Authority) and approval was granted by the DMR for the drilling of the 23 wells. The 23 wells that were approved by the DMR are listed in **Section 3.3, Table 1**.

The Applicant does not require approval from the Department for the drilling of the 23 wells that have already been approved by the DMR (and subsequently drilled). The Applicant's DA seeks approval for the drilling of 20 wells (on EMAI) and the production of gas from a total of 43 wells. The Department has no powers to override an existing approval under other legislation or impose conditions which would be contrary to another Act.

The production of gas from the gas wells requires the Applicant to hold a Petroleum Production Lease (PPL). To obtain a PPL, the Applicant is required to obtain development consent for the proposal under the *EP&A Act*. If a PPL is granted to the Applicant in the future, it provides the Applicant with exclusive rights to conduct petroleum operations on the land within the Lease area.

The Applicant has provided additional information on whether gas wells require fracing on more than one occasion. The Applicant has advised that provided a gas well has been successfully fraced, it does not require refracing.

6.3.4 Conclusion

The decision for the approval of activities under Part 5 of the Act and whether the proposed activities will significantly affect the environment and therefore require the preparation of an EIS is a matter for the Determining Authority, the DMR. Part of the Stage 2 proposal (construction of 23 wells) was approved by the DMR under Part 5 of the *EP&A Act*. Therefore, the Applicant drilled the 23 approved gas wells following approval from the DMR. The construction of the remaining 20 gas wells, the gathering system, gas treatment plant and production of gas from the total 43 wells fall under Part 4 of the *EP&A Act* and are assessed in this DA.

If the Applicant wishes to produce gas from future gas wells (wells not in this DA) in the Lease area, the Applicant will be required to lodge a further DA under the *EP&A Act* for the production of gas from that well.

Accordingly, the Department is satisfied that the Applicant has followed appropriate processes for gaining necessary approvals.

The Department has also recommended a consent condition that the Applicant be required to obtain the prior approval of the Director-General for the redrilling and/or additional refracching of an existing well. The recommended consent conditions also require the Applicant to prepare a Redrilling and Refracching Management Plan for submission to the Department, prior to the redrilling or refracching of an existing well.

6.4 Visual Amenity

6.4.1 Visual Amenity Impact Assessment

The EIS provides a description of the existing visual environment of the project area and an assessment of potential visual impacts. The existing area is predominantly rural land with increasing residential development. Potential visual impacts associated with the proposed development include temporary impacts during construction (presence of construction equipment in the area, open trenches and spoil at individual sites prior to site restoration) and permanent impacts (individual wellhead structures, the gas treatment plant, flare and facilities and pipeline warning signs along the gathering system).

The EIS states that the gas treatment plant is screened by the local landscape and vegetation and that gas wells have been located to avoid visually sensitive areas where possible and will blend in with the surrounding landscape. With the implementation of mitigation measures, the EIS states that visual impacts will be minor, short-term and will not adversely alter the character of the landscape. The EIS concludes that the character of the landscape will not be adversely altered by the proposed development and the changes to the visual amenity of the area are not considered to be of significance.

6.4.2 Issues Raised in Submissions

The Department received 10 submissions (and 65 form submissions) on potential visual amenity impacts: one from the EPA, one from Camden Council, one from Mount Annan Botanic Gardens, seven private (original) submissions and 65 private (form) submissions.

These submissions raised concern regarding the high visual and night-lighting impact of the gas treatment plant due to its location on a rising exposed slope and inability to be screened. The submissions stated that the gas wells will be entirely visible and there is therefore a concern of vandalism. The submissions stated that the EIS visual impact assessment is inadequate and misleading and that the visual impact of the flare has not been considered.

6.4.3 Consideration of Key Issues

The Department required the Applicant to provide additional analysis of the potential visual impacts of the proposed facilities at Rosalind Park. The Department requested further information regarding the dimensions of the proposed buildings and infrastructure and their location on the Rosalind Park Site.

The Department conducted two site inspections of the proposed Rosalind Park Site, the existing drilled wells and the existing Stage 1 Pilot Ray Beddoe Gas Treatment Plant. The Department also visited the Mount Gilead Homestead. The Department has used the information from these site visits in its assessment.

The Department has considered the following matters in its visual assessment of the proposal:

1. Overall landscape qualities;
2. Characterisation of the visual components of the proposal;
3. Identification of the visual catchment and potential viewers;
4. Assessment of impacts on the landscape and visual amenity;
5. Independent Review of Visual Impact Assessment and
6. Recommended mitigation measures to reduce potential impacts on visual amenity.

Existing Visual Environment and Project Components

The Department considers the Applicant's description of the existing landscape is adequate. It should be noted that although the Rosalind Park Site is largely cleared, there are significant stands of mature trees within the riparian zone of Menangle Creek to the south of the site. Comments raised in submissions expressed concern at the proposed Gas Treatment Plant being located in a "rural" setting and some submissions suggested that the Plant should be located in an "industrial" setting. Overall, the Department considers the Rosalind Park Site to be in a "rural" landscape setting. The Department also notes that the Rosalind Park Site is adjacent to an existing sandstone quarry.

The proposed development includes the following infrastructure: gas wellheads and the gas treatment plant and associated facilities. The gas wellheads are approximately two metres in height above ground level and the fenced enclosure area during production is approximately 4 m by 8 m. The proposed gas wells (to be drilled) in this DA are located across the EMAI.

The major infrastructure of the proposal is located at Rosalind Park, adjacent to an existing quarry. The Applicant has categorised the proposed infrastructure into three areas as follows:

1. Plant Area (Area 1);
2. Associated offices and facilities (Area 2); and
3. Laydown area and pipeyard (Area 3).

The Plant area includes the Gas Treatment Plant which includes specific components such as incoming suction scrubbers, a compressor, TEG Unit, metering skid interconnected by a main pipe rack and the horizontal flare.

The facilities in Area 2 include the Control Room, office and accommodation block, site office and amenities block, and workshop/industrial shed. All of these buildings will be prefabricated and constructed from colourbond external cladding.

Area 3 includes the storage of well casing and tubing, trucking equipment and associated drilling equipment.

From additional information provided by the Applicant, the proposed facilities will have the following approximate elevations:

- Office complexes including office complex, control room and office, amenities and living quarters – height of 3 metres;
- Industrial Shed/workshop – height of 7 metres;
- Gas Treatment Plant (TEG Reflux Condenser) – height of 12 metres;
- Gas Treatment Plant (Exhaust Stack of compressor) – height of 13 metres; and
- Powerlines – height of 9 metres.

The Applicant has advised that the Gas Treatment Plant will be constructed at existing (natural) grade, however the facilities in Area 2 and Area 3 will be cut into the existing slope.

The Department considers the Gas Treatment Plant and the Workshop/Industrial Shed are the project components with the greatest potential to cause visual impacts, given their size and height and location within the landscape.

The Gas Treatment Plant and facility will be operated 24 hours per day and the horizontal flare will operate during plant shutdown. The Applicant has advised that Area 3 (the storage and pipeyard) will only be operated during daylight hours.

Visual Catchment and Potential Viewers

At the request of the Department, the Applicant commissioned a visual impact assessment report (prepared by URS) which identified the visual catchment of the site using site contours and photographs, to show the areas that are visible from the Rosalind Park Site and will therefore have views to the treatment plant site itself. The boundary of the visual catchment shows that potential views to the Rosalind Park Site from the Hume Highway (in the vicinity of the Nepean River) are blocked by roadside trees and the overburden stockpile of the adjacent quarry. The analysis also states that potential views from the Hume Highway north of the Nepean River to the site are shielded by existing landforms as the road is in a cutting.

The Applicant's visual catchment analysis states that potential views of the site to the north are screened by a high ridge immediately north of the site whilst potential views of the site from within Menangle Valley to the north east are generally blocked by landform and vegetation. However, the visual catchment analysis states that part of the Rosalind Park Site is visible from the Mount Gilead Homestead located on a ridge to the south east of the site. Additionally, the analysis states that potential views of the site to the rural land south of the site (the Mount Gilead property) are generally screened by trees up to 20 metres high, along Menangle Creek.

The visual catchment analysis identified that the Mount Gilead Homestead is the only house within the visual catchment of the site.

The Department notes that the Applicants analysis of visual impacts is limited to the locality of the site (within one kilometre of the site) and does not include a regional analysis of potential visual impacts.

Based on the assessment, the Department considers that the key potential sensitive viewers of the site include:

- Mount Gilead Homestead; and
- Menangle Park Urban Release Area.

The Department's assessment of the potential visual impacts is discussed in the following section.

Impacts on the Landscape and Visual Amenity

The proposed infrastructure at Rosalind Park will be located within a rural landscape that is largely cleared of native vegetation. Given the bulk and size of the proposed facilities, it is considered that the proposed development will cause a change in the landscape in the immediate locality of the site. The Department therefore considers the Rosalind Park Site will change from a rural to a more industrial landscape.

The Rosalind Park Site is surrounded by a ridge to the north, which trends north-east to south-west and reaches a height of 160 metres. This ridge assists in screening potential views of the facilities from the Menangle Park Village area. Topography to the north-east of the site includes ridges which rise in elevation to 160 metres and isolated hills ranging in height from 150 metres to 210 metres. This topography assists in screening the proposed facilities from views to the north east. To the south of the site, the land slopes towards Menangle Creek and rises on the southern bank to a ridge which reaches approximately 150 – 160 metres in height. The Mount Gilead Homestead is located on this ridge.

The Department considers that the potential impacts in the immediate area of the site include the viewing location from the Mount Gilead Homestead. The Applicant's consultant URS, provided sightlines or cross-sections of the Mount Gilead Homestead to the site, to determine the extent of potential views from the Homestead to the proposed facilities. The sightlines show that the existing trees along Menangle Creek will screen potential views of the Gas Treatment Plant and its stacks, the office and amenities building and most of the pipeyard, from the Homestead. The sightlines show that the proposed workshop (including the industrial shed) will be visible from the Homestead. To minimise the potential visual impact of the proposed development, the Applicant has committed to implement the following mitigation measures:

- Earth mounding and tree planting along the eastern boundary of the site;
- Shrub and tree planting on the proposed batters to be created by the construction of platforms at various levels within the site;
- Selection of materials and colours for the various buildings and plant components that minimise visual contrast with the surrounding areas; and
- Revegetation of all areas of exposed soil including cut and fill slopes and portions of the constructed platforms that are not used for buildings, roadway, pipe storage or the gas treatment plant.

The Department acknowledges that some aspects of the proposed facilities at Rosalind Park will be visible from the Mount Gilead Homestead. The trees at the southern boundary of the Rosalind Park site provide a screen which effectively should reduce potential impacts of the proposal on the visual amenity of the Mount Gilead Homestead. However, even with the presence of trees along Menangle Creek, the workshop/industrial shed and parts of the pipeyard will be visible from the Mount Gilead Homestead. The largest visual components of the Gas Treatment Plant being the exhaust stack of the compressor and the TEG Unit should not be visible from the Mount Gilead Homestead as views of these components will be shielded by existing trees.

To ameliorate potential visual impacts, the Applicant has proposed mitigation measures such as earth mounding and tree planting, appropriate selection of material and colours for the various buildings and revegetation of areas of exposed soil and constructed platforms that will not be in use.

At the Department's request, the Applicant prepared photo-montages of the proposed facilities and likely view of the facilities from the Mount Gilead Homestead. These studies and the Department's assessment of them are discussed further in a separate section on the impacts on Mount Gilead (**Section 6.14**).

Night-lighting

The Department notes that the facilities at the Rosalind Park Site shall be lit 24 hours per day. The Department acknowledges that lighting at the proposed facilities shall introduce a new source of lighting in the area at night-time. Although the lighting at

the site would be very localised and screened to some extent by the surrounding trees, the Department considered that there was some potential for night-lighting to spill into the view of the Mount Gilead Homestead. Therefore, the Department requested the Applicant to undertake a study of the potential effects of night-lighting and to include an assessment of the potential luminescence of the flare.

The Applicant has submitted supplementary reports to the Department which provide an assessment of potential night-lighting effects of the proposal. These reports show that changes to the proposed design are required to avoid direct line of sight impacts from the light sources to the Mount Gilead Homestead. In summary, the proposed changes include re-positioning the proposed luminaries, changing the direction of light from proposed luminaries and ensuring the appropriate selection of proposed luminaries. Changes are recommended for the following site areas:

- Pipeyard and laydown area;
- Workshop area floodlighting;
- East of office area and workshop general lighting;
- West of office area and Workshop – car park area;
- West of control room and slug catcher;
- Control room, living quarters and adjacent area;
- Southern boundary adjacent to the pipe rack; and
- Outdoor fluorescent lighting (hazardous area).

The reports also acknowledge that the existing tress along Menangle Creek provide a natural screen over the southern section of the Treatment Plant Site which will limit the direct line of sight from the Plant to the Homestead. The Treatment Plant is the only portion of the proposed facility that will be a 24 hour operation and therefore lit up at night-time. The northern section of the site (which includes the office, carpark, workshop and pipeyard areas) will be partially visible from the Mount Gilead Homestead. However, these areas will not be active during normal site operating hours. The lights within these areas would only be utilised outside of normal operating hours during an unplanned failure of a gas gathering line or a gas wellhead.

The reports conclude that if the Applicant follows the recommendations in the report, it will eliminate the primary source of obtrusive effects to Mount Gilead, being a direct view of the lamps or the illuminated parts of the luminaries. The reports also recommend that time control devices be used to ensure that outdoor lighting is not operating unnecessarily outside of curfew hours.

Lighting from the Flare

At the request of the Department, the Applicant prepared an additional assessment of the potential lighting effects of the flare, particularly in relation to the nearest residence. The Applicant has advised that flaring of gas will occur during Plant Shutdown or emergency situations for safety reasons. The flare has been designed to reduce impacts, by positioning the flare in a horizontal matter over an evaporation pond with embankments, to shield the flare from being in a direct line of sight. The flare is proposed to be located in the south east corner of the site and therefore will be screened by the trees along Menangle Creek. The Applicant contends that the exact timing of flare events is difficult to predict as it depends on a number of variables.

However, the Applicant has committed to ensure that all planned maintenance of the Plant (which would cause flaring of the gas) will only take place during daytime hours. However, it is not possible to predict when the Plant will need to be shut down for emergency reasons, causing a gas flare. It is anticipated that these occasions may occur either during the day-time or night-time. The Applicant has estimated the

frequency of the operation of the flare as discussed in **Section 3.7**. The Applicant advises that as the horizontal flare will operate 3% of the operational plant time, given its comparatively infrequent operation, the flare is not expected to impact local visual amenity.

Additionally, the Applicant has provided specific predictions on the type and frequency of plant activities that may lead to a flare event and estimated the level of lighting that would be seen at the Mount Gilead Homestead. These issues are discussed in more detail in the section on Mount Gilead (**Section 6.14**).

6.4.4 Independent Review of Visual Impact Assessment

The Department considered that the potential visual and night-lighting effects warranted further assessment by an independent expert. Therefore, the Department commissioned Parsons Brinckerhoff to prepare an independent review of the visual impacts of the proposal on the Mount Gilead Homestead and future urban release areas. The scope of the Independent Review included a review of the:

- Visual impact assessment provided in the EIS and supplementary report;
- Visual catchment of the proposed Treatment Plant;
- Identification of the potentially impacted receptors and assessment of the visual impact on these receptors.

The Independent review is reproduced in full in **Appendix A** of this report. The findings of the review included several recommendations for mitigation measures and further information such as:

- measures to protect the health of existing trees along Menangle Creek;
- preparation of a Landscape Management Plan which details proposed screening works;
- further information on the final colours of the plant facilities;
- recommended colours for the buildings, ground surfaces and planting material to reduce visual impacts on the Mount Gilead Homestead; and
- further information on the future of the adjacent quarry.

In summary, the review concluded that provided the recommendations were implemented, the proposal should have an acceptable level of impact on views from Mount Gilead Homestead and the surrounding area. The report also found that the retention of trees and additional planting along Menangle Creek, landscaping of the northern embankment and use of muted colours for plant buildings and ground surfaces are important in reducing visual impacts to an acceptable level.

6.4.5 Conclusion

The Department concurs with the findings of the Independent Review of the visual impact assessment and that the proposal will cause some visual impact on one private residence, the Mount Gilead Homestead. There are no other private residences within the visual catchment of the Rosalind Park Site.

The Department has further considered visual issues regarding the Mount Gilead Homestead in **Section 6.14** of this report. The Department acknowledges that some components of the Site will be visible from the Mount Gilead Homestead. The Department considers that the potential visual impacts on the Mount Gilead Homestead can be reduced to an acceptable level, provided adequate and successful visual mitigation measures are implemented. Additionally, the performance of the visual mitigation measures should improve with time (particularly over a period of 5 – 10 years) as shrub and tree plantings become established. To ameliorate the

potential visual impacts on the Mount Gilead Homestead, the Department has recommended consent conditions which will require the Applicant to:

- Provide colour specifications for the proposed facilities at Rosalind Park Site for the Department's prior approval;
- Implement all of the recommended visual and lighting mitigation measures recommended in reports by URS, Bassett Engineering and Simon Engineering (as specified in the recommended consent conditions); and
- Prepare a Vegetation and Landscape Management Plan which will detail the colour and appearance of the proposed buildings, proposed screening measures and monitoring of the effectiveness of the mitigation measures which will also need to be reported annually in the Applicants Annual Environmental Performance Report.

The Applicant is also required to submit key concepts of the Vegetation and Landscape Management Plan such as the procedures and principles of the mitigation measures to the Director-General for approval prior to construction.

The Department considers that the trees in the Menangle Creek riparian zone provide substantial shielding of views from Mount Gilead to the Treatment Plant Site. The presence of the trees minimises a line of sight view from the Mount Gilead Homestead to the Gas Treatment Plant facility. Therefore, the Department's recommended conditions also require the Applicant to regularly monitor the health of the trees in the Menangle Creek riparian zone and to recommend measures to improve the health of the trees if required. Additionally, the Applicant will be required to implement measures to protect and retain these trees. The Department considers that these requirements will ensure that if the health of the trees deteriorates, such that the view of the development from Mount Gilead Homestead increases beyond the predictions in the report by URS, then the Applicant shall undertake appropriate measures.

The Department has also recommended that the Applicant Commission an Independent Landscape Expert (who must be approved by the Director-General) to undertake an audit of the effectiveness of the visual mitigation measures and to specifically comment on the effectiveness of measures to prevent and/or minimise visual and lighting impacts on the Mount Gilead Homestead. The Audit will also recommend actions or measures to improve the performance of the visual mitigation measures and provide an audit report to the Director-General. The Independent Audit must be conducted within six months of commissioning of the development and every two years thereafter.

6.5 Flora and Fauna

6.5.1 Flora and Fauna Impact Assessment

A flora and fauna assessment of gas drill sites and access roads, underground gas gathering system route and the treatment plant was undertaken by Wildscenes EcoResearch Pty Ltd and EcoSearch Consultants as shown in **Table 7** and reported in the EIS.

Table 7 - Flora and Fauna Assessments

Company/Study	Survey Period	Survey Coverage	Assessment Activities
WildScenes EcoResearch (WildScenes EcoResearch April 2003)	Site visits between 10 September 2002 and 10 December 2002	Gas gathering system between well sites: - GL 1 – GL 19 - M 1 – M 23 - RP 1 – RP 12	- Review of existing records including threatened species within a 5km radius of the study site; - Active searching for fauna during daylight hours; - Flora survey using transects.
WildScenes EcoResearch (WildScenes EcoResearch May 2003)	Site visits conducted on 15 March 2003 and 21 March 2003	Gas wells in the Elizabeth Macarthur Agricultural Institute (EMAI) area: EM 1 – EM 20	- Review of existing records including threatened species within a 5km radius of the study site; - Active searching for fauna during daylight hours; - Flora survey using transects
WildScenes EcoResearch (WildScenes EcoResearch April 2003)	Site visits conducted on 4 October 2002 and 3 December 2002	Gas wells: - MP 1 – MP 12 - MP 18 – MP 20 - MP 22 – MP 23 - MP 25 - RP 1 – RP 12 - Gas treatment works site	- Review of existing records including threatened species within a 5km radius of the study site; - Active searching for fauna during daylight hours; - Flora survey using transects
Ian Tait-EcoSearch Consultants (Assessment No. 4)	28 June 2001	Gas wells: WG 1 – WG 6	Site inspection

Much of the area to be affected has been cleared in the past for agricultural or grazing purposes. Vegetation adjacent to the areas affected includes remnant Cumberland Plain Woodland, Sydney Coastal River Flat Forest and Shale Sandstone Transitional Forest.

The EIS states that the opportunistic fauna surveys identified that fauna in the areas to be affected was largely depauperate due to the lack of habitat available on site. Those species that were observed were generally common or introduced and associated with open pasture areas and disturbed sites.

Breeding raptor populations of the Peregrine Falcon, Little Eagle and White-bellied Sea Eagle have been identified within the Elizabeth Macarthur Agricultural Institute (EMAI) grounds. Of greatest concern was the potential noise and disturbance of raptors during their breeding seasons. A map showing exclusion zones (for the location of gas wells) was provided by the Applicant and appear to provide a buffer of approximately 100 metres from the edge of vegetated areas.

A range of threatened flora and fauna species and ecological communities are known from the region. The Applicant prepared Eight part tests for those species identified as possibly occurring in the area and are shown in **Table 8**.

Table 8 - Eight Part Tests

Flora/Communities	Fauna
Cumberland Plain Woodland	Koala
Shale Sandstone Transitional Forest	Squirrel Glider
Sydney Coastal River Flat Forest	Regional Honeyeater
<i>Pimelea spicata</i>	Cumberland Land Snail
<i>Pomaderris brunnea</i>	Powerful Owl

The Eight part tests found that there would be no significant impacts on any threatened species and the preparation of a Species Impact Statement (SIS) would therefore not be required for this proposal.

The EIS and supplementary documentation states that relatively little environmental impact is anticipated and that mature trees would not be removed during the development process. Additionally, the EIS recommends that the Applicant take due care when undertaking development such as drilling of gas wells at a number of locations that are in proximity to threatened ecological communities such as the Sydney Coastal River Flat Forest, Shale Sandstone Transitional Forest and Cumberland Plains Woodland. These locations include (but are not limited to) gas wells EM 1, EM 5, EM6, EM 8 and gas gathering lines near wells GL 6, GL 8, RP 4, RP 6, RP 7.

In particular, the EIS recommends that care should be taken during the construction of gas gathering lines that connect wells RP 4, RP 5, RP 6 and RP 7 due to the presence of Cumberland Plains Woodland. Further, the EIS recommends that impacts should be minimised by not removing native species, considering alternative routes for gathering lines and limited proposed works to existing disturbed areas. Finally, the EIS recommends that any mature trees on the sites should be retained and not removed during development of the proposal.

6.5.2 Issues Raised in Submissions

The Department received seven submissions on potential flora and fauna impacts: one from NSW Agriculture, one from NPWS, one from Royal Botanic Gardens, one from Camden Council and three private submissions.

These submissions questioned the adequacy of flora and fauna surveys and requested additional field work is undertaken targeting specific flora and fauna species that were not identified during field work but are known to exist within the proposed development area. The submissions also called for recognition and assessment of protected species and historically significant flora species, other than endangered species.

6.5.3 Consideration of Key Issues

The Department requested further information regarding construction techniques and physical dimensions of well sites, gas gathering systems and the treatment plant, flora and fauna survey techniques adopted, identification of the Cumberland Land Snail, threatened species, justification for the selection of species for which Eight part tests were prepared and raptor species present on the EMAI site and details of the exclusion zone.

The proposed well sites, gas gathering system route and treatment plant site are dominated by pasture grasses although scattered trees are present on some areas. Whilst some surrounding vegetation has been classified as threatened ecological

communities, the sites chosen are largely free of any significant areas of such communities. During the Department's assessment of the proposal, the Applicant made some minor modifications to the gas gathering route. The revised route in the Rosalind Park area now avoids some areas of remnant Endangered Cumberland Plain Woodland along the riparian zone of Menangle Creek. The Applicant has also committed to minimising the extent of vegetation clearing and to avoid the removal of mature trees wherever possible. The Department concurs with these commitments.

Further, it is understood that site revegetation and rehabilitation is detailed in management plans to be submitted to the Department of Mineral Resources, and therefore the Department considers that given the large area difference between that cleared to construct/establish the well sites and that required for production, revegetation of the area surrounding the production well sites should be undertaken by the Applicant in consultation with the landholder.

Although few fauna were identified in the areas to be affected, a number of commitments were made regarding fauna protection. It is stated that up to one kilometre (1 km) of trench could remain open overnight and that earth ramps would be constructed at the end of each day at each end of any open trench to avoid fauna being trapped overnight in trenches with steep sides. Given this, it is possible that if fauna were to fall in, it may need to walk up to 500 metres in either direction to access ramps to get out of the trench. This approach also does not consider the potential impacts of rain which could cause a trench to fill with water. The Department considers that a preferable proactive approach to this issue is that opening of trenches be minimised to a length where works can be completed within a day or where this is not possible, it is preferable that preventative measures be implemented to avoid fauna falling into a trench.

Three raptor species have been identified at the EMAI site, which provides known breeding grounds for these species. The Department understands that NSW Agriculture has developed a plan of "buffer zones" around each of the raptor breeding areas. NSW Agriculture provided this Plan to the Applicant, whom placed all proposed gas well locations beyond this buffer zone. Further, the Applicant has committed to undertaking construction of well sites EM 8 and EM 11 during February and March, outside the breeding season of these species. Whilst the Department concurs with this approach, a number of other sites (EM 5, EM 7, EM 9 and EM 12) are located within close proximity to the raptor habitat which should also be constructed within this time period.

The Cumberland Land Snail was not located during field surveys although the area provided suitable habitat in numerous locations and other snail species were identified. The Department considers that as a precautionary measure, the Applicant should prepare a translocation strategy to be implemented should the species be found at any site. Further, the Department recommends that a person with expertise in identifying the Cumberland Land Snail inspect all sites prior to clearing to ensure that no individuals are affected.

6.5.4 Conclusion

The Department is satisfied that potential impacts of the proposed development on flora and fauna are manageable provided the recommended conditions and the Applicant's commitments are implemented. These conditions will require the Applicant to:

- limit the drilling and construction activities at certain gas wells at EMAI to specific months of the year which are known to be outside the breeding zone of raptor bird species;

- close trenches at night-time to ensure fauna that may fall into the trench do not become trapped;
- follow the recommendations of the EIS, to ensure that mature trees are not removed as a result of the development;
- prepare a translocation strategy for the threatened Cumberland Plain Snail; and
- engage an ecologist experienced in the identification of the threatened Cumberland Plain Snail to identify snail species uncovered during construction activities.

6.6 Noise and Vibration

6.6.1 Impact Assessment

Noise

On behalf of the Applicant, ERM conducted a noise and vibration assessment for all activities over the proposed area of the project. This included predictive modelling of air emissions, in accordance with EPA guidelines.

The EIS states that existing noise in the local area is limited to rural activities. In the vicinity of the proposed gas treatment plant, noise sources include traffic and quarrying operations. The main noise source at the gas treatment plant will be from the compressors. The main noise sources during proposed activities at the gas wells will be machinery noise during site preparation, drilling and fracing and site rehabilitation. Machinery noise will also occur during installation of the gas gathering system.

The EIS concludes that noise impacts will be negligible and will comply with EPA Industrial Noise Policy criteria, based on distances and the transient nature of the noise. Landholders will be notified prior to drilling and fracing activities. Further, noise impacts from the proposed activities would be consistent with other local noise sources.

The Applicant identified 107 receiver locations that are in the vicinity of the treatment plant or gas wells. The Applicant carried out background noise monitoring at four locations, to represent the acoustic environment in rural situations, in areas near the Hume Highway and to represent the situation in Menangle Park Village.

The Applicant has calculated Project Specific Noise Goals in relation to the noise from the Treatment Plant. The assessment included the proposed operation of three compressor engines and cooler fan units. Based on the background noise levels, the Applicant has determined noise criteria for the nearest residences as detailed in **Table 9**.

Table 9 – Operational Noise Criteria

Location	Day	Evening	Night
R1	43	35	35
R2 and R3	54	45	40
R4	42	45	35
R5 and R6	42	45	40
R7 and R8	37	39	35

The Applicant adopted the approach in the Environmental Noise Control Manual “Emergency Generators”, to assess the noise impacts of the flare. Based on the background levels the Applicant determined the noise criteria for the flare to be 40 dB(A) at night.

Construction Noise

Wells

The Applicant states that the construction of wells takes approximately one week and consists of three major activities:

1. Percussion drilling of the well;
2. setting the wellhead and casing; and
3. hydraulic fracturing of the coal seam.

The Applicant presented construction noise modelling results for the 107 receivers in the EIS. The results show that the predicted noise levels will be exceeded at some receivers. The Applicant intends (wherever possible) to schedule the drilling of wells to avoid cumulative impacts and to minimise consecutive construction of wells, where the same residential location is affected.

Treatment Plant

The Applicant has modelled the impacts of construction noise resulting from the construction of the gas treatment plant. The Applicant modelled three different construction scenarios which consider earthworks, road building, construction of footings and general site preparation. The construction works are expected to be completed within 26 weeks and the modelled noise levels meet the construction criteria at all receiver locations.

Operational Noise

Wells

The Applicant states that noise from operating wells is a high frequency “hissing noise” caused by remnant water from the coal seam passing through the local condenser at each well. The EIS further states that the hissing noise reduces over the first few weeks of operation as the remnant water is drawn out of the well. After all the water has been removed from the well and condenser, it becomes silent. The EIS also states that each well has a remotely controlled pneumatically operated valve that when exercised emits a short release burst. The level of noise emitted from this burst is difficult to hear beyond a distance of 50 metres.

The Applicant used the Environmental Noise Model (ENM), a noise prediction model to predict noise levels at the nominated 107 receivers in proximity to well locations. The Applicant found that the operational noise levels will be within the project specific noise criteria at all receiver locations.

Treatment Plant – General Operations

The Applicant used ENM software to predict noise levels from the general operations of the treatment plant. The noise modelling study was conducted for receivers that could be potentially affected by noise from the treatment plant, for still isothermal conditions and adverse weather conditions which were considered to occur on winter nights, autumn and spring nights and summer nights. The Applicant modelled day

and night-time periods for the receivers. (The receivers modelled are the same as those listed in **Table 9**).

The EIS states that the operation of the Gas Treatment Plant meets the project specific noise criteria at all existing residential locations. The EIS notes that the single exception is on unusually hot summer days when the cooler fans will be required to run at maximum speed which produces a 2dB exceedance at R7 (Mount Gilead Homestead). The EIS states that this situation is expected to occur for less than 3% of the time during summer days.

Treatment Plant – Flaring

The EIS states that flaring at the treatment plant may arise due to either unexpected equipment failure, rejection of Plant output or pressure build-up during shutdown of the Plant. The sound spectrum for the flare was used in the ENM model and single point calculations were performed under adverse weather conditions. The Applicant applied the EPA “Emergency Generators” goal of ‘background plus 10 db(A), which was calculated to be a Sound Power Level of 107 dB(A) at the closest residence. The EIS states that this level is higher than that quoted for the compressor enclosure and one cooler unit combined and therefore the EIS states that it would be easily satisfied given that flare noise is typically quieter than such plant.

Vibration

The Applicant assessed the potential impacts of vibration for construction and operational phases of the project. The Applicant applied recommended maximum levels for ground vibration to assess the probability of damage to various types of building structures. The Applicant also adopted vibration criteria for nuisance vibration levels. The Applicant notes that the vibration velocities (criteria to safeguard human comfort) are much lower than the 5mm/s peak particle velocity (criteria to protect against structural damage), which indicates that if the criteria for human comfort are achieved, there would be negligible likelihood of structural damage to buildings.

The Applicant has predicted vibration impacts from construction associated with the drilling and fracing of wells. Drilling is expected to cause continuous and impulsive vibration, whilst fracing is impulsive in nature. The Applicant refers to studies undertaken in the Camden Gas Project - Stage 1 which show that the human comfort criterion will be met at 25 metres from drilling and fracing activities. The EIS states that vibrations may also arise from earthworks and other activities involved in the construction of the gas gathering system. The Applicant’s assessment shows typical vibration levels from earthmoving construction activities and demonstrates that structural damage vibration effects are unlikely beyond a distance of five metres from the activity and human comfort criteria will be met at 20 metres.

The EIS states that vibration from operational aspects of the Plant will not have any structural or human comfort impacts on neighbouring residences due to the separation distances. The operational equipment will be vibrationally isolated from its foundations in order to reduce stress on the attached piping and reduce potential for failures related to metal fatigue. The EIS states that this approach will also serve to protect nearby on-site buildings from vibration damage and therefore off-site buildings will also be protected.

6.6.2 Issues Raised in Submissions

The Department received seven submissions (and 65 form submissions) on potential noise impacts: one from EPA, one from NSW Agriculture, one from Campbelltown Council, four private (original) submissions and 65 private (form) submissions.

These submissions expressed concern as the noise assessment had not considered future development at Menangle Park, did not include explosion testing and may have used insufficient wind data. Also, noise concerns are being experienced by residents due to the existing treatment plant at Westbrook Road.

6.6.3 Consideration of Key Issues

The EPA and the Department requested additional information regarding potential noise issues relating to the proposal. Specifically, the EPA requested further information regarding the operation of the flare at the gas treatment plant as follows:

- Clarification of the location of new residential receivers at future urban release areas (Spring Farm and Menangle Park), in terms of the noise impact assessment;
- the reason and frequency of use of the flare;
- confirmation whether the sound power level of 102dB(A) can be achieved, which is based on the Intrusive Noise Criteria. If not, what level can be achieved and what receivers will be affected; and
- A copy of the spectrum data developed for the flare in the Noise Impact Assessment.

The Applicant provided further information to the Department and the EPA regarding the flare and sound power level. The Applicant provided further information regarding potential noise issues associated with future residential receivers at Spring Farm and Menangle Park Urban Release Areas. The Menangle Park Urban Release Area is the closest of the two Release Areas and when superimposed on the noise contours, the information showed that the Menangle Park Urban Release Area is beyond the 35dB(A) Leq noise contour. Therefore, noise impacts from the treatment plant is considered unlikely to occur on the Spring Farm and Menangle Park Urban Release Areas. The Applicant considered that other project noise sources that could impact on the two Urban Release Areas included construction activities associated with gas well sites. The Applicant states that the gas wells will be built within six months of their approval and therefore given the timeframe for residential occupation within the two Urban Release Areas, the construction activities are unlikely to coincide with the new residential receivers.

The additional information provided by the Applicant also included further modelling using ENM software of specific flare events at receiver R7, the Mount Gilead Homestead. The predicted flare events and noise levels are shown in **Table 10**.

Table 10 - Predicted Flare Noise at Mount Gilead Residence

Number of different Flare events	Flare Event ¹	Total Frequency (once per)	Total duration (of each event)	Noise Level at R7	Noise Level at R7
				Leq, 15 minute	Lmax, L1, 1 minute
1	Spill Valve	5.8 days	4.2 hours	< 34.6	34.6
2	Compressor Blowdown (ESD)	21 days	15 minutes	40.5	47.5
3	Compressor Blowdown (Shut down and unload)	8 days	8 minutes	35.2	39.8
4	Pressure Safety Valve Discharge ²	60 to 120 days	0.5 minutes	37.5	52.2
5	Pressure Safety Valve Suction ²	60 to 120 days	0.5 minutes	39.4	54.2

Notes:

Information adapted from Table 1 in Letter from ERM to Sydney Gas dated 22 October 2003 Regarding "Stage 2 Coal Bed Methane Project – Response to the EPA's Request for Flare Noise Details."

1. The frequency of each event accounts for all three compressors.
2. This is a highly conservative estimate and in practice such events are rare.

In the additional information provided for the Mount Gilead Homestead, the Applicant states that the recommended noise goal is the lowest possible which is 35 dB(A)_{Leq, 15 minute}.

The Department notes from the data provided by the Applicant (presented in **Table 10**) that the noise level predicted for Flare Event 2 (Compressor Blowdown) is predicted to be 40.5 dB(A) which exceeds the 35 dB(A) criterion by 5.5 dB(A) for the night-time period. This flare event is predicted occur every 21 days. The predicted maximum noise level from this flare is predicted to be 47.5 dB(A) which exceeds the EPA sleep disturbance criterion by 2.5 dB(A).

The Applicant's supplementary information also included a range of flare noise mitigation options that were considered. These options are listed in **Table 11**.

Table 11 – Summary of Applicants Noise Mitigation Options for Flare Noise

Option	Noise Mitigation	Commitment by Applicant to implement option
1	Pressurised shutdowns	Yes
2	Compressor modifications – blowdown rate from 4 th stage reduced	Yes
3	Compressor modifications – bypass ball valve isolation system and control logic modifications	Yes
4	Gathering line pressurisation	Yes
5	Operational – field well control	Yes
6	Bundling – vertical to horizontal flare orientation	Yes
7	Increased flare diameter from 200 mm to 300 mm	Yes
8	Additional bunding – a 10 metre high wall located 35 metre from the flare on the southern and eastern site boundaries (spans 70 m in total)	No
9	Flare direction	Yes
10	Venting vs Flaring	No
11	Dual Venting System	No

Source

Information adapted from Table 1 in Letter from ERM to Sydney Gas dated 22 October 2003 Regarding “Stage 2 Coal Bed Methane Project – Response to the EPA’s Request for Flare Noise Details.”

6.6.4 General Terms of Approval

The EPA has provided General Terms of Approval for the project which include requirements for the management of noise impacts. These requirements include:

- Setting of noise limits for specific receivers, including limits for the operation of the flare (refer to **Table 12**);
- Guidance on when and how noise emission limits apply;
- Implementation of noise monitoring; and
- Development of a Construction and Well Maintenance Noise Management Protocol.

Table 12 – EPA General Terms of Approval – Noise Limits

Receiver Location	Day L_{Aeq}(15 minute)	Evening L_{Aeq}(15 minute)	Night L_{Aeq}(15 minute)	Flaring L_{A1}(1 minute)
R1 Medhurst Street Gilead	35	35	35	45 – spill valve 60 – other
R7 Mount Gilead Gilead	37	36	36	45 – spill valve 60 – other

The Department notes that the noise limits set by the EPA are based on the operation of three compressor engines. The noise impact assessment presented in the EIS modelled the operation of three compressor engines, as three engines are required to achieve the maximum production capacity of the plant of 14.5 petajoules.

The EPA’s General Terms of Approval also define the flaring events, frequency and duration that the noise limits for flaring in **Table 12** apply to. The Flaring Noise Limits in **Table 12** apply to flaring events with a frequency greater than and duration less than that shown in **Table 13**.

Table 13 – EPA General Terms of Approval – Flare Events relevant to “Flare” Noise Limits in Table 12

Flare Event	Incidence	Maximum Duration – time
Spill Valve	Once per 5.8 days	4.2 hours
Compressor Blowdown (ESD)	Once per 21 days	15 minutes
Compressor Blowdown (shutdown and unload)	Once per 8 days	8 minutes
Pressure safety valve discharge	Once per 60 days	30 seconds
Pressure safety valve suction	Once per 60 days	30 seconds

The EPA’s General Terms of Approval state that the noise limits for the site (provided in **Table 12**) apply to flare events that occur more frequently or have a greater duration than that defined in **Table 13**.

The Applicant will also be required to submit a report on the noise from the operation of the flare in the first six months of the plant. This report will assess the compliance of noise levels during the range of flaring incidents experienced since commissioning, with the noise limits specific in **Table 12** above.

The EPA's General Terms of Approval require the Applicant to prepare a noise compliance monitoring report on an annual basis to assess compliance of the development with the noise limits in **Table 12**.

The EPA also requires the Applicant to prepare a Construction and Well Maintenance Noise Management Protocol for the duration of the project. The Construction and Well Maintenance Noise Management Protocol must include noise compliance standards, community consultation, notice to affected members of the community for planned well maintenance activities, complaints handling and monitoring system, mitigation measures, construction times, contingency measures and monitoring methods and program.

6.6.5 Conclusion

To ensure the Applicant assesses the effectiveness of measures to limit the noise from the proposal to levels below the project specific noise limits (set by the EPA), the Department requires the Applicant to prepare and implement a Noise Monitoring Program, to be prepared in consultation with the EPA, to monitor the noise compliance of its operations.

The Department's recommended conditions of consent also require the Applicant to implement specific noise mitigation measures to prevent noise impacts from the flare operation. These measures include the implementation of Options 1 – 7 inclusive and Option 9 (as referenced in **Table 11** of this report).

The Department is satisfied that the proposal is unlikely to cause adverse noise or vibration impacts, provided the measures and requirements of the EPA and Department are implemented. The Department has recommended consent conditions which incorporate the General Terms of Approval by the EPA. These conditions require the Applicant to:

- Ensure that noise levels including flare noise levels do not exceed the noise criteria for the development;
- Prepare a detailed noise monitoring program for the development; and
- Prepare a Condition report for structures on EMAI within 25 metres of a wellhead.

6.7 Air Quality and Odour

6.7.1 Air Quality Impact Assessment

The Applicant has assessed the potential air quality impacts of the proposal, including predictive modelling, in the EIS. The EIS states that the predominant air emissions during the construction, operation and decommissioning phases of the project are nitrogen dioxide, total suspended particulates (TSP), PM₁₀, odour, ethyl mercaptan and carbon monoxide.

Construction Phase

The EIS states that emissions during the construction phase are due to the exhausts of construction equipment and dust generated during earthworks and from unsealed exposed surfaces. A number of construction activities will be undertaken at the well sites including establishment of access roads, drilling of wells and laying of the gas gathering system.

Overall, the EIS considers that construction impacts from machinery exhaust and dust due to topsoil removal would be short-term.

Operational Phase

The EIS states that the operational activities that will be conducted on site are the dehydration of the collected gas, compression of the gas to the required line pressure, odorant dosing of the gas and injection into the high pressure supply pipeline. The activities that could cause air quality impacts include the operation of the compressor engines and dehydrator unit, potential leaks from piping and connectors and operational flaring. The EIS notes that the compressor engines result in the largest emissions of combustion products from the site. Relatively low levels of nitrogen oxide will be produced by the flare during normal operations. However, during higher level flaring, significantly higher nitrogen dioxide emissions will occur and be associated with a high temperature exhaust from the flare.

The odorant proposed for the Plant is Captan 21 which contains Butyl Mercaptan and Tetra Hydro Thiophene. The odorant will be stored on site at all times and the odorising station will be enclosed in a shed. Potential odour emissions are generated during the initial connection of the odorant to the dosing system and subsequent bottle changeovers (every 220 days). The odorant dosing system is in a sealed enclosure at all times to mitigate fugitive emissions. Other potential odour emissions include accidental releases such as from the flare and the carbon scrubber vent discharge stack.

The Applicant predicted ground level concentrations of these air pollutants using dispersion modelling. A total of 25 receiver locations were selected for the assessment which included residences, schools and local landmarks. The Applicant modelled five scenarios for nitrogen dioxide emissions, two scenarios for carbon monoxide emissions, odour emissions, T Butyl Mercaptan emissions and particulate matter emissions.

The EIS concluded that emissions of carbon monoxide, odour, mercaptans and particulate emissions will comply with relevant EPA criteria. Nitrogen dioxide emissions from the site are below the criteria, however, nitrogen dioxide emissions (at 100% conversion of NO_x emissions) exceeded the EPA criteria at three sensitive receptors. A design parameter analysis was conducted on the discharge stacks (that is, increasing the discharge stack height and velocity) which lowered the nitrogen dioxide emissions to below the EPA criteria at all receivers.

6.7.2 Issues Raised in Submissions

The Department received eight submissions (and 65 form submissions) on potential air quality/odour impacts: one from the EPA, NSW Agriculture, one from the Royal Botanic Gardens, one from Campbelltown Council and four private (original) submissions and 65 private (form) submissions.

These submissions raised concern over dust generation and odour impacts. The submissions also questioned the accuracy of wind data used in the assessment and stated the EIS did not consider emissions from leaks which would include a range of pollutants. Another issue raised was the release of methane to atmosphere should structural damage to gas wells occur and the potential for odour from the gas wells.

6.7.3 Consideration of Key Issues

The EPA requested the Applicant to provide additional information regarding potential air quality issues relating to the proposal. The EPA requested the Applicant provide estimates of annual emissions of assessable pollutants for the whole site considering the proposal is defined as 'petroleum refining' in accordance with the EPA's Load Calculation Protocol. The EPA requested the Applicant to provide emissions to air of

benzene, benzo(a)pyrene, fine particulates, hydrogen sulphide, NO_x, SO_x and volatile organic compounds. This information was requested because the EPA does not concur with the Applicant's statement that these emissions will be negligible. Monitoring conducted at the Stage 1 Pilot Ray Beddoe Treatment Plant detected a number of these compounds in emissions and therefore it is expected that these emissions will also occur from the Stage 2 plant.

The EPA also requested the Applicant to prepare an assessment of the impact of sulphur dioxide, sulphur trioxide and sulphuric acid mist from the proposed development. Emissions from the Stage 1 plant included these compounds which are again therefore expected to occur in emissions from the Stage 2 plant. The Applicant indicated that emission levels for these compounds are below detectable limits. However the EPA did not agree with this response.

The EPA requested further information regarding the direction of the flare. The Air Impact Assessment in the EIS describes the flare as being a 'horizontal ground level' flare. The EPA requested a copy of the design drawings and specifications for the flare and clarification on whether the exit point of the flare is in fact horizontal.

The EPA also sought further information from the Applicant regarding:

- Clarification of the location of new residential receivers at future urban release areas (Spring Farm and Menangle Park), in terms of the air quality impact assessment;
- Estimates of assessable pollutant loads for the Stage 2 Project;
- Potential odour from gas wells;
- Potential Impact of atmospheric pollutants such as sulphur dioxide, sulphur trioxide and sulphuric acid mist to be included in the air impact assessment;
- Compliance of nitrogen dioxide levels with the Clean Air Plant and Equipment Regulation limits;
- Clarification on the number of compressor engines and gas wells in this DA; and
- Remodelling of nitrogen dioxide and assessment of cumulative impacts.

Particulate Matter

Some of the community submissions raised concerns about the potential dust impacts of the proposal. Particulate matter emissions are likely to be generated during the construction phases of the proposal, rather than the operational phase. Activities that will generate particulate emissions include road construction, well establishment, laying of the gas gathering system and truck movements. The Applicant's prediction of particulate emissions during construction shows that the EPA criteria will be met at all receivers modelled.

The EPA has adopted the National Environment Protection Measures (NEPM) standards for dust particulate matter as interim goals for the assessment of particulate matter. The EPA Standards for particulate matter emissions for PM₁₀ (particles less than 10 microns in diameter) are 30 ug/m³ (annual average) and 50 ug/m³ (24 hour). The EPA criterion for Total Suspended Particulate (TSP) is 90 ug/m³ (annual average). The Applicant adopted the TSP annual average EPA criteria and the PM₁₀ 24 hour EPA criteria. The assessment shows that the predicted dust concentrations are below the EPA criteria.

The highest predicted ground level concentrations for TSP are 6.8 ug/m³ and 6.9 ug/m³ at the residences at 33 Medhurst Rd and 2 Medhurst Rd respectively. These levels are significantly lower than the EPA TSP criteria of 90 ug/m³. Similarly, the highest predicted ground level concentrations of PM₁₀ 24 hour average were 2.71 and

2.77 at the residences at 33 Medhurst Rd and 2 Medhurst Rd respectively. These concentrations are also lower than the EPA criteria of 50 ug/m³.

The Department considers that the Applicant's assessment shows that particulate matter emissions are below the EPA criteria. The construction activities for the proposal are limited to the establishment of access roads and gas wells sites at the EMAI, construction of the gas gathering system and the construction of the Rosalind Park Treatment Plant Site. The construction period for site establishment and drilling activities is approximately two weeks per gas well and the 20 gas wells to be drilled at EMAI are to be drilled in a staged manner over a two month period. The Applicant has drilled all other gas wells under its PEL. The construction period for the Treatment Plant Site will occur over a period 12 to 20 weeks.

The Applicant has provided commitments in the EIS to implement measures to mitigate dust emissions during the construction of the well sites, gas gathering system and the Treatment Plant. The Applicants proposed dust mitigation measures include:

- Apply water on all cleared areas;
- Reduce vehicle speed and kilometres travelled by vehicles;
- Minimise exposed area and disturbance;
- Limit the area of earthworks during construction;
- Spray water on unsealed access roads and topsoil stockpiles;
- Limit unnecessary traffic by car pooling;
- Minimise clearing of vegetation;
- Avoid topsoil disturbance during high wind conditions; and
- Timely rehabilitation of exposed surfaces.

The Department considers the Applicant should also be required to implement additional measures to mitigate dust effects. Such measures include ensuring that all vehicles entering or leaving a site should be covered at all times if it is carrying a load that may generate dust and that measures be implemented to minimise wind blown dust from stockpiles. The Department is satisfied that dust emission has been adequately addressed and that the construction and operation of the proposal is unlikely to cause significant dust impacts on the local community.

Odour

The Applicant provided further information to the Department and the EPA regarding air quality issues. The Applicant advised that coal bed methane gas is usually odourless and consists of methane with small quantities of carbon dioxide and nitrogen and therefore the potential for odour emissions from gas wells is unlikely.

During the operation of the Stage 1 Pilot Treatment Plant, a leak of mercaptan odourant occurred. The EPA and Campbelltown Council raised this issue, and both expressed concern regarding potential odour leaks from the Stage 2 Plant. The Applicant stated that the Stage 1 Ray Beddoe Treatment Plant has had modifications done in relation to its operations to eliminate a recurrence of a leak of odour from the Stage 1 Plant. The Applicant also stated that the odour injection system at the Stage 2 Plant would comply with all appropriate standards and adopt best practice.

The Department notes that the assessment presented in the EIS shows that the EPA odour criteria will be met at all sensitive receivers.

However, the Department notes the concern of the EPA and Campbelltown Council regarding a potential leak of mercaptan, which is a highly odorous substance. The Department considers that the Applicant should prepare and implement a Community

Awareness Protocol to promptly advise appropriate authorities and nearby residents if a leak of mercaptan odourant occurs from the Stage 2 Plant.

Gaseous Air Emissions

Regarding emissions of sulphur oxides, the Applicant's consultant URS states that at the time of preparation of the EIS for the Stage 2 Project, the Applicant considered that there would be negligible concentrations of sulphur dioxide, sulphur trioxide or sulphuric acid mist within the gas stream emissions to the atmosphere. However, stack monitoring of the Stage 1 operations (at the Ray Beddoe Treatment Plant) identified emissions of these components at detectable levels as shown in **Table 14**.

Table 14 – Stack Monitoring Survey Results – Stage 1 Pilot Plant

Pollutant	Gas Compressor Exhaust mg/m ³	Fire Tube mg/m ³	Tank Reboiler/Still Column mg/m ³	Flare mg/m ³
Sulphur dioxide	0 – 27.4	9 – 48	60 – 1732	0 – 3.6
Sulphur trioxide/sulphuric acid mist	3.06	0.96	34.7	< 0.14

Source

Report prepared by URS for Sydney Gas titled "Response to EPA: DA-282-6-2003 Proposed Sydney Gas Stage II Coal Bed Methane Proposal" dated 21 October 2003.

The Applicant's consultant prepared emission data for the Stage 2 Plant (using information and assumptions and monitoring data from Stage 1) and using the dispersion model, AUSPLUME, ground level concentrations from these emissions were modelled. The results show that the maximum predicted ground level concentration of sulphur dioxide and sulphuric acid mist is 0.010 mg/m³ and 0.00075 mg/m³ respectively. These figures are 1.75% and 2% respectively of the EPA criteria and therefore it is considered that there is no potential for adverse impacts from possible sulphur dioxide and sulphur trioxide/sulphuric acid mist emissions from the proposed development.

Nitrogen Oxides

The EPA raised several queries with regards to the nitrogen oxide (NO_x) modelling presented in the EIS. The EPA considers that NO_x is a key issue in the area and consequently a detailed assessment of impacts is required. The EPA considers that the assessment presented in the EIS indicates the potential for adverse impacts at receivers, that background levels used in the modelling are incorrect, and that of the five NO₂ scenarios presented in the EIS, none are considered to be representative of likely impacts. The EPA requested that the Applicant revise the dispersion modelling to:

- Use a more realistic treatment of the conversions of NO_x to NO₂;
- Use a more appropriate background level for NO₂;
- Prepare predictions of ground level concentrations for all applicable time periods for all relevant criteria (namely 1-hour and annual averages);
- Include all applicable emission sources;
- Identify all sources of data and provide emissions sampling or analysis reports if these are relied upon; and
- Quantify predicted ground level concentrations at all receivers.

The Applicant engaged a consultant URS, to address the issues raised by the EPA and submitted supplementary reports. URS estimated emission rates for the Stage 2 Plant based on stack testing from the Stage 1 Ray Beddoe Treatment Plant and

equipment specifications from suppliers. URS confirmed that the process equipment that will generate NO_x emissions from the proposal are the same as detailed in the EIS, however NO_x emissions from the Still Column were not included due to a lack of available data on emission rates at the time of preparation of the EIS. The consultant provided stack emission data and estimated NO_x emission rates. Ground level concentrations for 1-hour average and annual average, with and without background levels were provided for total NO_x. However, not all of the NO_x emitted by the Plant will be in the form of NO₂.

URS also predicted NO₂ concentrations using two methods to provide for varying ratios for conversion of NO to NO₂. (The methods included US EPA's Ozone Limiting Method and the relationship developed by Janssen et al in their paper "A Classification of NO Oxidation Rates in Power Plant Plumes Based on Atmospheric Conditions"). All of the predicted ground level concentrations were compared to EPA assessment criteria for NO₂, being 246 ug/m³ for 1-hour averages and 62 ug/m³ for the annual average. In particular, revised concentrations were reported for the potentially worst affected receivers being the Main House at 33 Medhurst Rd, the Mount Gilead Homestead and the Mount Gilead Residence to the North as shown in

Table 15 – Maximum Predicted NO₂ Concentrations

Location	Using Ozone Limiting Method		Using Janssen Equation	
	Max 1-hour average (excluding background) ug/m ³	Max 1-hour average (including background) ug/m ³	Max 1-hour average (excluding background) ug/m ³	Max 1-hour average (including background) ug/m ³
33 Medhurst Rd – Main House	70	134	22	99
Mount Gilead – Main	68	89	19	83
Mount Gilead - North	71	89	19	83

Source

Report prepared by URS for Sydney Gas titled "NO_x Dispersion Modelling Study – Proposed Camden Gas Project Stage II (DA-282-6-2003) dated 20 November 2003.

The revised modelling showed that no exceedances of the NSW EPA assessment criteria for NO₂ would occur at nearby sensitive receptors.

URS submitted a further supplementary report on NO_x emissions in December 2003, when the supplier provided maximum limits for NO_x emissions from the three compressor engines. The emission rate provided by the supplier was double the emission rate used in the previous modelling study (discussed above). URS provided revised annual NO_x emission loads for the site resulting from the increased emission rate. As the compressors are the main source of NO_x at the site, the annual emission loads became almost double that estimated previously.

URS re-modelled the NO_x emissions with the new data which showed that the maximum off-site NO_x concentrations are predicted to increase proportionately with the increase in emissions. The maximum NO₂ concentrations were also determined (as modelled previously) and once the background concentrations were included, the maximum off-site NO₂ concentrations were predicted to increase by around 10-20% dependent upon the location of the receiver. The maximum predicted NO₂ concentrations are shown in **Table 16**. (The EPA assessment criterion for 1-hour NO₂ concentration is 246 ug/m³).

Table 16 – Maximum Predicted NO₂ Concentrations (Revised Concentrations)

Location	Using Ozone Limiting Method		Using Janssen Equation	
	Max 1-hour average (excluding background) ug/m ³	Max 1-hour average (including background) ug/m ³	Max 1-hour average (excluding background) ug/m ³	Max 1-hour average (including background) ug/m ³
33 Medhurst Rd – Main House	83	150	42	120
Mount Gilead – Main	77	96	37	83
Mount Gilead - North	83	96	38	83

Source

Letter prepared by URS to Sydney Gas titled “NO_x Emissions from Stage II Plant” dated 12 December 2003.

The revised modelling of NO_x concentrations show that NO₂ emissions at the nearest potentially affected residences (namely 33 Medhurst Rd and Mount Gilead) comply with EPA air quality criteria. For instance, the maximum 1-hour predicted NO₂ concentrations at 33 Medhurst Rd are predicted to range from 120 ug/m³ to 150 ug/m³ (depending on the conversion calculation) which is below the EPA criteria of 246 ug/m³. Similarly, the maximum 1-hour predicted NO₂ concentrations at Mount Gilead are predicted to range from 83 ug/m³ to 96 ug/m³ (depending on the conversion calculation) which are also below the EPA criteria.

The EPA has issued General Terms of Approval for the proposal which include specific requirements for the monitoring and management of NO_x emissions. The Department has incorporated the General Terms of Approval into its recommended consent conditions for the proposal.

Future Urban Release Areas

With regards to potential air emissions on the Spring Farm and Menangle Park Urban Release Areas, the Applicant stated that the construction phase of the project would be completed prior to the establishment of the two Urban Release Areas and therefore the potential air quality impacts from the project on the Release Areas would be from the operational phase. The Applicant stated that modelled ground level air emission concentrations at existing receivers located between the Urban Release Areas and the Treatment Plant Site comply with relevant EPA criteria. Therefore, the proposal would not cause adverse air emissions in the Spring Farm and Menangle Park Urban Release Areas.

The Department concurs with this conclusion and considers that air quality emissions from the project would not cause adverse impacts on potential future residences in these two release areas.

6.7.4 General Terms of Approval

The EPA has provided its General Terms of Approval for the proposal which include specific requirements regarding the monitoring and management of air pollutants as follows:

- Monitoring of air emissions from each of the three compressor engines, TEG Fire Tube, Reboiler Still Column, Carbon Scrubber Vent discharge stack and the flare;
- Load limits of air pollutants; and

- Concentration limits for air pollutants that cannot be exceeded.

The concentration limits for each discharge point (that is, the concentration that cannot be exceeded) are provided in **Table 17**.

Table 17 – EPA General Terms of Approval - Air Quality Concentration Limits

Pollution Point	Process/Instrument	Concentration Limit
Point 1	Compressor Engine 1	Nitrogen oxides – 450 mg/m ³ Sulphur dioxide – 7 mg/m ³ Sulphuric acid mist and or/sulphur trioxide 3.1 mg/m ³
Point 2	Compressor Engine 2	Nitrogen oxides – 450 mg/m ³ Sulphur dioxide – 7 mg/m ³ Sulphuric acid mist and or/sulphur trioxide 3.1 mg/m ³
Point 3	Compressor Engine 3	Nitrogen oxides – 450 mg/m ³ Sulphur dioxide – 7 mg/m ³ Sulphuric acid mist and or/sulphur trioxide 3.1 mg/m ³
Point 4	TEG Fire Tube	Nitrogen oxides – 110 mg/m ³ Sulphur dioxide – 35 mg/m ³ Sulphuric acid mist and or/sulphur trioxide 1.0 mg/m ³
Point 5	Reboiler Still Column	Nitrogen oxides – 13 mg/m ³ Sulphur dioxide – 1042 mg/m ³ Sulphuric acid mist and or/sulphur trioxide 35 mg/m ³

The EPA General Terms of Approval also require the Applicant to undertake monitoring of air emissions and related parameters from the discharge points such as the compressor engines. The Applicant is required to conduct this monitoring on a quarterly basis and submit the information to the EPA.

The Applicant is also required to submit a report within six months of commissioning of the gas treatment plant which provides the post commissioning source air emissions, sampling and analysis undertaken to assess compliance with the concentration limit conditions.

The EPA also requires the Applicant to submit a monitoring program of assessable pollutants from the start gas vents.

6.7.5 Conclusion

The Department considers that the Applicant has satisfactorily addressed air quality issues through information provided in the EIS and supplementary information provided to the Department and EPA. The Department acknowledges that the proposal will introduce air emissions in the South-western air shed and considers that this issue can be effectively managed through rigorous monitoring to ensure compliance with EPA criteria. The assessments have shown that the operation of the plant will not cause air quality impacts on the surrounding area or affect the health of the community.

The Department has recommended a consent condition that requires the Applicant to ensure that air pollutant emissions from the development do not exceed the criteria in **Table 18** at any privately owned residence.

Table 18 – Air Quality Impact Assessment Criteria

Pollutant	Averaging Period	Criterion
Nitrogen Dioxide	1 Hour	246 µg/m ³
Nitrogen Dioxide	Annual	62 µg/m ³
Sulphur Dioxide	1 Hour	570 µg/m ³
Sulphur Dioxide	Annual	60 µg/m ³
Sulphuric acid mist	3 minute	33 µg/m ³
Methyl mercaptan	3 minute	0.84 µg/m ³

The Applicant is also required to submit a detailed Air Quality Monitoring Program (for the Director-General's approval) to evaluate compliance of the development in not exceeding the concentration of air quality pollutants (as listed in **Table 18**) at privately owned residences.

The EPA has provided its General Terms of Approval for the project which the Department has incorporated into its recommended conditions of consent. In summary, the conditions will also require the Applicant to:

- Monitor air emissions at various sources within the Treatment Plant (and specifies which pollutants need to be monitored and the concentrations limits that may be discharged); and
- Prepare a Community Awareness Protocol to advise nearby residents and appropriate authorities if a leak of mercaptan odourant occurs from the Stage 2 Plant.

6.8 Non-indigenous Heritage

6.8.1 Non-indigenous Heritage Assessment

New South Wales Archaeology prepared a post-European heritage study (on behalf of the Applicant) and assessment of the proposed project area. The Camden area was found to be important in heritage terms as an early settlement and agricultural area. Several items of local, state and national heritage significance are listed in heritage registers, however none are considered close enough to be affected by proposed activities. It is considered unlikely that further European archaeological sites will be disturbed during construction works. Therefore excavation permits are not required. A further archaeology study was conducted by New South Wales Archaeology in April 2003 on revised gas gathering line and gas well locations (see Section 6.11). No European heritage items were found within the revised locations.

The only impact mitigation measure recommended in the report is awareness training for site personnel in case any further heritage items are uncovered during construction works. If this occurs, work will cease and an appropriate archaeological decision will be made on how best to proceed to protect the significance of the item.

6.8.2 Issues Raised in Submissions

The Department received eleven submissions on potential non-indigenous heritage impacts: one from NSW Agriculture, one from the NSW Heritage Office, two from Elected Representatives (one from Ms Peta Seaton on behalf of the Menangle residents and one from Mr Geoff Corrigan on behalf of the Camden Historical Society), one from Camden Council, one from Wollondilly Shire Council, one from Camden Historical Society Inc, and four private submissions.

Most of these submissions related to potential impacts on the heritage values of the EMAI site and Camden Park. The submissions also related to potential impacts on

the “Glenlee” property and insufficient heritage assessment of the Mount Gilead property.

6.8.3 Consideration of Key Issues

Elizabeth Macarthur Agricultural Institute

The NSW Agriculture expressed concerns regarding the potential impact of the proposal on the heritage landscape of the Camden Park/EMAI area. The Applicant's consultant (New South Wales Archaeology) provided an initial response to those concerns. The response stated that the proposal will not interfere with or modify the historic landscape character of the Camden Park and Menangle Village landscape unit in a significant manner. This assessment is based on the small and discrete nature of each well structure (within EMAI), their limited number and spatial separation (greater than 500 metres apart) and that within one year of construction the size of the well structure is significantly reduced to an area of 10m x 4m. The response also stated that given that the structure of the gas wells had some potential to compromise the visual integrity of the historic landscape of the EMAI, a number of recommendations were presented to the Applicant to reduce any impacts. Additionally, NSW Agriculture raised specific concerns that some of the trees within the historic orchard on the EMAI will suffer damage. New South Wales Archaeology has provided recommendations to the Applicant to ensure the proposal does not affect the orchard site or trees within it or the visual integrity of the orchard. The recommendations included:

- Ensuring gas well EM 6 is not relocated to any other area within the orchard site;
- Taking caution during construction of the gas gathering system between well sites EM6 and EM8 to ensure works do not cause any damage to the tree roots; and
- Employing an arborist to make recommendations to ensure the historic trees are not impacted by the proposal.

The Applicant commissioned a further assessment to address concerns of the NSW Heritage Office regarding the potential impacts to the landscape of the EMAI. Subsequently, the Applicant commissioned Geoffrey Britton to prepare a Statement of Heritage Impact (on behalf of the Applicant) for land within the EMAI property in relation to the proposal.

The approach adopted for this study included desktop review and access of historical aerial photographs, site visits to active sites at Cawdor, Glenlee and Menangle Park to assess the effectiveness of rehabilitation and an assessment of potential impacts of cultural landscape significance. Consideration was also given to soil quality and integrity as it relates to agricultural viability which directly affects the conservation and maintenance of land as a rural cultural landscape. The study included assessment of the 20 proposed well sites at the EMAI property, proposed access roads and gathering lines and application of the NSW Heritage Office's NSW Heritage Significance Criteria.

The Statement of Heritage Impact concluded that some impacts on the Camden Park Estate cultural landscape may result from the proposed development. Some of the proposed gas well sites will result in visual impacts and screening is recommended in most cases. With regard to access roads, use of the existing road is not expected to result in degradation, provided the width of the road is not increased. The construction of a new access road (to gas wells EM 5 and EM 7) is likely to temporarily impact on the appreciation of the farm landscape and the setting of an item on the Stage Heritage Register due to its close proximity to family-owned land.

Gas gathering lines will be located within the existing roads and therefore result in minimal impacts.

It is noted however, that the proposed operations will be of a short term nature, gas well sites will be spaced to minimise cumulative visual impact and work will not be conducted in wet weather in order to avoid damage to the soil structure. Most of the identified impacts will be minimised by the implementation of recommended mitigation measures including archaeological briefings, strict enforcement of work zones, fencing and screening and effective rehabilitation at the completion of work.

The NSW Heritage Office reviewed the Report and advised that it satisfactorily addressed the concerns of potential heritage impacts on the landscape character of the EMAI. The Department received a representation from Ms Peta Seaton which requested the Department to defer consideration of the DA until the NSW Heritage Office completes work to assess the remnant cultural landscapes in the Sydney Region and completes its assessment of the application to list the EMAI on the State Heritage Register. The EP&A Act limits the time available for determining DAs and does not provide for deferring the consideration of DAs pending the completion of strategic studies. The Department also notes that the NSW Heritage Office is satisfied with the Applicant's assessment of heritage impacts on the EMAI.

Glenlee

The Department has considered the concern from Camden Council regarding potential vibration impacts on Glenlee and notes that the Applicant has committed to ensuring that there will be no structural impact on a building beyond 25 metres of a wellhead. The Department notes that Glenlee is located more than 300 metres from the nearest Gas Wells being GL 9 and GL 10. Furthermore, the drilling and fracing of these Gas Wells were approved by DMR in accordance with the provisions of the Applicants PEL and an assessment under Part 5 of the EPA Act was undertaken. Further, these wells have already been drilled. The Department considers that given the distance of Glenlee from the nearest gas wells, the DMR has approved drilling of the wells and the Applicant has already drilled the wells, there are no additional measures required to protect Glenlee.

Mount Gilead

The Applicant's Heritage Assessment in the EIS did not specifically identify the Mount Gilead Property or Homestead as a heritage item. The Department notes that the Mount Gilead group of buildings are listed in the Campbelltown City Council Development Control Plan No. 83 – Heritage Policy. This Policy identifies heritage items within the Campbelltown Council area including items of State Significance. The Development Control Plan (DCP) lists the Mount Gilead Group in Appendix 1 of the DCP and therefore these items are of local heritage significance. The Heritage record includes the group of stone buildings, windmill and dam, built onwards from the 1820's. The group of stone buildings includes the Mount Gilead Homestead, the two storey stone and stable building, a store south-east of the Homestead and several other stone service buildings south of the house. The listing on the Council Heritage Register states that the property has been used as a working property for sometime and various owners have grazed cattle and sheep. At the time of the heritage recording in October 1993, the property was being used as a working dairy farm.

The Applicant has stated that the proposal will not be undertaken on any part of the Mount Gilead property. However, the Department considers that the proposal may potentially affect the vistas of the Mount Gilead Homestead unless the Applicant implements appropriate visual mitigation measures as an integral part of the

development. The Department has specifically and independently assessed the visual impacts of the proposal on the Mount Gilead Homestead in **Section 6.4** and **Section 6.14** of this report. The assessment concludes that provided the Applicant implements the recommended mitigation measures, the visual impact on the Homestead can be reduced to satisfactory and tolerable levels. The Applicant produced photomontages to predict the changes to the visual landscape and vistas of the Mount Gilead Homestead, as a result of the proposal. These are provided in **Appendix B** of this report. The photomontages do not show the mitigation measures that the Applicant has committed to provide and the photomontages also do not include specific mitigation measures that the Department has requested the Applicant to implement. These mitigation measures are discussed further in **Section 6.4** of this report.

The Department considers the visual impacts of the proposal on the Mount Gilead Homestead can be satisfactorily managed with the implementation of appropriate management measures and the monitoring of the effectiveness of these measures to mitigate visual impacts.

6.8.4 Conclusion

To minimise the impacts of the proposal on the cultural heritage landscape of the EMAI, the Department has recommended consent conditions which will require the Applicant to:

- Prepare a Vegetation and Landscape Management Plan which will include proposed measures to minimise impacts of the gas wells on the cultural heritage landscape of the EMAI and minimise visual impacts associated with the gas treatment plant on the Mount Gilead Homestead;
- Prepare a Soil and Water Management Plan which will consider measures recommended by the Statement of Heritage Impact to ensure soil quality and integrity as it relates to agricultural viability is not affected, as this directly affects the conservation and maintenance of land at the EMAI as a rural cultural landscape; and
- Commission an Independent Environmental Audit of the Applicant's construction activities at the EMAI.

The Department is also committed to consulting with the occupants of the Mount Gilead Homestead during the preparation of the Vegetation and Landscape Management Plan to ensure that their views, which are integral to the mitigation process, are accounted for.

The Department has also recommended several consent conditions to protect the visual landscape of the Mount Gilead Homestead. These are discussed in **Section 6.4** and **Section 6.14** of this report.

6.9 Indigenous Heritage

6.9.1 Assessment of Indigenous Heritage

New South Wales Archaeology conducted an Aboriginal heritage study for the proposal in October 2002, in consultation with representatives from the Tharawal Local Aboriginal Land Council and the Cubbitch Barta Native Titles Claimants Aboriginal Corporation. The initial study identified 22 Aboriginal sites located within or at the margins of the proposed zone of impact. Therefore, the project was revised and infrastructure was relocated away from Aboriginal sites. A further Aboriginal study was conducted by New South Wales Archaeology in April 2003. The areas were found to be of low archaeological sensitivity, although ground visibility was low at the time of the field survey. No Aboriginal items were found within the revised gas

gathering route lines or the new gas well locations. A total of six Aboriginal sites were found in the vicinity of proposed works. The study recommended protective measures to ensure no impact to these Aboriginal sites during construction.

6.9.2 Issues Raised in Submissions

The Department received two submissions on potential indigenous heritage impacts: one from NPWS and one private submission. These submissions raised concern of the adequacy of the indigenous heritage assessment and requested further assessment is undertaken.

6.9.3 Consideration of Key Issues

The NPWS sought additional information from the Applicant regarding Indigenous Heritage issues. The information requested included:

- An explanation of how monitoring locations for Aboriginal heritage were selected, including recommendations made by the Tharawal LALC and the Cubbitch Barta Native Title Claimants Aboriginal Corporation;
- Clarification of monitoring activities and the protocols to be used if cultural material is identified and whether permits under s87 will be sought. Consideration of alternate strategies such as archaeological investigation prior to construction;
- Incorporation of the results of further assessment into the proposal to minimise impact on Aboriginal heritage values, such as modifying the pipeline route to avoid archaeological sensitive areas;
- Determination of the need for s90 Heritage Impact Permits for the proposal;
- Preparation of maps identifying 'areas of sensitivity' and the 'impact zone' for the Aboriginal heritage assessment and flora and fauna assessment; and
- Preparation of a Construction Method Statement (CMS) to minimise impact within each sensitive area, outlining areas to be protected and measures to be used, such as re-routing, directional drilling, erosion and sediment controls, weed control plans, rehabilitation plans, on-site supervision by qualified experts, etc.

The Applicant's consultant (New South Wales Archaeology) provided further information regarding Indigenous Heritage Matters. The Applicant clarified that it did not require s90 consents to destroy under the *National Parks Wildlife Act*, as the footprint of the project has been designed to avoid impacts on Indigenous sites. New South Wales Archaeology re-iterates that these findings are discussed in Addendum 2 of the Archaeological and Heritage Assessment (Appendix B of the EIS) which state that cultural heritage assessment was prepared for revised gas gathering line locations and two additional gas wells. The report found that no Aboriginal objects were found within the revised gas gathering lines or gas well locations.

New South Wales Archaeology provided clarification on the proposed monitoring and mitigation measures. New South Wales Archaeology states that monitoring is not an ideal management tool in cultural heritage management and that monitoring is only acceptable when the landform unit has previously been assessed to be of low/moderate potential only or if the land has deep sedimentary soils which may contain burials. The New South Wales Archaeology reiterates that monitoring is not acceptable as a management strategy when a landform unit is assessed to be of moderate or high potential or sensitivity. Monitoring has been recommended to occur in 23 locations which have been assessed to be of low/moderate potential and/or have some limited potential to contain burials. The recommendation for monitoring has been made as a precautionary tool only.

New South Wales Archaeology states that further subsurface archaeological investigation is not warranted and could not be justified in relation to any of the locations that have been identified in the Heritage Report (in the EIS) for monitoring. Further, the Tharawal Local Aboriginal Land Council has since undertaken careful monitoring at a number of the identified monitoring locations (including gas wells GL 3, GL 2, MP 13, RP 7, RP 9 and RP 11) and no cultural heritage material has been recorded. New South Wales Archaeology states that this finding confirms the low rather than high potential sensitivity assessment of the areas under consideration and validates that subsurface archaeological investigation is not necessary in such areas. A recommendation in the heritage report states that in the event of archaeological material being uncovered during construction works should cease and advice sought from NPWS. The consultants response also states that as some of the Applicant's development has been relocated to avoid impacts to Aboriginal sites and areas of sensitivity, no section 90 Consents to Destroy are required.

The Applicant also provided a series of plans which showed the location of cultural sites in relation to the proposal. The Department notes that some cultural features are in proximity to the location of gas well sites or the proposed route of the gas gathering system, however, no identified or known sites are located in the same location as the proposed works. The Applicant will need to exercise care and caution when undertaking construction activities in those areas.

The NPWS reviewed the information prepared by New South Wales Archaeology and highlighted that under section 86 of the *National Parks and Wildlife Act 1984*, it is an offence to disturb or excavate any land with the purpose of discovering an Aboriginal object without first obtaining a Section 87 permit. The NPWS also requested that the Applicant provide a copy of the results of the heritage monitoring.

6.9.4 Conclusion

The Department is satisfied that there are no outstanding issues regarding indigenous heritage. To minimise the impacts of the proposal on indigenous heritage, the Department has recommended consent conditions which will require the Applicant to:

- Mark the locations of known Aboriginal relics on the ground prior to site preparation works;
- Ensure all employees and contractors are aware of these locations to prevent known relics being impacted upon during site preparation and construction; and
- Provide the results of the heritage monitoring to NPWS.

6.10 Safety / Hazard

6.10.1 Safety / Hazard Impact Assessment

Quantitative Risk Assessments (QRAs) were conducted by Planager Pty Ltd for the project. The assessments covered operation of the well head facilities, the polyethylene gathering lines between the well and the treatment plant and the treatment plant. Eight well head configurations were examined. Planager prepared an addendum to the QRA for the well head facilities in response to requests from DIPNR for further clarification. HAZOP studies were carried out by Kvaerner Pty Ltd and Worley Pty Ltd for the gas treatment plant and well head facilities, respectively.

The main hazard identified is associated with the production and handling of coal seam methane, which is a flammable gas held under pressure. Hazards are also associated with the handling of flammable liquids at the gas treatment plant.

The EIS concludes that the Department's criteria for individual fatality risk are satisfied, since:

- the 1 in a million per year residential risk criterion is satisfied between 0 and 20 metres from the well head, depending on well head configuration;
- the risk at 5 metres from the sales and gathering pipelines is no more than 0.1 in a million per year, compared with a sensitive use criterion of 0.5 in a million per year;
- the 10 in a million active open space criterion is satisfied within the boundary of the treatment plant; and
- the risk of fatality at the nearest residential area to the treatment plant and the gathering system is well below the criterion of 1 in a million per year.

The Applicant states that it will also employ impact management and mitigation strategies:

- security fencing at the wells;
- a safety management system for both construction and operation; and
- an emergency response plan for the treatment plant.

The Applicant therefore concluded that appropriate protection measures will be in place to reduce risk as low as reasonably practicable. In addition, the socio-economic study concluded that health risk from the project is expected to be negligible.

6.10.2 Issues Raised in Submissions

The Department received nine submissions on potential safety / hazard impacts: one from DMR, one from EPA, one from NSW Agriculture, one from Campbelltown Council and five private submissions.

These submissions highlighted the need for a Safety Management Plan to be in place if approval is granted and for Sydney Gas to comply with recommendations made in the QRA and HAZOP studies. Issues raised included the consideration of safety implications on future development in the area and for people in proximity to the wellheads. The submissions also claimed that the risk assessment report for the gas treatment plant is inadequate. Particular concerns were expressed about possible impacts from the gas treatment plant on the adjacent Mount Gilead property.

6.10.3 Consideration of Key Issues

The Department has reviewed the methodology used in the QRA studies. The studies have been conducted generally in accordance with the Department's risk assessment guidelines. The modelling of possible impacts from fires and explosions arising out of gas leaks from the wells, gathering system or treatment plant uses well-established techniques and a representative range of failure conditions has been considered.

Robust pipeline failure rate data has been used for the polyethylene gathering system pipeline network, based on relevant US Department of Transport gas pipeline failure statistics. The Planager QRA indicates that the estimated individual risk of fatality at a distance of 5 metres from the gathering pipeline is less than one in a hundred million per year, which represents a negligible level of risk to all land uses along the gathering system pipelines. (This level of risk is less than the one in 10 million quoted in the EIS for maximum risk from the gathering and sales pipelines. This is because the operating pressure of the gathering system is much lower than the sales pipeline, which is outside the scope of this development and was the subject of a separate assessment).

Equipment failure data used in the assessment of risk from the gas wells and treatment plant are taken from recognised published sources. Concern was

expressed in submissions that a key risk contour map for the gas treatment plant had been omitted from the preliminary hazard analysis. The risk contours have been provided to the Department subsequently and show that the one in a million individual fatality risk contour is generally contained within the gas treatment plant site boundary, except to the South of the site, adjacent to a quarry, where the risk contour extends some 80 metres beyond the gas treatment plant site into the same rural property. The Mount Gilead Homestead is located on the adjacent property, south of the Gas Treatment Plant site, about 700 metres from the plant. It is noted that the calculated 10 in a million individual fatality risk contour is contained fully within the gas treatment plant site. The risk from the gas treatment plant thus meets the Department's recommended criteria for fatality risks to active open space areas and for residential uses at the nearest residence.

Available data on steel process plant pipework failure rates is subject to considerable variability. While the Planager risk assessment of the various gas well configurations is said to use a "cautious best-estimate approach", some recent data from the UK off shore gas industry suggest that use of higher failure rates may be warranted. Accordingly, the Department's Major Hazards Unit has carried out an independent estimate of the risk from representative well configurations, using the more conservative pipeline failure data. Using these data with currently proposed well head configurations, the one in a million individual fatality risk contour for a new free flowing well could extend up to 40 metres from the well head (30 metres for an established well after about two years operation). No existing residences fall within this distance from currently operating or proposed gas wells.

Further work is being currently being done to refine the Department's gas well risk estimates based on modified well head configurations, which are likely to result in a reduction in the separation distances. However, even with the conservative assumptions used to date, the risk results do not support imposition of a 200 metre buffer between new residential development and operating gas wells, as currently required by Campbelltown City Council.

The Department recognises the importance of the need to avoid land sterilisation in the Menangle Park urban release area. Accordingly, it has prepared risk-based locational guidelines for the siting of residential development in proximity to coal seam methane wells (refer to **Section 6.2.3**).

The Kvaerner and Worley HAZOP studies have been carried out consistent with the Department's guidelines on such studies, which are typically required as conditions of development consent rather than being submitted at the Development Application Stage. Early submission reflects the fact that design work on the treatment plant has already been largely completed.

While it is noted that the majority of HAZOP actions are recorded as having been completed, the resiting of the gas treatment plant subsequent to completion of the HAZOP and the recent further consideration of alternate well-head configurations warrant an update of both studies. The recommended conditions of consent include a requirement that this be done. Conditions requiring preparation of an emergency plan for the above ground facilities and the implementation of a safety management system prior to commissioning of the development are also recommended.

6.10.4 Conclusion

The Department is satisfied that the proposed gas wells, the gas gathering system and the treatment plant will not pose an unacceptable risk to surrounding existing land uses, subject to recommended conditions of consent. The relevant

Departmental risk criteria are met on the Mount Gilead property, adjacent to the gas treatment plant.

Operating gas wells will not significantly impede future residential development in the Menangle Park urban release area. The locational guideline for the siting of residential development in proximity to coal seam methane wells, (prepared by the Department) provides a systematic approach to the safe location of such development.

The Department has recommended consent conditions that require the Applicant to prepare:

- A Fire Safety Study, Hazard and Operability Study and Final Hazard Analysis prior to construction;
- An Emergency Plan and Safety Management System prior to commissioning of the development; and
- A Compliance Report prior to commissioning of the Plant.

The Applicant will also be required to supply an Incident Report to the Department within 24 hours of any incident or potential incident with actual or potential significant off-site impacts on people or on the bio-physical environment. The Department has also recommended that the Applicant be required to conduct a comprehensive hazard audit 12 months after the commencement of operations.

6.11 Water Resources

6.11.1 Impact Assessment

The Applicant has assessed potential impacts from the proposal on surface water quality in the EIS. The Applicant considered that potential impacts on water resources included flooding over well sites, water quality impacts on surface water and groundwater from erosion and sediment transport, fuel spills or uncontrolled release of water into the surface water drainage system.

The EIS states that the risk of impacts on water quality from well sites will be minimised for short-term periods by taking appropriate weather windows into consideration. Restoration of disturbed sites is also proposed to be undertaken as soon as possible after operations are completed. Procedures for spill containment at all operational sites will be implemented to minimise risks from fuel and chemical spills. The EIS states that the gas gathering system will be planned to be located from areas that are prone to damage and or exposure from floodwaters.

The Applicant proposes to use water (with specifications of pH range of 6.0 to 7.5 and salinity below 1500uS/cm) for irrigation on paddocks and for dust suppression on roads, in consultation with the relevant landholder.

The EIS states that the loss of contained water from a drill sump may potentially occur due to an overflow from a heavy rain event and or inundation. The Applicant considers that as it does not use hazardous chemicals there is no risk of contamination and that a short term release of water from the sump would be small in the context of a high rainfall event. Also, flooding or inundation would result in dilution of the high salinity levels found in the sump water.

The Applicant states that the wells are being drilled to recover natural gas and not water and therefore there are no potential impacts on current groundwater users. The EIS states that the Hawkesbury Sandstone aquifers provide good quality groundwater resources however this unit is separated from the Illawarra Coal Measures by the Narrabeen Group, which is a low permeability strata and therefore

forms a hydraulic barrier. Further, the EIS notes that the presence of this barrier causes the coal seam methane extraction to yield such little water. Additionally, the coal measures have an inherently low horizontal permeability. Therefore, the Applicant considers that there is a negligible risk that the proposal could impact on the groundwater resources of the Hawkesbury Sandstone aquifers (as there is no pathway connecting the Illawarra Coal Measures). All gas wells will be cased and cemented in accordance with DMR requirements and therefore all aquifers within the geological section will remain isolated and cross-contamination of groundwater will not occur.

6.11.2 Issues Raised in Submissions

The Department received ten submissions on potential impacts on surface water and groundwater resources: one from the Department (Natural Resources), one from EPA, one from NSW Agriculture, one from Campbelltown Council, one from an Elected Representative (Ms Peta Seaton MP) and five private submissions.

These submissions raised concerns and recommendations regarding the Applicants proposal to use saline water for irrigation and dust suppression purposes. Other issues included the potential flood risk to the well sites and the potential for structural damage to the infrastructure. One submission raised concern regarding the sediment and erosion control practices being implemented. Submissions from the community raised issues such as the potential impact of the project on the local water supply, the proximity of the treatment plant to Menangle Creek (which flows into the Nepean River), risks of damage to the underlying watertable and contamination of groundwater and also risks from flooding.

6.11.3 Consideration of Key Issues

The EPA requested the Applicant to provide further information regarding:

- Proposed wastewater irrigation practices for wastewater collected at the well sites and for condensate collected at the Treatment Plant;
- Plans of proposed irrigation areas;
- Estimates of load limits for any assessable water pollutants in wastewater;
- Volumes of water expected to be collected at each well site;
- Volume of water expected to be collected following separation from the gas at the Treatment Plant;
- Management of water during off-site disposal, irrigation, dust suppression; and
- Expected concentrations of specific substances in each of the water sources identified.

The Applicant provided further information to clarify each water stream, its volume and proposed management of the water. The Applicant noted that there will be three primary sources of water from the proposal as follows:

- Groundwater from the gas wells drilled into the coal seam;
- Condensed water from the extracted gas, collected in water traps within the gas gathering system; and
- Condensed water from the gas dehydration unit at the Treatment Plant.

The Applicant prepared an estimate of annual quantities of water produced from the three sources based on its experience on the Stage 1 Project. The Applicant notes that during the drilling and fracing of a well, varying volumes of water are produced and stored in a primary sump at the gas wellhead site.

The Applicant also provided information confirming that it no longer intends to use wastewater for dust suppression or irrigation as previously stated in the EIS. This issue was raised by NSW Agriculture, the Department (Natural Resources) and some community members. Rather than using the water from the gas wells for dust suppression, the Applicant has now committed to transfer this water to the Gas Treatment Plant evaporation dam where it will be mixed with Treatment Plant water and will either evaporate or be disposed off-site by Thiess Environmental Services. Water collected in water traps associated with the drilling and production of a gas well will also be handled in the same manner as described for water make from the gas wells.

The Applicant also provided further information which included clarification that it required Part 3A Permits under the *Rivers and Foreshore Improvement Act 1948* for the construction of the gas gathering system across and adjacent to streams. The Applicant advised that the wells drilled under its PEL 2 (in accordance with the *Petroleum Onshore Act 1991*) are exempt from the requirements of the *Rivers and Foreshore Improvement Act 1948* and therefore the Applicant did not require Part 3A Permits. It was the Applicant's intention to also obtain approval from the DMR for the construction of the gas gathering system under the *Petroleum Onshore Act 1991*. However, the DMR did not provide approval for the construction of the gas gathering system and therefore the Applicant requested that it will require a Part 3A Permit for all crossings. The Applicant advised that for all stream crossings (there are 26 crossings in total), except for the Nepean River crossing, the gas gathering system will be buried and the creek or drainage area re-instated to as near as practical its pre-existing condition.

6.11.4 General Terms of Approval

The Department (Natural Resources) has provided General Terms of Approval for the proposal, for the Part 3A Permits which the Applicant requires under the *Rivers and Foreshore Improvement Act 1948*. These General Terms of Approval require the Applicant to:

- Prepare and implement a Soil and Water Management Plan prior to the issue of the Part 3A permit. The Plan shall include specific requirements for works and measures to minimise the potential for soil erosion discharge of sediment and other pollutants, implement a program for of testing
- Under-bore stream crossings B and F and ensure that the bed and banks of the stream crossings are not disturbed;
- Trench stream crossings A, C, D, E, J, K, L, M, N, O, X, Y and Z and prepare a trenched crossing design by a suitable qualified person;
- Ensure that stream crossing I is strapped to Menangle Bridge;
- Ensure that stream crossing H is either strapped to the existing road crossing, strapped to an upgraded road crossing, under-bored or consist of a pipe bridge;
- Advise the Director-General of the proposed stream crossing methods for the EMAI which are to be assessed and approved by the Department prior to the issue of the Part 3A permit;
- Undertake works within 20 m of watercourses during dry weather conditions;
- Minimise the disturbance of the bed and banks of all watercourses during the construction and re-instatement of the site;
- Minimise the amount of dirty water and sediment from the site entering protected waters or that is exposed to the flow of protected waters;
- Implement all relevant site drainage and sediment and erosion control measures and any other pollution control works required, prior to the commencement of any other works at the site; and

- Document in detail the commissioning of all sediment and erosion controls and any other water diversion structures and that the decommissioning meets the requirements of the NSW Department of Housing's publication "Managing Urban Stormwater: Soils and Construction".

The EPA has provided General Terms of Approval for the proposal which require the Applicant to:

- monitor a range of water quality parameters such as total suspended solids, biochemical oxygen demand, oil and grease, hydrocarbons, phenols, total organic carbon and electrical conductivity at the pump connection point at the evaporation pond at the Gas Treatment Plant Site;
- install a measurement device in the Evaporation Pond for recording the depth of effluent in the storage;
- prepare a monitoring program for assessable pollutants for oily water wastes and sewage waste; and
- provide a report containing an evaluation program for future integrity testing of the liner in the evaporation pond.

6.11.5 Conclusion

The Department has incorporated the Department's (Natural Resources) and the EPA's General terms of Approval into the recommended consent conditions for the project. The Departments' recommended consent conditions also require the Applicant to implement all practicable measures to minimise soil erosion and the discharge of sediments and water pollutants from the site.

6.12 Justification / Proven Gas Resource

6.12.1 Assessment of Justification / Proven Gas Resource

Justification for the proposal is presented in the EIS in terms of the need for the project to provide an efficient, reliable energy source to meet future demand for gas supply, biophysical considerations such as reduced greenhouse gas emissions and economic and social considerations. The EIS also provides justification in terms of ESD and outlines how Commonwealth, State and Regional energy initiatives will be met.

The proposal involves the development of coalbed methane gas production from the Illawarra Coal Measures. The methane is adsorbed into the coal during the coalification process and is released by the lowering of pressure within the coal seams.

The EIS states that the potential gas resources within the Stage II Project may contain up to 106 PJ of energy within the Bulli Seam. In addition to this, the EIS states that these estimates do not consider methane located in other coal seams and sandstone reservoirs within the Project Area. For instance, Sydney Gas states that it has drilled into and fraced additional coal seams which further increases the potential recovery of methane. The EIS also reports that the total gas recovered from Stage I of the Project and from simulation work undertaken by the University of New South Wales, the resource within the entire Camden Gas Project area should generate economic flow rates for the next 21 years.

6.12.2 Issues Raised in Submissions

The Department received eight submissions on potential impacts regarding project justification/proven gas resource issues: one from DMR, one from NSW Agriculture, one from Camden Council, and five private submissions.

These submissions raised concern regarding the proven quantity of recoverable gas, the actual economic viability of the project and responsibility should the project fail.

6.12.3 Consideration of Key Issues

Proven Resource

In New South Wales, it is contemporary practice to require Applicants for mining proposals to demonstrate a proven resource. The Department notes that the coalbed methane industry in NSW is an emerging industry and different to coal mining proposals. The ability to demonstrate a proven reserve will depend on the available technology and the engineering feasibility developed over time. However, the Department acknowledges that the Applicant has not demonstrated at this stage a proven reserve and therefore the benefits of the resource are considered “potential” until proven. As such, the Department required the Applicant to obtain landowners consent for land containing proposed gas wells in the DA. This ensures that landowners who may be directly affected by the proposal (which could present a land use conflict in the future) are aware of the proposal and give their consent to the Applicant lodging the DA. This measure safeguards the landowners who may be most directly affected by the proposal and assists in balancing the increasing land use conflicts in the area.

Energy from the Project

The Department has considered the potential energy production of the project in terms of New South Wales's consumption of gas. Based on data from the Ministry of Energy and Utilities, New South Wales used 115 Petajoules of gas during the 2000-2001 Financial Year for domestic, industrial and commercial uses. The Stage 1 Pilot Plant currently produces on average 0.85 Petajoules of gas per annum, representing 0.7 per cent of New South Wales current gas usage. The Stage 2 Plant is predicted to produce 14.5 Petajoules of gas at maximum production, which at existing usage levels in New South Wales, would represent approximately 13 per cent of New South Wales usage (using 2000-2001 usage levels). On this basis, the Department considers that the Stage 2 project has the potential to provide a considerable proportion of gas to the supply of New South Wales consumers.

6.12.4 Conclusion

The Department has recommended conditions that will require the Applicant to prepare a reserve statement for the coal seam methane resource within the Petroleum Production Lease (if granted by the DMR) for the Stage 2 Project. The condition will require the Applicant to prepare the reserve statement within 10 years of the date of the consent.

6.13 Potential Impacts on the Elizabeth Macarthur Agricultural Institute Property

6.13.1 Assessment of Elizabeth Macarthur Agricultural Institute (EMAI)

A number of key issues have been raised in submissions that are of particular concern to the EMAI property. For this reason, potential impacts on this property are discussed separately in this section. The key issues relating to the EMAI property are as follows:

- European heritage including visual amenity due to gas well heads;
- Indigenous heritage;
- Flora and fauna, including noise impacts disturbing nesting bird species; and

- Future land use conflict.

The EIS addresses these issues for the EMAI property as follows:

The European heritage study and Addendum study conducted by New South Wales Archaeology (see Section 6.8) included assessment of gas wells EM 1 – EM 20 located at the EMAI property. The study found that there is a Conservation Plan covering the original Camden Park which would apply to the proposed development at the EMAI property. The existing landscape was found to be somewhat disturbed by sand mining and agricultural activities. The study concluded that there will be no large-scale impact on the landscape of this historical unit, given the small and discrete nature of each gas well site. However, individual gas well sites will compromise the visual integrity of this historical landscape unit to some extent. Mitigation measures are recommended to minimise these impacts.

With regard to indigenous heritage, an initial Aboriginal heritage study conducted by New South Wales Archaeology found two Aboriginal sites (stone artefacts, lithic fragments and an Aboriginal scarred tree) located at the proposed site of gas well EM 9 and one Aboriginal site (stone artefacts) located at gas well site EM 13. Both gas wells are located on the EMAI property. The well locations were revised. A further Aboriginal heritage study by New South Wales Archaeology made recommendations to ensure construction of the gas wells will not impact Aboriginal sites at these locations.

The visual assessment in the EIS does not consider the EMAI property separately. With regard to gas wellhead facilities, the EIS states these will cause a permanent visual impact, however they have been located away from sensitive viewing locations where practicable or screened by enclosures or vegetation.

A flora and fauna study for gas wells EM1-EM20 including gathering lines at the EMAI property was conducted by WildScenes Eco-Research in March 2003. No threatened species were recorded during survey of the study sites. Threatened ecological communities were identified in the vicinity of the sites and eight-part tests were conducted. It was concluded that significantly impact on threatened ecological communities is unlikely.

The EIS does not separately describe land use of the EMAI property or identify potential future land use impacts. The EIS description regarding land use conflict is discussed in **Section 6.2**.

6.13.2 Issues Raised in Submissions

The Department received five submissions specifically regarding potential impacts on the EMAI property: one from NSW Agriculture, one from Wollondilly Shire Council, one from Camden Historical Society Inc and two private submissions.

These submissions raised concern over the following issues:

- Adequacy of the historical impact assessment for the EMAI and Camden Park property;
- The need to consider the EMAI property holistically in terms of cultural heritage significance;
- Adequacy of the flora and fauna assessment: No threatened species were located during site surveys and local naturalists were not consulted. However 14 species of Australian birds of prey have been recorded on the EMAI property since 1988. This called for further flora and fauna surveys on the EMAI property;

- Noise impacts on protected nesting bird species has not been considered in the EIS;
- High visual impact from the wells located at the EMAI property, including cumulative visual impact;
- Threat to future land use on and near the EMAI property due to land in the 200m buffer zone of each gas well being sterilised;
- No consultation was undertaken with the NSW Heritage Office regarding the EMAI property. NSW Agriculture is responsible for its preservation; and
- No consultation was undertaken with the landholders of Camden Park.

6.13.3 Consideration of Key Issues

Heritage

The Applicant commissioned a Heritage Study to assess the potential impacts of the proposed gas wells, gas gathering system and access roads on the cultural heritage significance of EMAI. This report and its findings were further discussed in **Section 6.8** of this report. The NSW Heritage Office is satisfied that provided recommended mitigation measures are implemented, the potential impacts of the proposal on the cultural heritage of the EMAI are manageable. The Department concurs with this conclusion and considers that given the dimension of the wellhead, and that they will only be in place for a limited period of time, the impacts of these structures on the landscape are limited and not permanent.

The Department will also require the Applicant to prepare a Vegetation and Landscape Management Plan which requires the Applicant to provide landscape measures to minimise the impacts of gas wells on the cultural heritage landscape of the EMAI.

Flora and Fauna

Issues raised during the exhibition process included concern regarding the potential impacts of the proposal on the flora and fauna values of the EMAI. The Applicant's representatives have met with NSW Agriculture to specifically discuss the potential noise effects on raptor species, which are breeding within the EMAI. This issue is discussed further in **Section 6.5** of this report. In summary, the Applicant has agreed to ensure that drilling, fracking and activities that generate noise do not occur in proximity to the raptor breeding habitat during the breeding season of those species. The Department also notes that the Applicant has located all of the proposed gas wells beyond an exclusion zone that has been developed for the protection of the raptor species. The Department considers the Applicant's commitment to not undertake noise generating activities within proximity to the raptor breeding locations, will provide appropriate protection for those species. The Department's recommendations include a requirement that the Applicant drills or fracc gas wells EM 5, EM 7, EM 8, EM 9, EM 11 and EM 12 during the months of February and March which are outside of the breeding season of nearby raptor species. Additionally, the Department recommends that the construction of the gas gathering line adjoining these gas wells is also undertaken outside of the breeding season of raptor species.

Sterilisation of Land

The Department notes the concern regarding the potential sterilisation of land in proximity to an operating gas well. The Department's Locational Guideline provides recommended separation distances between operating gas wells and future residences or other sensitive uses (refer to **Section 6.2.3**). These Guidelines recommend a range of separation distances (10 m to 25 m) based on the proposed surrounding land use, the configuration of the operating gas well and the period of the

wells operation. The Department considers that given the separation distances and the objective of managing the EMAI for its cultural, agricultural and biodiversity values, the siting of gas wells on the EMAI will not pose constraints for the ongoing management of the EMAI.

Water Management

Concerns were raised regarding the potential effects of the proposal on the soil integrity and water management at EMAI. The Applicant has modified its proposed water management and will now not utilise water make from the gas well for dust suppression or irrigation purposes. The Applicant proposes to collect the water from each gas well and transfer it across to the Gas Treatment Plant Site for disposal (by evaporation or removal by licenced contractors).

The Applicant will also be required to prepare and implement a Soil and Water Management Plan which includes a specific requirement that the Applicant detail measures to maintain the soil quality, soil integrity and soil structure of land on the EMAI during the construction and operation of the proposal. Additionally, the Applicant will be required to submit the proposed stream crossing methods (for the components of the gas gathering system that will traverse streams) on EMAI, which are to be assessed and approved by the Department, prior to the granting of the Part 3A Permit to the Applicant.

Drilling and Fraccing Process

NSW Agriculture sought clarification on whether the drilling and fraccing operations at gas wells were once only operations. The Applicant has advised that once a well has been successfully fracced, it does not require further fraccing. The Department has recommended a consent condition which requires the Applicant to seek the prior approval of the Director-General for the redrilling and/or additional fraccing of any gas well. The Applicant will also be required to prepare and submit for approval a Redrilling and Refraccing Management Plan prior to the activity being undertaken.

Management of Construction Impacts

The Department considers that the construction aspects of the project (compared to the operational aspects) have the greatest potential to cause impacts on EMAI. Once the project is operational on EMAI, the gas gathering line will be buried and not visible. Similarly, once the wellheads are in production, they will have a comparatively small footprint being 4 metres by 8 metres. However, construction activities on EMAI have the potential to cause adverse effects if appropriate management measures are not implemented or adhered to.

To ensure the construction aspects of the project on EMAI are conducted in a satisfactory manner, the Department has recommended that the Applicant be required to commission an Independent Environmental Audit of the construction of the gas gathering system, construction of the access roads and drilling and fraccing of gas wells on the EMAI. The Independent Environmental Auditor shall be approved by the Director-General and the audit shall be undertaken in accordance with appropriate audit guidelines and procedures. The Audit shall also include recommending measures or actions to improve the environmental performance of the construction of the development on EMAI, as required.

6.13.4 Conclusion

The Department considers the greatest potential for impact from the proposal to the EMAI would occur during the construction and drilling phases of the development,

compared to the operational phase. The Department has therefore recommended consent conditions that will require the Applicant to:

- Commission an Independent Environmental Audit during the construction of the access roads and gas gathering system, and the drilling and “fracking” of the proposed gas wells. The Independent Environmental Audit will be conducted by an Auditor approved by the Director-General. The Audit will review the compliance of all construction aspects of the proposal on EMAI to ensure they are undertaken in a satisfactory manner and to meet the requirements of the Applicants obligations under the consent;
- Conduct construction and drilling activities outside of the breeding season of raptor species utilising the EMAI Site;
- Implement all measures proposed by the supplementary “Statement of Heritage Impact” report as amended by the Heritage Office’s recommendations;
- Prepare a Vegetation and Landscape Management Plan which includes a specific requirement to detail measures to minimise the impacts of gas wells on the cultural heritage landscape; and
- Prepare a Soil and Water Management Plan which includes measures to maintain the soil quality, soil integrity, and soil structure of land on EMAI during the construction and operational phases of the project.

6.14 Potential Impacts on the Mount Gilead Property

6.14.1 Assessment of Impacts on the Mount Gilead property

The Department received several submissions from the owners of the Mount Gilead property, which raised a number of concerns about the proposal. Therefore, potential impacts of the proposal on the Mount Gilead property are discussed in this section. The key issues relating to the Mount Gilead property are as follows:

- European heritage;
- Visual amenity due to the gas treatment plant;
- Noise impact due to the gas treatment plant;
- Cumulative odour impacts due to other facilities;
- Future land use conflict due to the presence of wells and the gas treatment plant; and
- Community consultation

The EIS addresses these issues for the Mount Gilead property as follows:

The European heritage study conducted by New South Wales Archaeology (see **Section 6.8**) included an assessment of gas wells and gas gathering lines located in the vicinity of the Mount Gilead property, though no specific reference was made to this property. As a result of this study, gathering lines located in Rosalind Park, Menangle Park were re-routed away from known archaeology sites. An Addendum study by New South Wales Archaeology concluded that the revised locations are of low archaeological sensitivity and mitigation measures are provided.

The visual assessment in the EIS does not consider the Mount Gilead property separately. The EIS states that the proposed Plant location is screened from open public space and private residences by the local landscape and vegetation along Menangle Creek. Also, the siting of the above-ground gas wellhead sites will be installed to avoid areas of visual sensitivity where practicable and will be constructed to blend in with the local landscape. The EIS concluded that the character of the landscape will not be adversely altered by the proposed development and therefore, changes to the visual amenity of the area are not considered to be of significance.

The noise assessment in the EIS was conducted by ERM. The main noise sources at the Mount Gilead property would occur during the construction of gas wells and construction and operation of the gas treatment plant. Construction noise impacts are considered in the EIS to be short-term and transient in nature. Restricted hours of construction activity have been recommended. With regard to the gas treatment plant, based on existing background levels and predicted noise emissions from the compressor units (which represent the largest noise emission), noise impacts from the gas treatment plant are considered to be negligible and comply with the EPA Industrial Noise Policy guidelines. The EIS noted that the operation of the Gas Treatment Plant meets the Project Specific Noise criteria under still isothermal and adverse weather conditions at all receivers, except for the Mount Gilead Homestead which would experience a 2 dB exceedance on hot summer days when the cooler fans will be required to run at maximum speed. The EIS predicts that this situation will occur for less than 3% of the time during summer days.

Cumulative odour impacts due to the presence of other facilities in the vicinity of the Mount Gilead property have not been considered separately in the EIS. Odour emissions from the gas treatment plant are predicted to be below NSW EPA criteria at the facility boundary. The only identified source of odours is fugitive emissions from odorant dosing activities at the plant, which would be negligible given the use of an enclosed room and ventilation via a carbon scrubber.

The EIS does not separately describe land use of the Mount Gilead property or identify potential future land use impacts. The EIS description regarding land use conflict is provided in **Section 6.2**.

The EIS does not separately describe community consultation activities conducted for landowners of individual properties. However it is stated that pro-active consultation was undertaken with affected landowners through a range of consultation activities (refer to **Section 6.1**).

6.14.2 Issues Raised in Submissions

The Department received several submissions from the owners of the Mount Gilead property (and their representatives) regarding potential impacts of the proposal on the Mount Gilead property. These submissions raised concerns on a number of matters, with the key issues being:

1. Impact of the development on the historical significance, vistas and amenities of the Mount Gilead property;
2. High visual impact from the gas treatment plant and flare due to its location high on a rising exposed slope and inability to be screened;
3. High noise impact on the Mount Gilead property due to the operation of the gas treatment plant. The noise impact assessment should consider future development of the Mount Gilead property;
4. Cumulative odour impacts due to the close proximity of other facilities in the Camden Cobbitty area;
5. Reduced use, enjoyment and future development options of the Mount Gilead property due to the location of the treatment plant 70m from the Mount Gilead property. The gas treatment plant should have a buffer zone to protect the Mount Gilead property;
6. Insufficient information in the risk assessment report;
7. Noise and air assessment depends on weather data which is different to that presented in other EISs;
8. Future land use conflict due to the siting of gas wells along north side of Menangle Creek that would sterilise a strip of land adjacent to the Mount Gilead property boundary; and

9. Minimal consultation was undertaken with the landholders of Mount Gilead and inadequate information was provided.

6.14.3 Consideration of Key Issues

The Department acknowledges that the Mount Gilead Homestead is the closest residence to the facilities proposed at Rosalind Park (other than the owner of the Rosalind Park property itself) and therefore the Department has examined in detail the potential impacts of the proposal on the property. The Department requested the Applicant to provide further information in response to the issues raised regarding the Mount Gilead property. These issues include:

- Visual impacts and proposed mitigation measures;
- Preparation of photomontages of the proposed facilities, including from the view of the Mount Gilead residence;
- Clarification on risk matters; and
- Night-lighting effects including an assessment of lighting from the flare.

The EPA also sought further clarification from the Applicant in relation to the noise and air aspects of the proposal and potential effects on nearby residences, including the Mount Gilead Homestead (these issues are discussed in **Section 6.6** and **Section 6.7** respectively).

The Applicant provided further information to the Department which was also provided to the owners of the Mount Gilead property. These issues and additional information provided are discussed in the following section.

Risk Assessment

Concern was expressed in a submission from Mount Gilead that a key risk contour map for the gas treatment plant had been omitted from the preliminary hazard analysis in the EIS. The Applicant provided the risk contours to the Department and the resident and subsequently show that the one in a million individual fatality risk contour is generally contained within the area leased by the Applicant for the gas treatment plant site. The one in a million individual fatality risk contour extends beyond the leased area, south of the site, however it remains within the property boundary of the property being leased by the Applicant. The one in a million individual fatality risk contour does not encroach onto any of the adjoining property boundaries including the Mount Gilead property.

The Mount Gilead Homestead is located on the adjacent property, south-east of the Gas Treatment Plant site, about 700 metres from the plant. It is noted that the calculated 10 in a million individual fatality risk contour is contained fully within the gas treatment plant site. The risk from the gas treatment plant thus meets the Department's recommended criteria for fatality risks to active open space areas and for residential uses at the nearest residence.

Noise and Air Quality Effects

The potential noise and air emissions from the proposal were assessed in the EIS and in supplementary information that the Applicant prepared at the request of the EPA. The noise and air assessments are discussed in **Section 6.6** and **Section 6.7** respectively. The Department notes that the Mount Gilead submission expressed concern regarding the adequacy of wind data used in the dispersion modelling studies for the EIS. The Department sought advice from the EPA in relation to the adequacy of the wind data used by the Applicant for dispersion modelling studies. The Department was advised that the EPA requires proponents to use the most

recent 12 months of weather data for dispersion modelling assessments and that the Applicant has satisfied this requirement in its modelling assessments.

The EPA has provided its General Terms of Approval for the proposal which includes specific noise limits that the Applicant must meet at the Mount Gilead Homestead during normal operations and during flaring operations (refer to **Section 6.6, Table 12**). The EPA also requires the Applicant to monitor the performance of the development in terms of noise impacts and report the results of this monitoring to the EPA.

The EPA also requires the Applicant to provide a report assessing the compliance of noise levels during the range of flaring incidents experienced after commissioning of the Plant and the flare, with the noise limits set in the General Terms of Approval.

The Department has also recommended that the Applicant be required to implement specific noise mitigation measures for the flare to reduce noise impacts at the Mount Gilead Homestead (these measures are discussed in **Section 6.6**). The Department has also recommended a consent condition requiring the Applicant to undertake attended noise monitoring at the Mount Gilead residence, to measure its compliance of the operation with the noise limits set by the EPA.

The air quality assessment (refer to **Section 6.7**) demonstrates that the proposal can meet EPA impact assessment criteria at the Mount Gilead Homestead for a range of air quality pollutants including nitrogen dioxide, odour, sulphuric acid mist, sulphur dioxide and particulates.

The EPA General Terms of Approval require the Applicant to monitor air quality pollutants from the facility and to ensure that concentration limits as set in the General Terms of Approval are not exceeded. The EPA General Terms of Approval also require the Applicant to report on the monitoring undertaken to the EPA.

The Department considers that although the proposal will introduce a source of air quality pollutants to the local air shed, the Applicant has demonstrated that it can meet the EPA assessment criteria at all nearby receivers, including the Mount Gilead Homestead. Nevertheless, the Department has recommended that the Applicant be required to meet specific air quality impact assessment criteria at all privately owned residences and that the Applicant undertake monitoring to measure compliance with this recommended consent condition.

Visual Assessment

The Applicant provided further information regarding the potential visual impact assessment of the proposed facilities at Rosalind Park on the Mount Gilead Homestead. This information included supplementary documentation provided by URS and is discussed in **Section 6.4**. The information shows that the Mount Gilead Homestead may experience some views of the facilities at Rosalind Park.

At the Department's request, the Applicant also prepared a series of photomontages of the proposed facilities and the potential view of the facilities from the Mount Gilead Homestead. These photomontages are included in **Appendix 2** of this report and do not include the mitigation measures proposed by URS. The photomontages show that without the application of mitigation measures (as recommended in the URS report³), the Mount Gilead Homestead will experience potential views of the proposed facilities at Rosalind Park. The photomontages show that the Mount Gilead

³ This report was prepared by URS for Sydney Gas titled "Sydney Gas proposal – Stage 2 Coal Seam Methane Project Visual Assessment"

Homestead will have views of the proposed “Workshop” and parts of the surrounding offices and pipeyard at Rosalind Park. The Gas Treatment Plant, stacks (from the compressor engines) and horizontal flare are all screened from view by the trees in the Menangle Creek riparian zone. Therefore, the Department considers the stand of trees adjacent to the site provide significant screening of the proposal from the views of the Mount Gilead Homestead.

The Department considers that given the view of the “Workshop” and adjoining areas, from the Homestead, the successful implementation of mitigation measures and choice of colours for the facility are particularly important to reduce the visual impact on the Mount Gilead Homestead to an acceptable level. The Department notes the comments in the Independent Review of the Visual Impact Assessment (**Section 6.4.4** and **Appendix A**) and considers that the Applicant should be required to provide further information on the design and specifications of the appearance of the facilities to ensure impacts are reduced to an acceptable level.

The Department has also noted the recommendations of the Independent Review of the Visual Impact Assessment, such as changing the proposed colour of the “workshop” to a dark grey colour and using darker materials for the ground surface such as blue metal. The Department considers that the implementation of these measures will assist in ensuring the proposed facilities are not obvious features in the landscape surrounding the Mount Gilead Homestead. However, the measures may take a few years to become established (such as tree and shrub plantings) and therefore the visual mitigation of the development should improve with time.

To ensure the visual impacts of the development are managed to a satisfactory level, the Department has recommended a consent condition which requires the Applicant to submit for the approval of the Director-General, a colour scheme for all proposed buildings and that the colours selected for the facilities shall aim to minimise the visual impact of the facility on surrounding land uses and maximise the ability of the facilities to “blend into” the local landscape. The Applicant will be required to provide the colour specifications for approval prior to the commencement of construction of the facilities.

The Department has also recommended that the Applicant prepare a Vegetation and Landscape Management Plan which shall contain the detailed measures of achieving best practice management of the visual impacts. The Plan shall include measures to protect mature trees and specifically, the mature trees in the Menangle Creek riparian zone. The Department considers the stand of trees adjacent to the site provide significant screening of the proposal from the views of the Mount Gilead Homestead. Therefore, the Plan will also require the Applicant to monitor the health of these trees and recommend measures if required to improve the health of the trees. The Plan will also require the Applicant to undertake supplementary planting at the boundary of the site, if required.

The Department recognises that tree plantings and similar strategies may sometimes fail due to environmental conditions or poor plant selection. Therefore the Department has also recommended that the Plan require the Applicant to monitor the effectiveness of all visual mitigation measures, particularly the measures used to minimise the visual impacts on the Mount Gilead Homestead. Additionally, the Applicant will be required to report on the results of the visual impact monitoring in the Annual Environmental Performance Report. The monitoring results will specifically identify and remedial measures that may be required.

The Department considers that the owners of the Mount Gilead Homestead should be given the opportunity to comment on the Vegetation and Landscape Management Plan, prior to its approval. Therefore, the Department has committed to seeking

comment on the Vegetation and Landscape Management Plan from the owners of the Mount Gilead Homestead and will consider any issues raised prior to determining whether to grant approval of the Plan.

To provide additional assurance that visual impacts on the Mount Gilead Homestead are managed at an acceptable level, the Department has also recommended that the Applicant commission an Independent audit of the performance of the mitigation measures which will be undertaken by an Independent Landscape Expert whose appointment must be approved by the Director-General. The Independent Landscape Expert will assess the performance of the visual mitigation measures with specific reference to the effectiveness of measures in screening the development (and lighting from the development) from the Mount Gilead Homestead. The Independent Landscape Expert will also review the adequacy of the Vegetation and Landscape management Plan and recommend actions or measures to improve the visual mitigation measures if required. The Independent Audit will be undertaken within six months of the commissioning of the proposed development and every two years thereafter and the results will be reported to the Director-General.

Night-lighting

The Department's assessment of the night-lighting effects of the proposal is discussed in **Section 6.4**. In addition to this assessment, the Applicant's consultant, URS has also provided further information regarding the frequency of different types of flare events and the estimated level of light that would be viewed from the Mount Gilead Homestead. These estimates are provided in **Table 19**.

Table 19 - Predicted Flare Events

Number of different Flare events	Flare Event ¹	Total Frequency (once per)	Night-time Frequency ³ (once per)	Total Duration (each event)	Estimated Lux Level (Lx) of flare if viewed from the Mount Gilead Homestead ⁴
1	Spill Valve	5.8 days	11.4 days	4.2 hours	0.03
2	Compressor Blowdown (ESD)	21 days	42 days	15 minutes	0.56
3	Compressor Blowdown (Shut down and unload)	8 days	16 days	8 minutes	0.11
4	Pressure Safety Valve Discharge ²	60 to 120 days	120 to 240 days	0.5 minutes	1.51
5	Pressure Safety Valve Suction ²	60 to 120 days	120 to 240 days	0.5 minutes	2.27

Notes:

Information adapted from Table 2 in URS (2003) "Sydney Gas Proposal Stage 2 Coal Seam Methane Project Visual Assessment of Lighting and Flare" prepared for Sydney Gas 6 November 2003.

1. The frequency of each event accounts for all three compressors.
2. This is a highly conservative estimate and in practice such events are rare.
3. This is based on flare events occurring 50% during day light hours and 50% during night time hours (i.e. sunrise at 6 am, sunset at 6pm).
4. These estimated Lux levels (from Bassett) are conservative as they do not take account of the screen effects of the earth bunding, the evaporation pit or the trees along Menangle Creek.

The information in **Table 19** shows that the Applicant is predicting that the five different flare events may operate, each with different frequency and duration. The Department notes from **Table 19** that the most frequent flare events are likely to be caused by the Spill valve and the compressor Blowdown (shutdown and unload). These events are predicted to occur at night-time, once per 11 days and once per 16

days respectively. These events are estimated to produce a comparatively low level of light (0.03 Lx and 0.11 Lx) that may be viewed from the Mount Gilead Homestead. (The URS report states that bright moonlight produces 0.25 Lx, whereas sunlight at midday produces an average of 100,000 Lx). The compressor Blowdown is predicted to occur once every 42 days for a period of 15 minutes and produce a level of light of 0.56 Lx at the Homestead. (This level of light is approximately twice that of bright moonlight).

The flare events that have the potential to cause the greatest level of light to the Mount Gilead Homestead (pressure safety valve discharge and pressure safety valve suction) are each predicted to occur for a short duration of 30 seconds, once per four to eight months. The Department also notes that the Applicant considers that the occurrence of these two flare events to be a conservative estimate and in practice they rarely occur.

Additionally, the Applicant has advised that the cause of these two flare events (an emergency caused by the Pressure Safety Valve lifting) are considered worst case scenarios and they have not occurred at the existing Stage 1 Ray Beddoe Pilot Plant which has been in continuous operation since 1 May 2001. The Department recognises that it is difficult to accurately predict the occurrence of a flare event caused by an emergency situation and that this situation has not occurred to date at the Stage 1 Plant.

The Department also recognises that the flare is positioned horizontally which differs from normal flaring operations at other gas plants which generally utilise a vertical flare. Subsequently, the height of the flame from the horizontal flare will be significantly reduced, resulting in less light being reflected and reducing the potential for a direct line of sight to the Mount Gilead Homestead. Due to the position and location of the flare, the existing trees along Menangle Creek will screen the potential line of sight views of the flare from the Homestead.

To further reduce the illumination of the surrounding landscape from the operation of the flare, the Applicant has committed to undertake mitigation measures as follows:

- Construct earth mounding around the northern and eastern edges of the flare evaporation pond; and
- Undertake tree planting on the outer slopes of the mounding to provide additional visual screening.

Considering the infrequency of flare events that are predicted to produce levels of light approximately 6 to 9 times greater than moonlight and that these events have not occurred to date at the Stage 1 Pilot Plant and their duration is predicted to be 30 seconds, the Department is satisfied that the potential night-lighting effects of the proposal will not significantly compromise the amenity of the Mount Gilead Homestead. Additionally, the Applicant has committed to implement mitigation measures which will further reduce the potential line of sight for light from the flare to be seen from the Mount Gilead Homestead.

The Department has also recommended that the Applicant be required to implement all mitigation measures detailed in the supplementary reports provided by the Applicant to the Department. The Department will also require the Applicant to report on the effectiveness of lighting controls in the Annual Environmental Management Report. Additionally, the Department will require the Applicant to record the frequency of the operation of the flare and make this information available to the Director-General on request. This will require the Applicant to record:

- Date and time of each flare event;
- Duration of each flare event;

- Operation of flare in daylight or night-time hours;
- Cause of the operation of the flare;
- Number of compressor engines that have been operating during the period; and
- Comparison of the frequency, night-time frequency, duration and estimated light level of each type of flare event with the flare events predicted in the supplementary report by URS.

The Department considers that the outcomes of the visual and night-lighting assessments are dependent to a large extent on the stand of trees in the Menangle Creek riparian zone. These trees are predicted to shield the Mount Gilead Homestead from night-lights from the Gas Treatment Plant and direct views of the Gas Treatment Plant facility. The Department considers the protection of this stand of trees is an important measure to ensure visual impacts of the project on the Mount Gilead Homestead are reduced to a satisfactory level. The Department has therefore recommended that the Applicant's Vegetation and Landscape Management Plan include provisions for monitoring the health of the trees, retaining and protecting the trees and recommending measures to improve the health of the trees if required.

Additionally, the Department has recommended that the Independent Landscape Expert audit the effectiveness of visual mitigation measures to reduce the night-lighting effects of the proposal. The Audit will be undertaken within six months of commissioning the Plant and then every two years thereafter. The regular conduct of this audit will ensure that the effectiveness of the visual mitigation measures will be independently reviewed on a regular basis for the term of this consent.

Heritage

The Department recognises that the Mount Gilead buildings including the Homestead have local heritage significance. The Applicant is not proposing to undertake any activities on the Mount Gilead property. However, some components of the proposal have the potential to be viewed from the Mount Gilead Homestead and therefore become part of the vista. To reduce this impact, the Department has recommended conditions of consent to manage, control and monitor the implementation and success of visual mitigation measures to reduce the potential impacts of the proposal on the visual amenity and vista of the Mount Gilead Homestead. (The Department's recommended approach for managing visual impacts on the Mount Gilead Homestead is discussed in the above section). Therefore, the Department considers once the visual mitigation measures are established, the visual effect of the proposal on the Mount Gilead Homestead will be reduced to an acceptable level and will not compromise its significance as a heritage item.

Future Land Use Conflict

The Department notes the concern of the owners of the Mount Gilead property regarding the potential for the siting of gas wells adjacent to the property boundary to sterilise future development on their land. The Department has recently prepared a Guideline for separation distances in relation to operating coal seam methane wells. This Guideline is discussed in detail in **Section 6.2** of this report and provides guidance on separation distances for specific wellhead configurations. The gas wells located adjacent to the Mount Gilead property boundary are gas wells RP6, RP7, RP9 and RP11. These four wells range from being 40 metres to 100 metres from the Mount Gilead property boundary. The Guideline specifies that the separation distance between operating gas wells to future residences be 10-25 metres (depending on the configuration of the well head). Therefore, the separation distance around each of these gas wells does not encroach onto the Mount Gilead property. Therefore, the Department is satisfied that the required separation distance does not

present a land use conflict such that future development on the Mount Gilead property will be affected.

6.14.4 Conclusion

The Department has recommended specific conditions to minimise adverse effects on the amenity of residents of the Mount Gilead Homestead. These specific conditions require the Applicant to:

- Record all flare events, the types, cause, occurrence (date and time) and duration, so that the actual operational performance of the Flare can be compared to the supplementary information provided by the Applicant;
- Vegetation and Landscape Management Plan - Colours and appearance of the Gas Treatment Plant and associated facilities are to be designed in accordance with the recommendations of the Department's Independent Review of the Visual Impact Assessment;
- Vegetation and Landscape Management Plan – the trees in the Menangle Creek riparian zone will be retained and protected and the health of the trees will be monitored and recommendations made if required to improve the health of the trees;
- Commission an Independent Landscape Expert who is to be approved by the Director-General to assess the performance of the visual mitigation measures and provide specific comments on the effectiveness of visual and lighting mitigation measures to prevent and/or minimise visual and lighting impacts of the proposal on the Mount Gilead Homestead; and
- Implement all of the recommendations of the Basset Engineering report with respect to reducing night-lighting effects of the proposal on the surrounding area, particularly the Mount Gilead residence.

The Department will also seek comment on the Vegetation and Landscape Management Plan from the owners of the Mount Gilead Homestead and will consider any issues raised prior to determining whether to grant approval of the Plan. This will provide the owners of the Mount Gilead Homestead with the opportunity to make comments on the detailed landscape and visual mitigation measures proposed by the Applicant.

6.15 Commission of Inquiry

The Department received two private submissions requesting a Commission of Inquiry. The Minister for Infrastructure, Planning and Natural Resources may direct a Commission of Inquiry be held for part or all environmental aspects of the proposed development, under s.119 of the EP&A Act. The Department does not consider that a Commission of Inquiry will add appreciable value to the assessment process in this instance.

The Department has undertaken a thorough and independent environmental impact assessment of the proposal which included the consideration of all submissions. The key issues have been discussed above and are adequately assessed in the EIS. The Department is satisfied that the operation of the proposal, subject to appropriate management measures is unlikely to cause significant environmental impacts.

The Department has recommended conditions of consent that include impact assessment criteria to assess noise and air emissions, monitoring of noise, odour and air emissions, preparation and implementation of Environmental Management Plans, reporting on risk assessment, environmental performance and the conduct Independent Environmental Audits on the construction of the project at EMAI, the Landscape Performance of the development and the ongoing environmental

operation of the development. The EPA and the Department (Natural Resources) have issued General Terms of Approval for the proposal and include air quality, noise, odour, waste, water and sediment monitoring and reporting.

The Department considers that there are no outstanding issues relating to environmental impacts, which warrant the establishment of an Inquiry or require further investigation.

7. 79C EVALUATION

7.1 Matters for Consideration - General

In determining a development application, a consent authority is to take into consideration such of the following matters as are of relevance to the development the subject of the development application:

(a) the provisions of:

- (i) any environmental planning instrument, and**
- (ii) any draft environmental planning instrument that is or has been placed on public exhibition and details of which have been notified to the consent authority, and**
- (iii) any development control plan, and**
- (iv) the regulations (to the extent that they prescribe matters for the purposes of this paragraph), that apply to the land to which the development application relates,**

The Department's consideration of these matters is contained in **Section 4** of this Report. The Department is satisfied that all relevant planning issues have been addressed and considered in the determination of the development application. The Department concludes that the proposal is consistent with the aims, objectives and provisions of all the applicable planning instruments, plans and policies.

(b) the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality;

The likely environmental impacts of the proposal are considered and assessed in **Section 6** of this Report. The Department has considered all the environmental, social and economic impacts of the proposal and concludes that the proposed development can be managed, subject to the imposition of the recommended conditions of consent. The recommended conditions of consent address performance criteria, environmental management plans, environmental monitoring and environmental auditing that would apply to the development, if approved. The Department obtained advice from the NSW Rural Fire Service regarding bushfire protection and has recommended specific conditions to manage bushfire risk.

(c) the suitability of the site for the development;

The suitability of the site for the development is considered in **Sections 3, 4 and 6** of this Report. The proposal is consistent with land use objectives and the potential impacts of the proposal can be effectively managed. The location of the proposed gas wells and treatment plant has been constrained by the location of a high production methane gas resource (below ground), the location of an existing gas pipeline to transport the gas to the Sydney market and competing existing and future land uses in the area. The Department has recommended specific conditions for the management of monitoring of potential impacts on the nearest residence (Mount Gilead Homestead). On the basis of this assessment, the site is suitable for the proposal.

(d) any submissions made in accordance with this Act or the regulations;

A detailed discussion of the issues raised in submissions is contained in **Section 5** and **Section 6** of this Report. Submissions were received from government agencies, State owned Corporations, Elected Representatives, Local Councils and members of the public. The issues raised in the submissions have been addressed in this assessment of the proposal and/or appropriate conditions of consent have been incorporated to manage these concerns and potential impacts.

(e) the public interest.

The public interest of the proposal is considered in Section 1 through to Section 6 of this Report. It is considered that the proposal is consistent with State and regional planning objectives relating to environmental management, sustainable economic development and employment generation. The Department therefore considers that the proposal is in the public interest and all environmental, economic and social issues have been addressed in the assessment of the proposal

8. RECOMMENDED CONDITIONS OF CONSENT

The recommended conditions of consent at Attachment “A” have been prepared taking into consideration the General Terms of Approval provided by the EPA, the Department (Natural Resources) and the Mine Subsidence Board and matters raised by Government agencies, Elected Representatives, the three local Councils (Camden Council, Campbelltown City Council and Wollondilly Shire Council) and all other persons and organisations who made submissions on the development proposal, including land owners, community groups and businesses.

The recommended conditions of consent include administrative conditions on the scope of the approval, set production limits and the life of the approval. The conditions of consent also provide for the appropriate management of environmental impacts associated with the development, such as visual amenity, flora and fauna, noise and air issues, soil and water management and a range of requirements for environmental management, monitoring, reporting and independent audits and review.

The Department has undertaken extensive consultation with the Applicant concerning the content and intent of the conditions of consent.

9. CONCLUSION

The Department is of the opinion that that the proposal is consistent with State planning objectives for sustainable development, environmental management and resource utilisation. The proposal would provide an additional energy resource (with reduced greenhouse gas emissions) to the people of NSW. It is considered that the potential environmental impacts of the proposal can be suitably managed such that they do not preclude development consent. The proposal would also provide socio-economic benefits in the regional area including the employment of additional personnel and contractors and expenditure on equipment maintenance and other operating costs in the area.

The Department has considered the submissions on the proposal and considers that the potential environmental issues can be effectively managed through the recommended conditions of consent.

It is concluded that the proposal should be approved, subject to the recommended conditions of consent which will control and mitigate potential environmental impacts.

The development of the proposal would also be subject to the granting of a Petroleum Production Lease with conditions, if development consent is granted.

10. RECOMMENDATION

It is RECOMMENDED that the Minister:

- 1) Consider the findings and recommendations of this report;
- 2) Approve the DA (DA 282-6-2003-i) for the proposed development as submitted by Sydney Gas Operations, subject to conditions under Section 80 of the EPA Act; and
- 3) Sign the attached Instrument of Consent.

Endorsed

Chris Wilson
Director
Major Development Assessment

Sam Haddad
Deputy Director General

Appendix A

Independent Review of Visual Impact Assessment

Appendix B

Photomontages of the Proposed Facilities at Rosalind Park (supplied by the Applicant)