NSW GOVERNMENT
Department of Planning

MAJOR PROJECT ASSESSMENT: Apex Gas Exploration Project (07_0103)

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

September 2009

Cover Photo: Drilling Darkes Forest No. 1 Well.

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EXECUTIVE SUMMARY

Apex Energy NL (Apex) is involved in coal seam gas exploration and development in various parts of the Sydney Basin. Apex is proposing to undertake an exploration program including the drilling of approximately 15 exploration boreholes at various locations above the Illawarra Escarpment, north and west of Wollongong.

The project involves the drilling of boreholes to variable depths up to 50 m below the base of the Illawarra Coal Measures. The project would determine the gas potential (quality, flow rates and volumes) in all coal seams of the Illawarra Coal Measures as well as the commercial potential of goaf gas, which has collected in the goaf areas left after longwall mining. Definition of the gas potential would enable planning of future developments capable of utilising the gas resource.

The proposal is classified as a major project under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and consequently the Minister for Planning is the approval authority for the application.

The project has a capital investment value of $7.445 million, and would create 8 operational jobs over a period of approximately 3 years.

The Department exhibited the Environmental Assessment (EA) for the project between 6 April and 11 May 2009 and received 12 submissions, including 7 from government authorities, 2 from special interest groups and 3 from the general public. Only one submission objected to the project. Other submissions did not object, but most raised concerns about the potential impacts to water, flora and fauna, noise, Aboriginal heritage and the potential for bushfire. One submission in support of the project cited the use of coal seam methane gas as a sustainable energy source for NSW to meet future energy demand.

The Department has assessed the project application, EA, submissions on the project and Apex's response to submissions in accordance with the relevant requirements of the EP&A Act, including the objects of the Act and the principles of ecologically sustainable development.

Based on this assessment, the Department is satisfied that the project can be managed in a manner that would not result in any significant impacts on the environment or surrounding land owners.

In this regard, the Department has recommended conditions restricting the hours of drilling operations at two boreholes sites (AI05 and AI06) in proximity to private residences, to ensure the residents receive adequate respite from drilling activities during the early morning, evening and night time periods, and on weekends.

The Department has also recommended a broad range of other conditions to ensure that the project operates within accepted and best practice environmental standards.

The Department believes that the outcomes of the project could potentially lead to future development that would utilise the gas resource to help meet NSW's energy needs.

On balance, the Department believes the benefits of the project outweigh its residual costs, that it is in the public interest, and should therefore be approved subject to conditions.

1. BACKGROUND

Apex Energy NL (Apex) is involved in coal seam gas exploration and development in the Illawarra region south of Sydney and the Burragorang region southwest of Sydney. The Apex Gas Exploration Project (the project) is a major coal seam methane exploration project proposed for the Illawarra Region within Petroleum Exploration Licences (PEL) 442 and 444, in respect of which Apex is the licence holder and operator (see Figure 1).

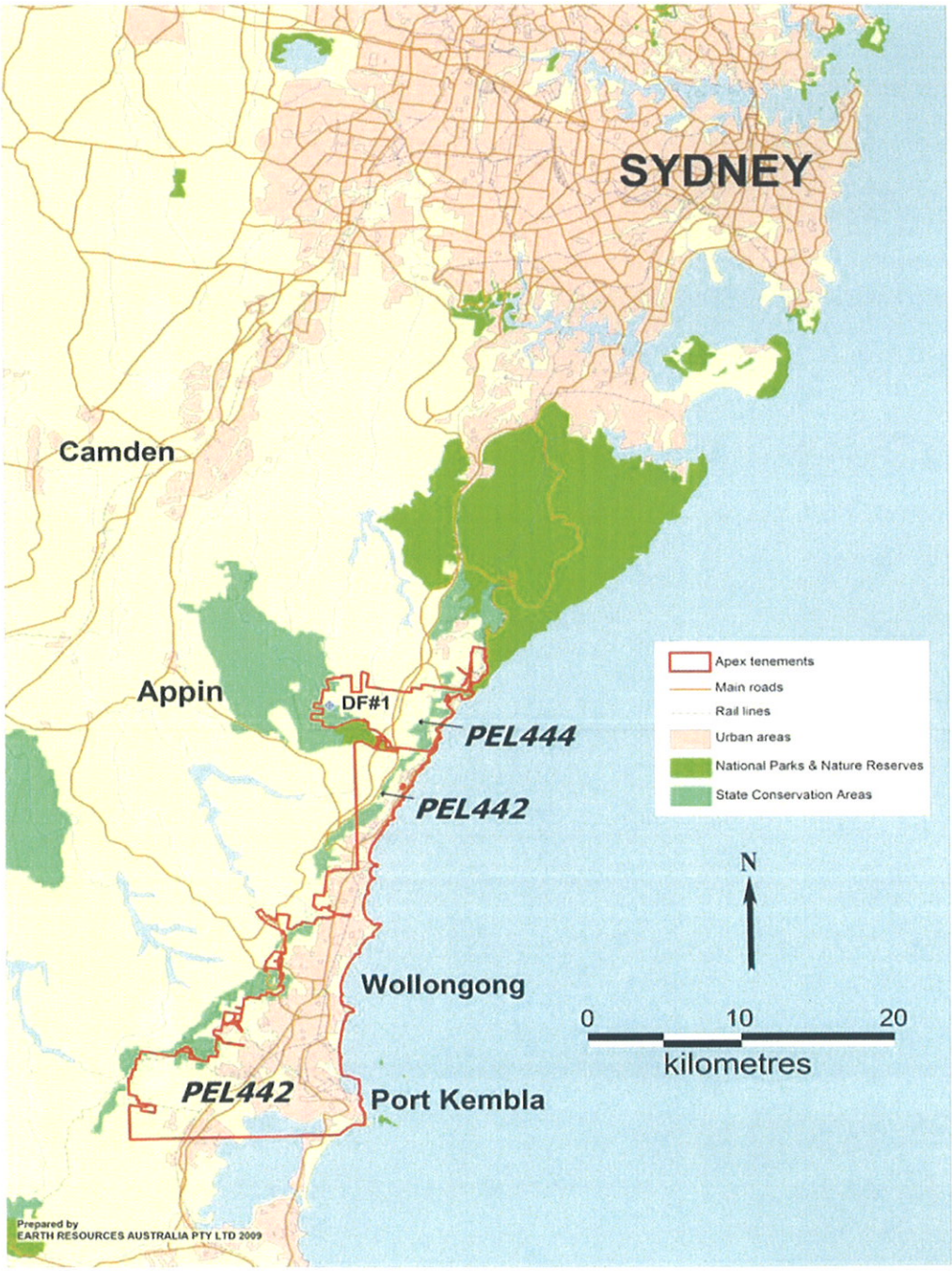

Figure 1: *Location of the Apex Energy Exploration Drilling Project*

The project involves exploration drilling and monitoring of coal seam methane gas potential in the Illawarra Coal Measures in the Southern Coalfield. The project drill sites are located to the north of Wollongong, above the Illawarra Escarpment in the Wollongong local government area (LGA) (see Figure 2).

On 27 July 2007, Apex lodged an application for this project (MP 07_0103) seeking approval under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

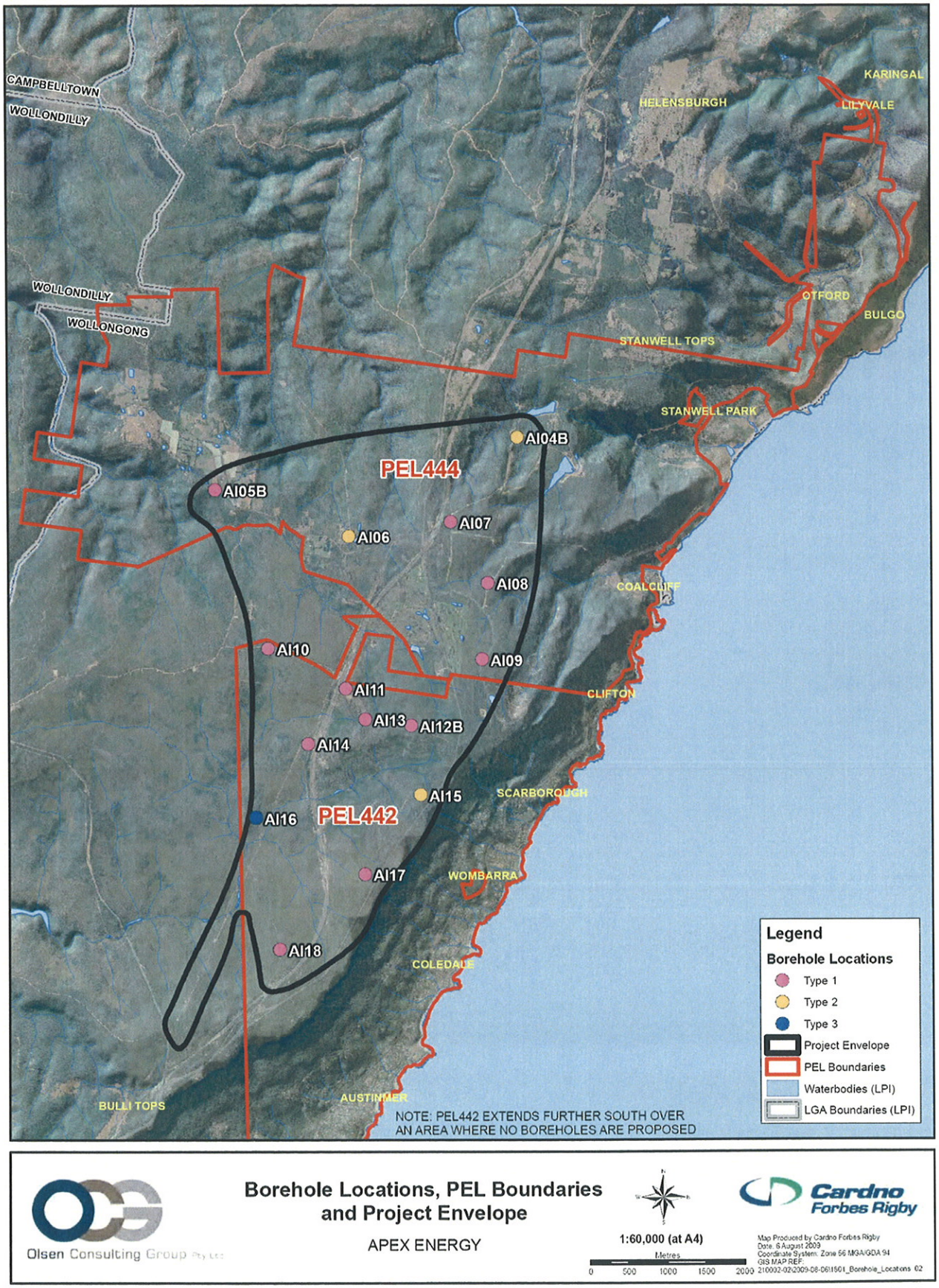

Figure 2: *Project Envelope, Borehole Locations and Type*

2. PROPOSED PROJECT

2.1 Project Description

The key components of the project are summarised in Table 1 and described in detail in the Environmental Assessment (EA) for the project (see Appendix E).

Table 1: *Components of the Apex Gas Exploration Project*

Aspect	*Description*		
Project Summary	**The construction and operation of 15 boreholes at various surface locations within PEL 442 and PEL 444. Each borehole would be drilled to variable depths, up to 50 metres (m) below the base of the Illawarra Coal Measures, to monitor gas potential (quality, flow rates and volumes). The results of the project would potentially enable the gas resource to be extracted, provided it is deemed viable to do so[1].**		
Site Locations	Various locations within a project envelope located above the Illawarra Escarpment, within PEL 442 and 444 and in the Wollongong LGA (see Figure 2).		
Hours of work	Activity	Hours	Time Period
	Construction - clearing, site establishment and drill assembly/setup	Monday to Friday 7am – 6pm, Saturday 8am – 1pm and no time on Sundays or Public Holidays	Up to 4 weeks per borehole
	Operation - drilling of boreholes	24 hours 7 days per week	Up to 6 weeks per borehole
	- monitoring and flaring	24 hours 7 days per week	Up to 1 week per borehole
Project Life	Approximately 3 years based on an 11 week period for each site.		
Site Construction and Operation	• Site establishment, including land clearing (if required), installation of drilling equipment and facilities, and the establishment of a drilling sump to collect water extracted from the borehole during drilling and monitoring; • Drilling of boreholes to variable depths, up to 50 m below the base of the Illawarra Coal Measures; • Casing of boreholes with cemented steel; and • During the gas monitoring period, the existing sump would be reused to collect water extracted from the gas during monitoring, and a gas flaring chamber would be located at least 30 m from the wellhead, outside the fenced area (see Figure 3), to convert the gas to carbon dioxide and water before release to the atmosphere. The monitoring period may be undertaken immediately after drilling or may be delayed depending on the availability of monitoring equipment.		
Associated facilities	Access roads, parking areas, equipment store, water tank and amenities.		
Borehole Site Disturbance	The final location of boreholes would be within an 80 m by 80 m area surrounding the borehole location co-ordinates listed in Table 2. Each borehole site comprises a 50 m by 60 m compound, with a maximum envelope of 80 m by 80 m to allow for light vehicle parking areas and construction of access tracks, which would result in a 'worst case' disturbance footprint of approximately 0.6 hectares (ha). The impact of each borehole has been assessed based on an 80 m by 80 m envelope. Based on the locations chosen for the 15 boreholes, clearing and/or modifying of approximately 9 ha of vegetation would be required, including: • 4.8 ha of disturbed vegetation; • 2.4 ha of Coastal Sandstone Ridgetop Woodland; • 1.2 ha of Coastal Upland Swamp; and • 0.6 ha of Coastal Sandstone Gully Forest.		
Employment	Operational workforce of approximately 8 employees, who would rotate from site to site.		
Residential receivers	Residences are situated in close proximity to boreholes AI05 and AI06. The closest residences are located approximately 140 m and 310 m from these sites, respectively.		
Capital Value	$7,445,000		
Rehabilitation	Those boreholes without potential for future production would be rehabilitated in accordance with Department of Industry and Investment requirements, by capping the borehole, respreading topsoil and revegetating the site with native flora. Those boreholes that may potentially be used for future production would be maintained in an operative state. Each of these sites would be inspected monthly to determine and undertake maintenance requirements, security checks and bushfire control measures. Apex has also committed to repairing any SCA roads and tracks that are damaged as a result of the project.		

[1] Extraction of the gas does not form part of this project application.

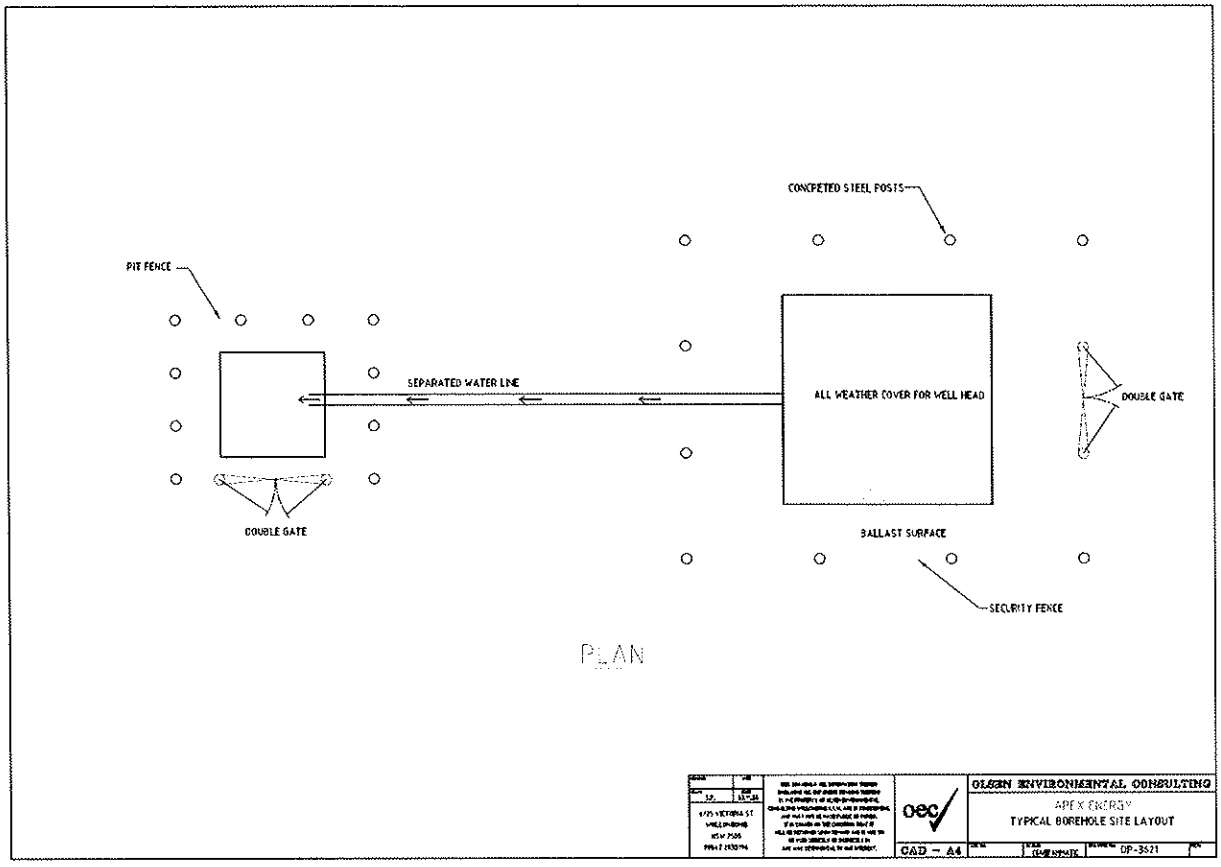

Figure 3: *Typical borehole layout at the completion of drilling*

2.2 Borehole locations, types and descriptions

The proposed boreholes would be one of three types (Type 1 – Open Hole, Type 2 – Open Hole/Core/Zero Radius Drilling, and Type 3 – Core, as shown in Figure 4), each of which would require different equipment and duration on site. The exact locations of each borehole would be determined by inspections immediately prior to drilling, to identify any environmental constraints not previously identified. The flexibility of borehole location is such that, in most cases, relocation to avoid unacceptable impact can occur without jeopardising the success of the exploration program. Should site conditions require relocation of the borehole, this would be confined to an area 80 m by 80 m around the borehole locations listed in Table 2 below.

Table 2: *Borehole locations, type and depth*

Priority	Borehole Identifier	Borehole Type	Top Coal Depth (m)	Total Depth (m)	Easting co-ordinate	Northing co-ordinate
1	AI05	1	457	687	311840	6210520
2	AI09	1	395	625	307905	6209840
3	AI14	1	373	608	309639	6209234
4	AI18	1	335	565	310966	6209419
5	AI17	1	325	555	311449	6208627
6	AI16	3	335	565	311366	6207639
7	AI04B	2	371	601	308585	6207780
8	AI06	2	460	690	309586	6207257
9	AI15	2	345	575	310438	6206778
10	AI07	1	432	662	309839	6206858
11	AI08	1	405	635	309099	6206539
12	AI12B	1	395	625	310559	6205879
13	AI13	1	385	615	308416	6205579
14	AI10	1	450	680	309829	6204849
15	AI11	1	400	630	308723	6203877

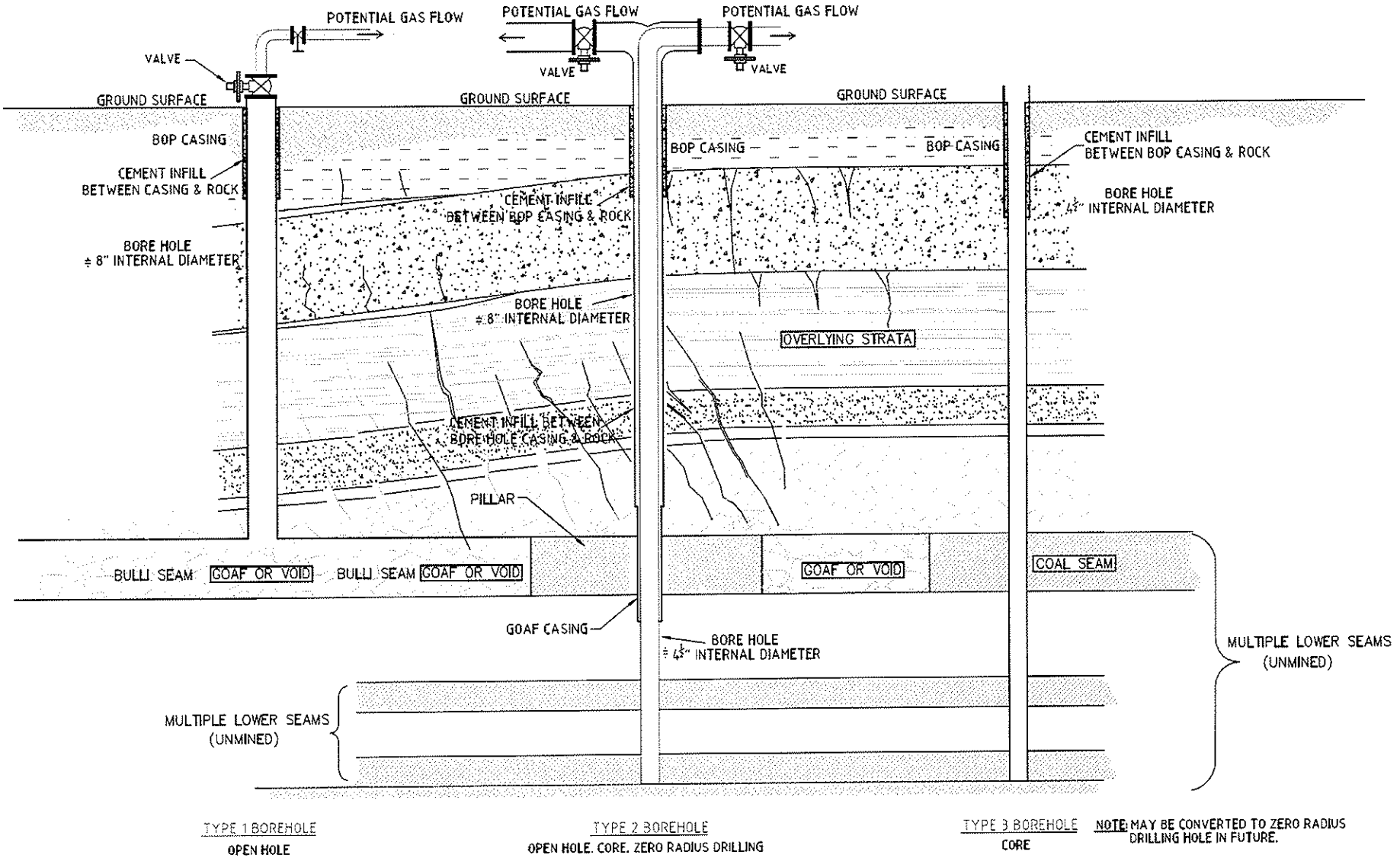

Figure 4: *Schematic diagram showing 3 types of boreholes*

2.3 Project Setting

The project envelope extends south from Helensburgh throughout Darkes Forest and then further south to the west of Coledale (see Figure 2). The land within the project envelope is owned by Sydney Catchment Authority, the Department of Environment, Climate Change and Water (Dharawal State Conservation Area) and a number of private landholders. Generally, the land within the project envelope supports intact native vegetation, in good condition, with high native species diversity. Some areas within the project envelope have previously been disturbed by human activity, including coal mining and quarrying activities. These areas generally contain exotic species and reduced species diversity. The topography within the project envelope contains areas of rugged sandstone escarpment and ridges, with moderate to steep slopes and narrow, deeply incised valleys. Within the project envelope there are a number of water bodies, including, Waratah Rivulet, O'Hares Creek, Iluka Creek, Maddens Creek and Lodden Creek, as well as, a number of smaller tributaries and drainage lines.

2.4 Project Need

Apex has identified a potential gas resource in unmined seams of the Illawarra Coal Measures, as well as goaf gas in areas of abandoned Bulli Seam mine workings. Goaf gas is the accumulation of coal seam methane in the area of collapsed rock strata (ie. goaf) left following the extraction of coal by longwall mining methods. Current technology enables access to deep coal seam gas and goaf gas, which makes the use of coal seam and coal-mine waste gas for electricity generation economically and environmentally beneficial. The use of this gas would have positive greenhouse benefits through a reduction in the use of coal for electricity generation and the conversion of coal-mine methane gas to carbon dioxide, which has a lower global warming potential than methane. At present, the majority of NSW's energy needs are derived from the combustion of coal, which produces high levels of greenhouse gases. It is anticipated that the project will result in good quality, high volume gas reserves, that could help reduce the State's dependence on more greenhouse gas intensive fuels.

Apex predicts that the proposed exploration program will identify sufficient gas reserves to supply a 15 MW ($65 million), greenhouse friendly, peak/intermediate combined cycle gas turbine (CCGT) power station. Such a power station would help meet NSW's growing need for peak/intermediate electricity.

3. STATUTORY CONTEXT

3.1 Major Project

The proposal is classified a major project under Part 3A of the EP&A Act because it constitutes development for the purpose of drilling of petroleum wells in the Wollongong LGA, where the principal resource sought is coal seam methane, and therefore meets the criteria in Clause 6(i)(c) of Schedule 1 of *State Environmental Planning Policy (Major Development) 2005*. As such, the Minister for Planning is the approval authority.

However, on 4 March 2009, the Minister delegated to the Director-General her powers and functions as an approval authority under Section 75J of the EP&A Act, to approve project applications with less than 25 public submissions and with a capital investment value under $50 million. The proposal meets these criteria and consequently the Director-General may determine the application under delegated authority.

3.2 Permissibility

Land associated with the project is situated on land zoned 7(a) Special Environmental Protection Zone, 7(b) Environmental Protection Conservation Zone and 7(d) Environmental Protection Hacking River Zone. Clause 6(d) of the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* provides that development for the purpose of petroleum exploration is permissible without consent throughout the state. The project is appropriately characterised as development for the purpose of petroleum exploration. Consequently, the Minister may approve the carrying out of the project.

3.3 Exhibition

Under Section 75H(3) of the EP&A Act, the Director-General is required to make the EA for a project publicly available for at least 30 days. After accepting the EA for the project, the Department:

- made it publicly available between 6 April and 11 May 2009:
  - on the Department's website;
  - at the Department's Information Centre;
  - at Wollongong City Council; and
  - at the Nature Conservation Council;
- notified relevant State government authorities, and Wollongong City Council by letter; and
- advertised the exhibition of the EA in the Illawarra Mercury on 6 April 2009.

This satisfies the requirements of Section 75H(3) of the EP&A Act.

During the assessment process the Department also made a number of documents available for download on the Department's website. These documents included the:

- project application;
- Director-General's environmental assessment requirements;
- EA; and
- Apex's responses to issues raised in submissions.

3.4 Environmental Planning Instruments

Under Sections 75I(2)(d) and 75I(2)(e) of the EP&A Act, the Director-General's report for a project is required to include a copy of, or reference to, the provisions of any:

- State Environmental Planning Policy (SEPP) that substantially governs the carrying out of the project; and
- environmental planning instrument (EPI) that would (except for the application of Part 3A) substantially govern the carrying out of the project and that has been taken into consideration during the assessment of the project.

The Department has considered the proposal against the provisions of relevant SEPPs and other EPIs, and is satisfied that none of these instruments substantially govern (or would govern) the carrying out of the project (see Appendix D).

3.5 Objects of the EP&A Act 1979

The Minister's consideration and determination of the application must be consistent with the relevant provisions of the EP&A Act, including the objects set out in the Act. The objects of most relevance to the Minister's decision on whether or not to approve the Act's application are found in Sections 5(a)(i), (ii), (iv) & (vii). They are:

"The objects of this Act are:

(a) to encourage:

(i) the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment,

(ii) the promotion and co-ordination of the orderly and economic use and development of land,

(vi) the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats, and

(vii) ecologically sustainable development"

The Department has fully considered the objects of the EP&A Act, including the encouragement of ESD, in its assessment of the application. The assessment integrates all significant economic and environmental considerations and seeks to avoid any potential serious or irreversible damage to the environment, based on an assessment of risk-weighted consequences. Apex has also considered a number of alternatives to the proposed development, including surface exploration using geophysical methods to probe or detect properties of the sub-surface, using techniques such as reflection seismology or ground penetrating radar.

The Department is satisfied that the project is able to be undertaken in a manner that is consistent with the objects of the EP&A Act.

3.6 Statement of Compliance

Under Section 75I of the EP&A Act, the Director-General's report is required to include a statement relating to compliance with the environmental assessment requirements issued for the Project. The Department is satisfied that the Director-General's environmental assessment requirements have been complied with.

4. ISSUES RAISED IN SUBMISSIONS

The Department received a total of 12 submissions following public exhibition of the EA:

- 7 from government authorities;
- 2 from special interest groups; and
- 3 from the general public.

A summary of the issues raised in submissions is provided below. A full copy is attached in Appendix C.

4.1 Public Authorities

None of the submissions received by public authorities objected to the application but the following comments were provided as follows.

The **Department of Environment, Climate Change and Water** (DECCW) had concerns regarding noise impacts, water protection, native vegetation removal, impacts to threatened species and Aboriginal heritage. DECCW had particular concerns regarding the proposed locations of Borehole AI05, which is in the process of rehabilitation, including the provision of suitable habitat for frog species, and Borehole AI10, which is located within an upland swamp.

The **Department of Industry and Investment** (DII) supported the proposed project as an appropriate investigation of the State's petroleum resources. However, DII recommended conditions relating to environmental and geological issues, and said that the proposal for 24/7 drilling operations is not adequately justified.

The **Office of Water** within DECCW (OOW) requested an investigation into the groundwater environments of the proposed boreholes in accordance with the guidelines *Groundwater Monitoring Guidelines for Mine Sites (DWE, 2003)* and that the results of the investigations be reported to OOW for assessment. OOW also requested groundwater quality protection criteria be established and all groundwaters intercepted by the project must be licensed, in accordance with any statutory water sharing arrangements in force.

The **Roads and Traffic Authority** (RTA) recommended conditions of approval relating to "Specific Traffic Arrangements" as identified within the Traffic Impact Summary for the project, and the requirement for Apex to obtain a Section 138 concurrence and a Road Occupancy Licence from the RTA prior to the commencement of works within the road reserve.

The **Sydney Catchment Authority** (SCA) stated that four of the proposed borehole sites (AI10, AI14, AI16 and AI18) are located within Sydney's water supply catchment areas on land owned and managed by SCA. Consequently, SCA's approval is required to enter the Special Area. In its submission SCA recommended specific environmental management conditions relating to:

- soil and water management;
- vegetation clearing and rehabilitation;
- access and work in the special areas; and
- gas flaring, hot works and bushfire management.

Wollongong City Council (WCC) had concerns in relation to potential soil and water impacts, rehabilitation and the appropriate use of topsoil and waste, as well as potential impacts on Aboriginal heritage. In addition, it suggested traffic management conditions.

The **Department of Lands** had no objection to the proposal.

4.2 Community and Interest Groups

There were 3 submissions from the general public and 2 from special interest groups (Healthy Cities Illawarra and the Northern Illawarra Residents Action Group). Of these 5 submissions, 1 objected to the project, 1 supported the project and 3 did not object but raised concerns. The key issues identified by both the general public and special interest groups were water, biodiversity, noise, bushfire and rehabilitation.

The submission in support of the project cited the use of coal seam methane gas as a sustainable energy source for NSW to meet future energy demand.

5. ASSESSMENT

5.1 Noise

The EA includes a noise impact assessment undertaken by specialist acoustic consultants Heggies Pty Ltd in accordance with requirement of DECC's *Industrial Noise Policy* (INP).

Of the 15 borehole sites, two (AI05 and AI06) are in close proximity to several private residences. There are three privately-owned residences, as well as the Darkes Forest Community Hall and the Darkes Forest Rural Fire Service located within 250 m of borehole AI05, with the closest private residence located 140 m away (see Figure 5). There is one privately-owned residence located approximately 310 m from borehole site AI06 (see Figure 6).

Figure 5: *Original and new locations for Borehole AI05*

Figure 6: *Location of Borehole AI06 and surrounding residents*

Construction Noise

Construction activities are expected to occur over a 4 week period and would include vegetation clearing, site establishment and drill assembly/setup. The construction noise assessment did not consider drilling noise, which was considered as part of the operational noise assessment (see additional consideration below). The assessment predicted that the construction noise criteria would be met at all surrounding residences within proximity to both borehole sites AI05 and AI06 (see Table 3), when drilling noise is excluded.

The Department is satisfied that the construction activities (excluding drilling) would not result in any significant noise impact on surrounding residents.

Table 3: *Construction noise criteria and worst predicted construction noise levels (daytime only)*

Site	*Nearest Receiver*	*Construction noise criteria LA10 (dBA)*	*Construction noise levels LA10 (dBA) (excluding drilling)*	*Assessment*
AI05	304 Darkes Forest Road	55	55	Complies
AI05	311 Darkes Forest Road	55	55	Complies
AI05	313 Darkes Forest Road	55	55	Complies
AI06	128 Darkes Forest Road	58	49	Complies

Operational Noise

A summary of the predicted worst case operational noise levels at sensitive receivers is presented in Table 4. The main operational activities are expected to occur over a 7 week period and would include a 6 week drilling phase and 1 week gas monitoring and flaring phase. Following this phase, operations would include monthly site inspections to determine and undertake maintenance requirements and security and bushfire control measures, until the future use of each borehole is determined. Noise levels during the gas monitoring and flaring phase and maintenance phase are predicted to be low and short term in nature, and as a result would be unlikely to affect surrounding residences. Therefore, noise impacts associated with these activities have not been assessed in detail in this assessment.

The operational noise assessment predicted that drilling operations would result in all operational noise criteria being exceeded at the nearest residential receivers to AI05 and AI06, except at AI06 during the day, where the noise prediction is predicted to be equal with the noise criteria (see Table 4).

The other 13 boreholes are situated in remote locations away from sensitive receivers, and therefore would be unlikely to cause adverse noise impacts.

Table 4: *Operational noise criteria and worst predicted operation noise levels*

Site	*Nearest receiver*	*Criteria*			*Noise Prediction*			*Assessment*
		Day LAeq (dBA)	*Evening LAeq (dBA)*	*Night LAeq (dBA)*	*Day LAeq (dBA)*	*Evening LAeq (dBA)*	*Night LAeq (dBA)*	
AI05	304 Darkes Forest Road	40	40	36	47	47	47	Up to 11dB above criteria
AI05	311 Darkes Forest Road	40	40	36	45	45	45	Up to 9dB above criteria
AI05	313 Darkes Forest Road	40	40	36	42	42	42	Up to 8dB above criteria
AI06	128 Darkes Forest Road	43	39	35	43	43	43	Up to 8dB above criteria

Although the assessment indicated that drilling activities would exceed the operational noise criteria, the Department considers that it would have been more reasonable to assess noise associated with drilling against construction noise criteria, as drilling is more a construction-related activity and would only last a maximum of 6 weeks per borehole.

Notwithstanding, the assessment predicted that drilling would significantly impact four private residences in proximity to boreholes AI05 and AI06, particularly at night with exceedances up to 11 dBA above the criteria predicted (see Table 4).

Although relatively short term, the Department considers that, even with the noise mitigation measures proposed by Apex, these exceedances would have the potential to significantly affect the quality of life for residents in proximity to these boreholes, particularly during the night. In this regard, the highest exceedances are predicted during the night in response to the 24 hour drilling proposed, which would contrast significantly with the quiet rural character of the area.

To mitigate this impact, the Department has recommended conditions restricting the hours of drilling operations, at these two boreholes, to drilling during the daytime only Monday to Saturday, unless a written negotiated noise agreement is made between Apex and the relevant landowners. This is to mitigate the noise impacts from these two boreholes and to ensure the residents receive adequate respite from drilling activities during the early morning, evening and night time periods, and on weekends.

In addition, the Department has included conditions to formalise commitments made by Apex, that require Apex to prepare and implement a Noise Management Plan (specifically to Boreholes AI05 and AI06), including noise monitoring of the performance of the project.

With these measures in place, the Department is satisfied that the project can be undertaken in a manner than would not result in any significant noise impacts to surrounding land users.

5.2 Water Resources

Groundwater

Apex commissioned Ecoengineers Pty Ltd (Ecoengineers) to provide an assessment of potential water-related impacts associated with the project.

The project has the potential to impact on groundwater quality as a result of cross-contamination. It also has the potential to affect groundwater quantity, through uncontrolled groundwater release to the surface during operations. Apex states that the potential for cross-contamination and groundwater release is minimised through the use of steel casing, which would prevent the migration of methane gas into the groundwater and the movement of groundwater between strata and to the surface. In addition, all boreholes would be cased-off and cemented in accordance with DII requirements. Furthermore, the absence of significant aquifers beneath the Eastern Woronora Plateau further minimises the potential impact.

Overall, the assessment found the potential to impact on groundwater quality and quantity is remote, although there is potential for small volumes of groundwater to be brought to the surface. Based on the assessment, it is predicted that the volumes expected can be easily managed through the installation of an earthen spoil bund and drill sump (see Figure 7), which would store water temporarily until tankers remove the water offsite. Furthermore, the blow-out prevention equipment associated with the wellhead (see Figure 8) would provide additional control on upward flows.

If a significant flow of gas is encountered, then boreholes would be maintained in an operative state for the period between gas monitoring and potential future gas production. Boreholes not required for gas production would be sealed (filling the borehole with concrete) and rehabilitated in accordance with DII requirements. Sealing with concrete eliminates the potential for future cross aquifer contamination.

DECCW raised concerns about the potential for groundwater impacts and requested that Apex carry out a dedicated groundwater investigation in accordance with *Groundwater Monitoring Guidelines for Mine Sites*, (Department of Water and Energy, 2003) to verify estimates of yield from different strata.

Apex did not accept that a dedicated program of groundwater investigation should be carried out prior to drilling, as it had undertaken a detailed digital magnetotelluric survey at 30 representative sites across the project envelope, which failed to identify interstitial water, or any significant quantities of water in the goafs or sandstone formations. In addition, Apex noted that there had been a significant number of independent consultant study reports conducted on groundwater environments within the project envelope, which have

concluded that vertical transmissivity in the local strata is extremely low, and as a result any water-bearing strata encountered are extremely unlikely to provide a significant make of groundwater into the borehole, or to the surface.

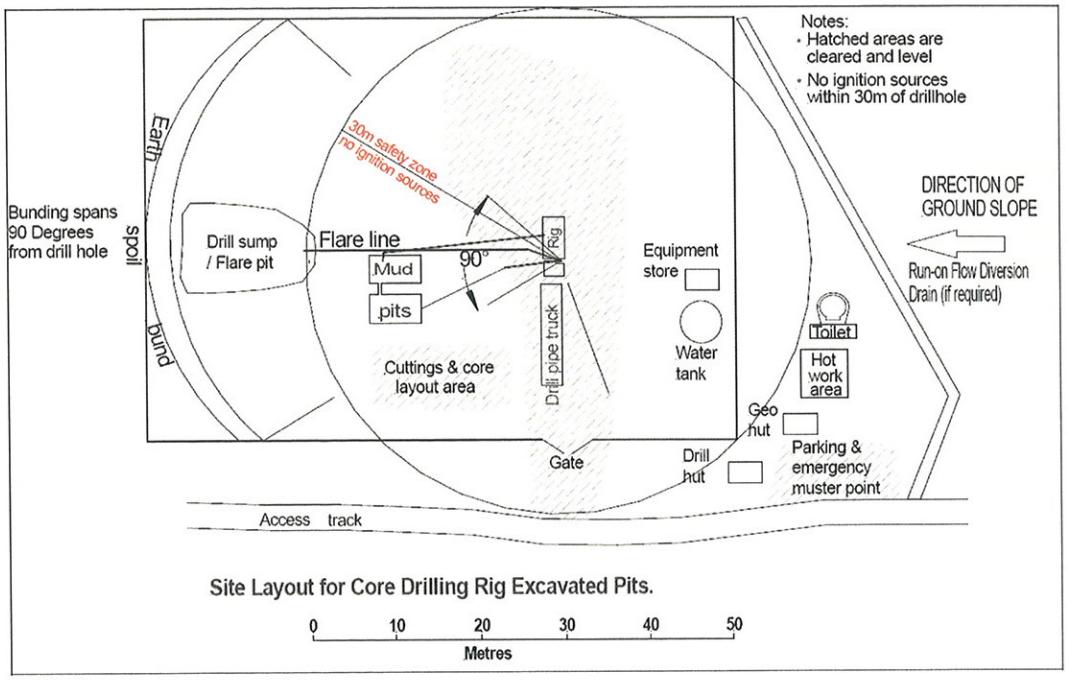

Figure 7: *Typical site surface layout during drilling*

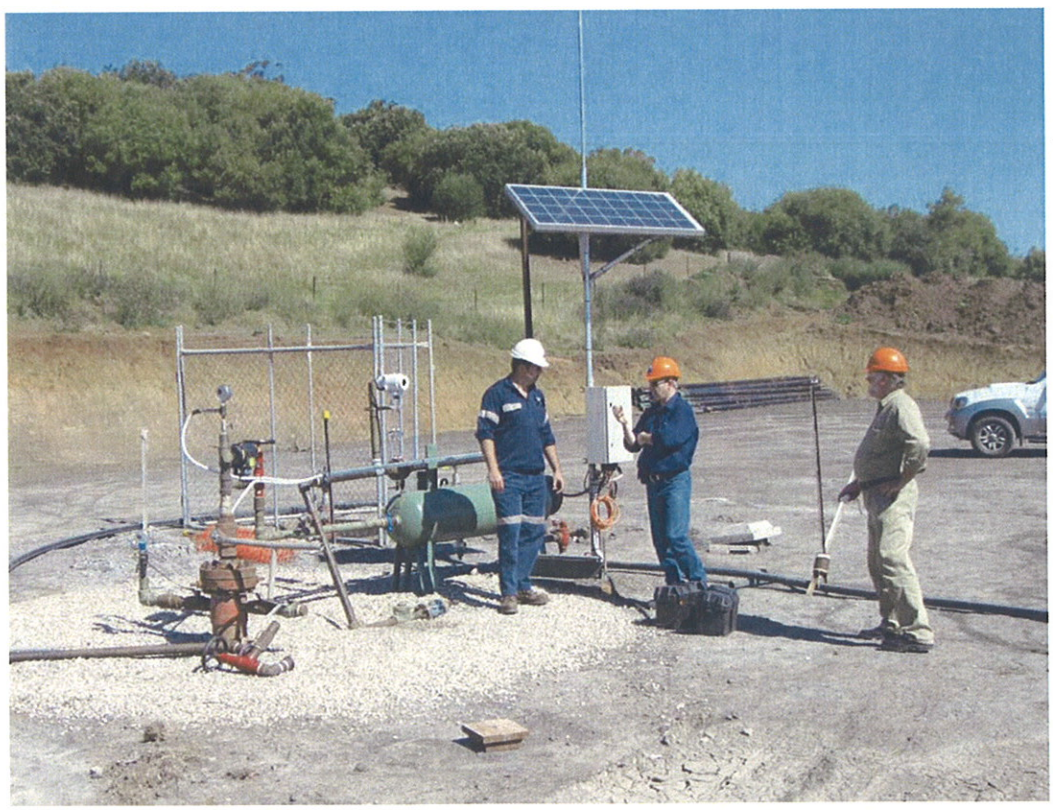

Figure 8: *Gas wellhead in operation*

The Department is satisfied that the project is able to be managed such that it would not cause any significant impacts to groundwater resources. Apex has committed to establishing the boreholes in accordance with DII requirements, which would reduce the ability for groundwater to enter the boreholes and cause cross-contamination or discharges to the surface. To ensure that groundwater is effectively managed, the Department has recommended conditions requiring Apex to prepare and implement a Water

Management Plan for the project, including a groundwater contingency strategy to address any groundwater brought to the surface.

Surface Water

The project has the potential to impact on surface water quality, particularly from activities associated with the construction of roads, drill pads and borehole sites; excavation of surface sumps and stockpiles; spillage of fuel from construction equipment and vehicles; and accidental release of saline drilling fluids and produced groundwaters.

Groundwaters and saline drilling fluids have the potential to impact on surface water quality should they accidentally be released off-site. Produced groundwater has the potential to contain methane and have elevated levels of salinity and heavy metals, which could have deleterious effects on water quality and native vegetation if released into natural water systems.

Apex has committed to constructing bunding and surface sumps within each borehole envelope (see Figure 7), which would capture and temporarily store discharged groundwater and drilling fluids, until tankers remove the liquids and dispose of them at a licensed waste water facility offsite. The sump would have sufficient capacity to accommodate project waste water, as well as run-off following rainfall events, to further minimise the accidental release of contaminated waters.

During site establishment and throughout the life of each borehole site prior to rehabilitation, there is also the potential for erosion and sediment loss to occur. Apex has committed to installing erosion and sediment controls such as silt fences and water diversion structures, in accordance with *Soils and Construction* (Landcom, 2004) to manage erosion and minimise sediment loss offsite.

The Department is satisfied that the potential impacts to surface water are not significant and can be appropriately managed. The Department has recommended conditions requiring Apex to prepare and implement an Erosion and Sediment Control Plan for the project, as part of a Water Management Plan.

5.3 Flora and Fauna

The EA included a flora and fauna assessment undertaken by Biosis Research, which incorporated literature and database reviews, and on-ground survey work over three days during September 2008.

The majority of land within the project envelope supports intact native vegetation in good condition, with a high native species diversity. However, due to coal mining and quarry activities there are disturbed areas scattered throughout the project envelope, which generally support vegetation with reduced species diversity, consisting mostly of groundcover and exotic species. Consequently, over half of the proposed boreholes have been located on sites that have been previously disturbed, in order to minimise the amount of native vegetation clearing required. The assessment identified three native vegetation communities predicted to be affected by the project – Coastal Sandstone Ridgetop Woodland, Coastal Upland Swamp and Coastal Sandstone Gully Forest.

In response to flora and fauna-related concerns expressed by DECCW, Apex changed the locations of Boreholes AI05 and AI10. Due to the potential impact on frog habitat, Borehole AI05 was relocated to Crown land, approximately 350 m northwest of the original site (see Figure 5). The new site is cleared of native vegetation and has no known Aboriginal sites. Borehole AI10 was relocated approximately 40 m south south-west of the original site to avoid disturbance to Coastal Upland Swamp vegetation. The new site does not support this vegetation community and does not occupy any threatened flora or fauna or any Aboriginal sites.

Following the relocation of these two boreholes, the total area of vegetation clearing required for the project is approximately 9 ha, including:

- 4.8 ha of disturbed vegetation;
- 2.4 ha of Coastal Sandstone Ridgetop Woodland;
- 1.2 ha of Coastal Upland Swamp; and
- 0.6 ha of Coastal Sandstone Gully Forest.

The flora and fauna assessment concluded that no threatened flora or fauna species, endangered populations or Endangered Ecological Communities (EECs) listed under the *Threatened Species Conservation Act 1995* (TSC Act) or the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) would be affected by the project. Of the 9 ha of vegetation requiring removal, over 50% (4.8 ha) is disturbed. Some native vegetation clearing would be required, however the project would not impact on the viability of these communities.

To minimise the impacts of the project and/or prevent further degradation to native vegetation, Apex has identified a number of mitigation measures, including:

- minimising native vegetation clearing by keeping the construction footprint to a minimum and locating borehole sites and access tracks within existing cleared/disturbed areas, where possible;
- avoiding clearing of any significant habitat features, including trees with hollows;
- installing erosion and sediment control measures around construction sites and adjacent to roads, to prevent contaminated runoff from entering watercourses during and after construction; and
- rehabilitating the construction footprint with endemic species, and in accordance with best practice.

The Department is satisfied with the outcomes of the assessment and the commitments made by Apex. The Department believes that Apex should be required to implement the mitigation measures outlined in the EA to minimise impacts and has recommended conditions to that effect. The Department has also recommended conditions requiring Apex to prepare and implement a Vegetation Clearing and Rehabilitation Management Plan.

5.4 Greenhouse Gas Emissions

The project would generate direct and indirect greenhouse gas emissions (GHGEs) that would contribute to global warming and climate change. The EA includes a detailed Greenhouse Gas Assessment, undertaken by Heggies Pty Ltd. This assessment was undertaken in accordance with the Commonwealth Government's *National Greenhouse Accounts Factors.*

The assessment calculated direct and indirect GHGEs associated with the project, including Scope 1 emissions (direct GHGEs from sources controlled by Apex), such as venting coal seam gas to the atmosphere, combustion of coal seam gas during flaring operations and diesel combustion during borehole establishment. No Scope 2 GHGEs (ie emissions from the consumption of purchased electricity) would be generated by the project, as diesel power would be used during borehole establishment. Further, no downstream Scope 3 GHGEs would occur as a result of the project, as there is no proposal to gather the gas and to pipe it elsewhere for usage. Any such proposal would be part of a future, separate project application.

During the operational (gas monitoring) phase, the majority of extracted coal seam gas would be flared in purpose-built gas flaring chambers (see Figure 9). This gas comprises 80% methane, which flaring would convert to carbon dioxide, thereby significantly reducing GHGEs. Apex has committed to preparing and implementing a Borehole Testing and Flaring Management Plan in consultation with key agencies and industry experts.

Figure 9: *Gas flaring chamber*

The estimated scope 1 GHGEs generated by the project directly, under different emission scenarios are set out in Table 5. The average GHGEs expected to be released during the one week operational period for each borehole, is likely to be between 3,760 t CO_2-e and 5,375 t CO_2-e, based on 100% and 90% flaring, respectively. This equates to between 0.0002% and 0.003% of total NSW GHGEs and between 0.0007% and 0.0009% of total Australian GHGEs for 2006.

Table 5: *Estimated GHGEs generated by the project directly*

Emission Scenarios	*Greenhouse Gas Emissions (t CO_2-e)*	*Percentage Comparison with 2006 Total Emissions*	
	Scope 1	*NSW*	*Australia*
Expected Minimum (11,000 m^3/day, 100% Flaring)	2,998	0.002%	0.0005%
Expected Average Minimum (14,000 m^3/day, 100% Flaring)	3,760	0.002%	0.0007%
Expected Average (14,000 m^3/day, 90% Flaring)	5,375	0.003%	0.0009%
Expected Average Maximum (14,000 m^3/day, 0% Flaring)	19,903	0.012%	0.0035%
Expected Maximum (28,000 m^3/day, 100% Flaring)	39,603	0.025%	0.0069%

The Department is satisfied that GHGEs from the project would be minimal, but recommends that Apex prepare and implement an Air Quality and Greenhouse Gas Management Plan to reinforce its commitments and to confirm these outcomes.

5.5 Other Issues

Other environmental issues considered during the assessment process are summarised in Table 6 below:

Table 6: *Other environmental issues*

Issue	*Potential Impacts/Consideration*	*Conclusion*
Air Quality	• Potential air quality impacts include dust and particulate emissions (TSP and PM10), principally from site establishment and drilling operations. • The majority of boreholes are in isolated areas, except for boreholes AI05 and AI06. • During construction, water spraying from a water cart would be used to reduce dust generation and the number of vehicles accessing the site would be minimised. • All drilling rigs would be fitted with dust attenuation devices to ensure Occupational Health and Safety requirements for the drill operators are achieved. This would ensure that there would be no adverse impact upon surrounding residences.	• Apex has committed to a range of management measures and controls, including the watering and revegetation of disturbed areas. The Department is confident that air quality impacts associated with the project would not significantly impact any residence. However, the Department has recommended air quality impact assessment criteria to manage potential air quality impacts and recommended conditions requiring Apex to prepare and implement an Air Quality and Greenhouse Gas Management Plan.
Traffic	• Traffic would be generated by the project during site establishment, operation and inspections of the boreholes for safety and maintenance purposes. • A maximum of 2 heavy vehicles and approximately 5 light vehicles would access each site daily during the 4 week site establishment phase and 6 week drilling operation period. • Following site establishment and prior to flow monitoring, one light vehicle would access each site weekly to ensure it is maintained and all safety arrangements are operating, as well as to deliver the trailer-mounted gas-flaring chamber during the week prior to the commencement of flow monitoring. During the one week gas monitoring period at each borehole, each site would be accessed by up to 5 light vehicles per day. • Apex has committed to preparing and implementing a Traffic Management Plan in consultation with the RTA.	• The Department is satisfied with the measures proposed by Apex to manage traffic impacts associated with the project. However, the Department has included conditions on traffic management to reinforce commitments made by Apex.

	This would address traffic arrangements for each of the 7 access gates as identified in the Traffic Impact Summary	
Waste	• Waste would be generated by the project during the site establishment phase and during operation. Waste would include packaging associated with materials and supplies, wastewater from temporary offices and toilet facilities, general office waste and vehicle servicing wastes. • Waste would be recycled appropriately, where possible, and collected and disposed of off-site at a licensed waste facility.	• The Department is satisfied with the measures proposed by Apex to manage waste produced by the project. However, the Department has included conditions on waste minimisation to reinforce the commitments made by Apex regarding waste disposal.
Heritage	• An archaeological assessment was undertaken by Biosis Research Pty Ltd, which was attended by representatives from the Illawarra Local Aboriginal Land Council; and Kullila Welfare and Housing. • No Aboriginal or European heritage artefacts were identified at any of the 15 borehole sites as part of this assessment. • The assessment found the potential for archaeological sites is very low due to the historic land use patterns within the project envelope.	• The Department is satisfied that the project would not impact on Aboriginal or European archaeological heritage sites, and therefore no further measures are required. • In the event that Aboriginal or European artefacts are identified during the project, Apex has committed to stopping all works, notifying an archaeologist and notifying DECCW under Part 6 of the *National Parks and Wildlife Act 1974.*
Vibration	• The main source of vibration would be drilling operations. The risk of damage to structures or human discomfort arising from vibration associated with drilling operations at the nearest residential receivers is predicted to be negligible.	• The Department considers it would be unlikely that any residences would experience vibration impacts, and therefore no further measures are required.
Odour	• Coal seam gas is largely odourless. Given the isolated nature of the boreholes and the short duration of gas monitoring, odour is not predicted to be an issue.	• The Department considers it would be unlikely that any residences would experience odour impacts, and therefore no further measures are required.
Rehabilitation	• Rehabilitation of borehole sites would be undertaken in two ways. 1. Boreholes which would potentially be used for gas production would not be rehabilitated immediately. For the interim period between monitoring and potential/future production, these boreholes would be maintained in the configuration shown in Figure 3. Each site would be inspected monthly to determine and undertake maintenance requirements, security and bushfire control measures until approval for production is granted. 2. Boreholes which would not be used for future gas production would be sealed and rehabilitated in accordance with DII requirements. Rehabilitation works would include: ➢ removal of surface infrastructure; ➢ sealing of the borehole by filling with concrete; ➢ spreading of topsoil stockpiles over the site; and ➢ revegetation of the site with native flora. • Apex has also committed to repairing any damage caused to SCA or DECCW roads and tracks as a result of the exploration activities.	• The Department is satisfied with the rehabilitation measures proposed by Apex. To reinforce these measures, the Department has recommended conditions which require Apex to prepare and Implement a Rehabilitation Management Plan, in consultation with relevant landowners/stakeholders and DII. • This plan is to include well-defined procedures for restoring sites to their pre-disturbance condition as soon as possible following decommissioning.

6. RECOMMENDED CONDITIONS OF APPROVAL

The Department has prepared recommended conditions of approval for the project (see Appendix A).

These conditions are required to:
- prevent and minimise adverse environmental impacts;
- set standards and performance measures for acceptable environmental performance;
- require regular monitoring and reporting; and
- provide for the ongoing environmental management of the project.

Apex has reviewed and accepts these conditions.

7. CONCLUSION

The Department has assessed the EA, submissions on the project and Apex's response to these submissions, in accordance with the objects of the EP&A Act, and is satisfied that the impacts of the project would be relatively short term and minor, and can be mitigated and/or managed to ensure an acceptable level of environmental performance.

The project would result in exceedances of noise criteria at four privately-owned residences on Darkes Forest Road during the drilling of Boreholes AI05 and AI06. Due to the significant exceedances of the criteria, particularly at night, the Department has recommended conditions restricting the hours of drilling operations at these boreholes to ensure the residents receive adequate respite from drilling activities during the early morning, evening and night time periods, and on weekends.

The Department is satisfied that the sites chosen are suitable for the project, given that the boreholes have been chosen to give a representative coverage of the area under exploration, and individual borehole locations have been chosen to minimise vegetation clearing.

The project would provide insight into the potential use of coal seam gas and goaf gas in the Illawarra for the production of electricity, which would result in both economic and environmental benefits. The project would also involve $7.445 million in capital investment and create 8 short-term operational jobs.

The Department is confident that these benefits can be achieved without significant impacts to the environment or residents surrounding the sites. Consequently, the Department believes the benefits of the project outweigh its potential costs, that it is in the public interest and that it should be approved subject to conditions.

8. RECOMMENDATION

It is RECOMMENDED that the Director-General, as delegate of the Minister:
- consider the findings and recommendations of this report;
- approve the project application, subject to conditions; and
- sign the attached instrument of approval (Appendix A).

8/9/09

Director, MDA

9.9.09

Executive Director, MPA

13/9/09

Deputy Director-General, DASP

21/9/2009

Director-General