International Power

# CHAPTER 3

## Alternatives

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## Alternatives to the Proposal - Summary of Key Outcomes

A range of alternatives were considered as presented in this chapter. The natural gas-fired gas turbines operating in open cycle mode as proposed are considered to be the only practical option when compared to alternatives such as hydro, wind, combined cycle gas turbines, reciprocating gas engines and coal fired generation for meeting the peak electricity demand and network support requirements described in **Chapter 2**.

The “do nothing” option was not considered by IPRA to be an option in light of the NSW Government Green Paper, the NEMMCO *SOO 2006 and 2007* load growth forecasts for NSW and the TransGrid *Needs Statement* (March 2006) and *Request For Proposals* (October 2006) as discussed in **Chapter 2**.

In addition to desktop studies and field investigations, extensive consultation has been undertaken with NSW regulatory agencies, in particular with officers from DoP, DECC and DoH in regard to environmental aspects of the proposal. The outcome of this consultation is the proposal presented in this Application.

Provided that the project is commercially viable, is consistent with State and Local Government policy and satisfies relevant Acts and prescribed Regulations (zoning, environmental, heritage etc), IPRA considers that the key “alternatives” parameters are associated with cost effective plant and site selection. These factors comprise:

**(A) Plant selection**, these being:

- proven plant technology and “buildability” using local industries and other resources;
- satisfying environmental and socio-economic community requirements;
- plant sizing to satisfy the range of network support scenarios envisaged;
- plant capability for dual firing of gas with seamless transition to back-up distillate firing;
- available fuel(s) and reliability of fuel supply;
- plant capability to meet power quality, responsiveness, reliability and security parameters;
- procurement lead times to meet project deliverability requirements;
- whole-of-life operational and maintenance requirements;

**(B) Site selection**, these being:

- land availability;
- convenient network access for grid connection;
- environmental and other community impacts;
- proximity to electricity load centre(s);
- access for gas connection and a supply centre for distillate fuel;
- access to water for plant process uses;
- other local resources and infrastructure such as communications, transport access, etc which impact upon construction and ongoing operation.

# Chapter 3 Alternatives to the Proposal

Desktop studies were carried out to review plant characteristics best suited to providing both market and network support services at a commercially viable price. These very quickly centred on the plant type proposed in this application for the reasons set out **Section 3.1** below.

As explained in Chapter 2 (**Section 2.2.6**) it is clear, from a regional perspective, that locating the proposed peaking plant at Parkes optimises the network support outcomes sought by TransGrid while still providing NEM management support opportunities to NEMMCO and NEM participants.

Desktop studies identified two primary sites and two secondary sites in reasonable proximity to the Parkes load centre, the high voltage grid and natural gas from the Central West Pipeline as the preferred fuel option. IPRA conducted field visits to these sites - including a review of local Parkes resources and infrastructure - together with further technical studies and discussions with TransGrid.

The site proposed in this Application was selected for the reasons set out **Section 3.2** below.

The proposed Parkes Peaking Power Plant Project site is located some 10km west of Parkes and is immediately adjacent the existing TransGrid 132/66kV substation on the Condobolin Road. It would have total output of between 120MW and 150MW, comprising three gas turbines fuelled by natural gas supplied via a new 10km long underground pipeline from the existing Central West Pipeline at Parkes. The gas turbine plant would have a “dual fuel” capability to allow a seamless transition to burning distillate as the backup fuel to ensure continuity of generation during natural gas supply interruptions.

NOx air emissions would be controlled through water injection being the most technically and cost efficient control mechanism to meet the required air emission standards for the operating regime envisaged. The modelling undertaken using conservative “Worse Case” emission scenarios demonstrates that other prescribed air emissions (including carbon monoxide, particulates, volatile organic compounds and so on) would fall well within Regulatory limits.

Water take from local resources would be minimised and re-use of treated effluent water from the Parkes sewage treatment system would form part of the detailed design considerations. The facility would be a zero wastewater discharge site.

Access to infrastructure, land availability and the relative distance of sensitive receptors were determining factors in selecting the Parkes site. The Development Site has a rural 1(a) zoning and the Parkes Peaking Power Plant Project would be permissible with consent from the relevant authority within this Land Use Zone.

**Plate 3-1** shows IPRA’s Snuggery facility - near Mount Gambier in the southeast of South Australia - which is located adjacent to the 132/33kV substation owned by the local high voltage transmission operator, ElectraNet.

The proposed Parkes Peaking Plant would look somewhat similar to Snuggery, which also has three gas turbine units and provides system support in the southeast region of South Australia.

**Plate 3-1 Snuggery Peaking Power Plant – South Australia**

*(Source: IPRA, 2006)*

## 3.1 Plant Selection - Generation Technologies

The natural gas-fired gas turbines operating in open cycle mode as proposed are considered to be the only practical option when compared to alternatives such as hydro, wind, combined cycle gas turbines, reciprocating gas engines and coal fired generation for meeting the peak electricity demand and network support criteria.

The essential characteristics of providing peaking power and network support reliably (to an acceptable level of electrical quality and physical security) include being able to provide cost efficient energy or ancillary services when that service is required (often at very short notice), where it is required and to the extent required.

### 3.1.1 Renewables

#### *Hydro-electric power stations*

In favourable geographic circumstances, such as the Snowy Scheme, hydro-electric power stations are able to provide peak load energy to the National Electricity Market. However, as there is no suitable river water resource in the Parkes region, nor is the terrain suited to alternative cost effective “pumped-storage” generation, this is not an option.

#### *Wind and Solar*

Notwithstanding higher unit cost profiles, generation from wind and solar power are simply not suitable for peak load power stations.

Wind fails the reliability and availability requirements because it is intermittent and uncontrollable - equally likely be unavailable as available when required and not necessarily of sufficient strength to generate to the level required. Wind turbines also suffer from the need to impose automatic “output de-rating” as a plant protection measure from the heat in peak summer periods.

Solar, while promising much in the future if more research is carried out on small scale lower cost applications, is not considered a reliable option given that the potential requirement for peaking power and network support can span 24-hours and the output is affected by adverse (inclement, overcast or dust) weather conditions.

Neither solar nor wind generators have significantly advanced storage technologies for later “release” of power when required to meet demand or provide other network support.

### 3.1.2 Gas Turbines/Generators

#### *Open Cycle Gas Turbines*

Gas turbine power plant is referred to as operating in “open cycle” mode when no heat is recovered from the exhaust gas to drive a steam turbine to produce additional electricity output.

Modern open cycle gas turbines and aero-derivatives have a slightly better thermal efficiency than coal-fired power stations but with lower greenhouse gas emissions. The typical establishment time for the design, build and commissioning of open cycle gas turbine units is around 1 year, which is significantly less than for a coal fired power station. Open cycle gas turbine units can be at full capacity within 10 minutes from cold start, compared to a minimum of eight hours for a coal-fired power station.

Given the relatively fast start-up times for these systems, open cycle gas turbine units are ideal for operations to meet short duration peak load demand and generally represent best practice technology for this use.

The capital cost per megawatt generated is less than that for combined cycle gas turbines or coal fired generators however operating costs are higher thereby making open cycle gas turbine units more cost effective only when operated for the short periods envisaged in a peaking role when higher prices generally pertain.

### *Combined Cycle Gas Turbines*

Combined cycle gas turbine power stations consist of one or more open cycle gas turbine units coupled to a steam turbine. Steam is generated using the residual heat from the open cycle gas turbine units, which is then used to drive a steam turbine.

Combined cycle gas turbine units have the advantage of offering higher thermal efficiencies than open cycle gas turbine power stations and coal fired power stations. However, they are more suited to intermediate or base load operations as they require longer start-up and shut down periods than open cycle gas turbine units and have a lower operating cost on a continual duty basis..

The opportunity to utilise combined cycle plant at Parkes is further limited by the need for considerably greater water resources as steam feedstock.

The peaking power and network support services to which the Parkes Peaking Power Plant Project are directed do not warrant the higher cost and greater water demand of combined cycle plant.

### *Compression Ignition Engines*

Smaller size diesel generators and their more modern derivatives, gas generators (often called reciprocating gas engines or “RGE’s”) range in size up to 10MW. They have similar efficiencies to the open cycle gas turbines proposed, have relatively short design and commission period and have comparatively shorter start up and shut down time characteristics.

However, in IPRA’s view, these types of small generators are traditionally used for and more suited to the lower end “distributed energy” market, not for the intended larger scale peaking power and network support role. Also, IPRA considers that:

- depending upon the plant size chosen, it would require between 12 to 15 such units to provide the same level of services proposed in terms of reliability and security;
- the potential for 12 to 15 such units operating in unison to cause or cope with system instability;
- the greater number of units would have comparatively greater whole-of-life operation and maintenance costs; and

Further, IPRA is aware that natural gas supplies ex from the Moomba pipeline can be problematic and for that reason is proposing that its gas turbine plant should be dual fired using distillate as the back up fuel. Reciprocating gas engines, however, are limited to a single fuel burning capability which would impact on that type of plant when natural gas supplies are restricted or disrupted.

### 3.1.3 Coal-Fired Power Stations

Building a coal-fired power peaking power station at Parkes is not an option. If not already in operation, they typically require 8 hours to start up and therefore unable to respond to unforeseen load peaks.

Existing coal-fired power stations elsewhere in the State are a cost effective means of catering for base load demand and, if in operation, can contribute to meeting peak demand if not already running at full load.

Coal-fired power stations produce significantly greater greenhouse gas emissions and environmental impacts than the proposed Parkes Peaking Plant open cycle gas turbines.

## 3.2 Gas Turbine Options

The Parkes Peaking Power Plant Project is directed at meeting peak electricity demand and providing network and market support services.

This objective determines the type of gas turbine that can be used. The requirements are for a gas turbine that can be placed in service rapidly; can handle intermittent operation; can tolerate a high number of starts and stops; is reliable and capable of natural gas-firing with distillate-firing as back-up.

A number of manufacturers can provide generating plant that matches these requirements. The technology is well proven and has been used in similar service around the world for many years.

IPRA has opted to propose a facility comprising three smaller gas turbines rather than a single large unit with a correspondingly larger ground and aesthetic “footprint”. This multi-unit concept and dual fuel capability:

- optimises operational efficiency to meet the level of support services intended;
- increases reliability and security in the event of plant breakdown;
- minimises environmental (air emissions, noise etc) impacts commensurate with the number of units required to operate;
- allows one generating unit to be taken out of service for maintenance (at a time of unlikely generation demand) while the other two units are available should market support services be required at an unforseen time; and
- allows a “seamless” transition from natural gas to distillate in the event of natural gas supply restrictions or interruption.

## 3.3 Alternative Back-up fuels

### 3.3.1 Distillate

IPRA proposes that the Parkes Peaking Power Plant be fuelled by natural gas with distillate fuel as a back up in the event of curtailed or constrained gas supplies.

It is clear from the consultation conducted and community and government stakeholder feedback received by IPRA that considerable concern would be directed at the potential environmental impacts resulting from the use of distillate as the back-up fuel for the Parkes facility.

It should be noted that, contrary to some perceptions in the broader community, gas turbine combustion technology fuelled by distillate is different from the internal combustion technology generally associated with automotive diesel engines.

The fundamental difference between the two is that the volume of air through a gas turbine is very large (~85$m^3$/sec) compared to an internal combustion engine (~7$m^3$/sec) and there is also a significantly higher difference in the turbine exhaust stack temperature (~500˚C compared to ~400˚C).

Consequently, the level of air emissions and resulting ground level concentrations of substances of concern (primarily particulates and volatile organic compounds) are significantly less from gas turbine technology than from internal combustion engines.

The differences between gas turbine and internal combustion engine technologies are recognised by the following:

- regulations under the Act[1] which impose much more stringent limits on gas turbine technology because such tighter limits are achievable; and
- the much lower levels of emissions for gas turbines compared to internal combustion engines (as documented in the National Pollutant Inventory [2]).

The specialist air emission reports attached to this Environmental Assessment demonstrate that, given the infrequent operating time of the peaking power plant and the conservative nature of the air quality assessment, use of distillate as a back-up fuel is considered to have negligible potential for adverse air quality impacts.

### 3.3.2 Other Alternative Back-up Fuels Considered

Given its limited experience in potential alternative fuels, IPRA sought extensive advice from plant suppliers in relation to their experience with alternative fuels in the plant being tendered for consideration.

Assuming consistent fuel quality control, IPRA's primary concerns in regard to alternative fuels are:

- proven plant operational history;
- proven plant performance;
- manufacturer's plant warranty;
- plant capability for seamless transition (without disruption to generation) from/to gas;
- safety aspects associated with storage and use;
- ready availability insofar as continuous bulk delivery on 24 hours notice; and
- cost.

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1 *Protection of the Environment Operations (Clean Air) Regulation 2002 - Schedules 3 and 4* (NSW Clean Air Act)

2 *National Pollution Inventory – Emission Estimation Technique Manuals* (COMMONWEALTH) *for Fossil Fuel Electric Power Generation Version 2.4* (March 2005) and *for Combustion Engines Version 2.3* (October 2003)

IPRA's assessment of alternative back-up fuels is summarised in **Table 3-1**. Costs are shown relative to distillate as a base case.

**Table 3-1 Summary of Alternative Back Up Fuels**

| Fuel Type | Proven History | Proven Performance | Warranty | Seamless Transition | Safety | Availability | Cost |
|---|---|---|---|---|---|---|---|
| **Biodiesel** | Limited | Limited | NO | Unknown | OK | Problematic | >Higher |
| **Naphtha** | Limited | Limited | Limited | NO | Problematic | Problematic | >Higher |
| **LNG** | OK | OK | Limited | OK | Problematic | Problematic | >>Higher |
| **LPG** | NO | NO | NO | Unknown | Problematic | Problematic | >>Higher |
| **Ethanol** | NO | NO | NO | Unknown | Problematic | Problematic | >>>Higher |
| ***Methane** | Limited | Limited | Limited | Unknown | Problematic | Problematic | >>>Higher |
| **Distillate** | YES | YES | YES | YES | OK | OK | (Base) |

***Source: IPRA, 2007***

* Note that natural gas is predominantly (~85+%) methane and IPRA sought to canvass suppliers' operational experience with pure methane. IPRA notes that supply of pure methane would be very problematic.

Against these parameters, distillate best meets all of IPRA's primary concerns and, compared to distillate, all of the alternatives have significant shortcomings against one or more of the above considerations.

In particular, IPRA would not accept a fuel for which the plant manufacturer would not provide a commercial warranty covering plant life, reliable operation and performance. Similarly, IPRA would not accept any fuel for which the manufacturer's plant did not have a proven history of reliable operation and performance.

Notwithstanding this, storage of highly flammable and/or explosive fuels (eg ethanol, LPG, LNG, naphtha) presents a significant safety and hazard issue in the event of accident or malicious damage. Compounding these problems are the extremely large site storage facilities required to represent a meaningful back-up against natural gas supply disruption.

Biodiesel is still in its infancy insofar as use in gas turbines and a number of plant manufacturers are now trialling their plant on this fuel. None are willing to offer warranties and obviously there is only a limited track record to date for plant utilising this fuel.

## 3.4 Air Emission Control Options

IPRA has consulted with officers of the NSW DoP, and DECC in regard to air emissions and controls. It was emphasised in these consultations that a proposal would need to consider the use of best available and most appropriate technology commensurate with commercial viability to meet and, where possible, better the prescribed emission limits stipulated in POEO (Clean Air) Regulations[3] .

Further to compliance with the broad range of prescribed emissions, specific attention was directed at demonstrating Regulatory compliance with and best practice controls, firing both gas and distillate fuels, for:

- Nitrogen Oxide and Nitric Oxide emissions (NOx);
- particulate emissions ($PM_{10}$); and
- Volatile Organic Compounds emissions (VOC).

The specialist air emission reports attached to this Environmental Assessment (refer **Chapter 7** and **Appendix C**) establish that given the infrequent operating time of the peaking power plant and the conservative nature of the air quality assessment, the proposed plant is considered to have negligible potential for adverse air quality impacts.

### 3.4.1 NOx Emissions and Control

IPRA has considered the use of Selective Catalytic Reduction, Dry Low NOx and Water Injection (also referred to as Wet Low NOx) for NOx emissions and control on the proposed plant.

***Selective Catalytic Reduction***

Selective Catalytic Reduction (SCR) is a post combustion control, where ammonia is injected into the gas turbine exhaust stream to react with NOx in the presence of a catalyst. The products of this reaction are molecular nitrogen and water.

The SCR process is best suited to combined cycle gas fuelled plant operating at base load mainly due to the temperature dependency of the catalytic NOx-ammonia reaction and the catalyst life. The reaction takes place over a limited temperature range of 315ºC - 400ºC and, above approximately 455ºC the catalyst is damaged, often irreversibly and so requires disposal and replacement.

Further to the technical constraints outlined above, other issues associated with the use of SCR include:

- exhaust emissions containing excess, un-reacted ammonia;
- increased storage and safe handling risks associated with ammonia; and
- safe disposal of spent catalysts which typically contain heavy metal oxides.

[3] *Protection of the Environment Operations (Clean Air) Regulations*

Small open cycle units (such as those proposed for Parkes) have exhaust temperatures in the range 400ºC - 500ºC making SCR an unacceptable option on a technical basis. Notwithstanding this IPRA consider that the SCR would introduce broader unacceptable health and environmental concerns associated with the use of ammonia and heavy metal catalysts.

### *Dry Low $NO_x$ and Wet Low $NO_x$*

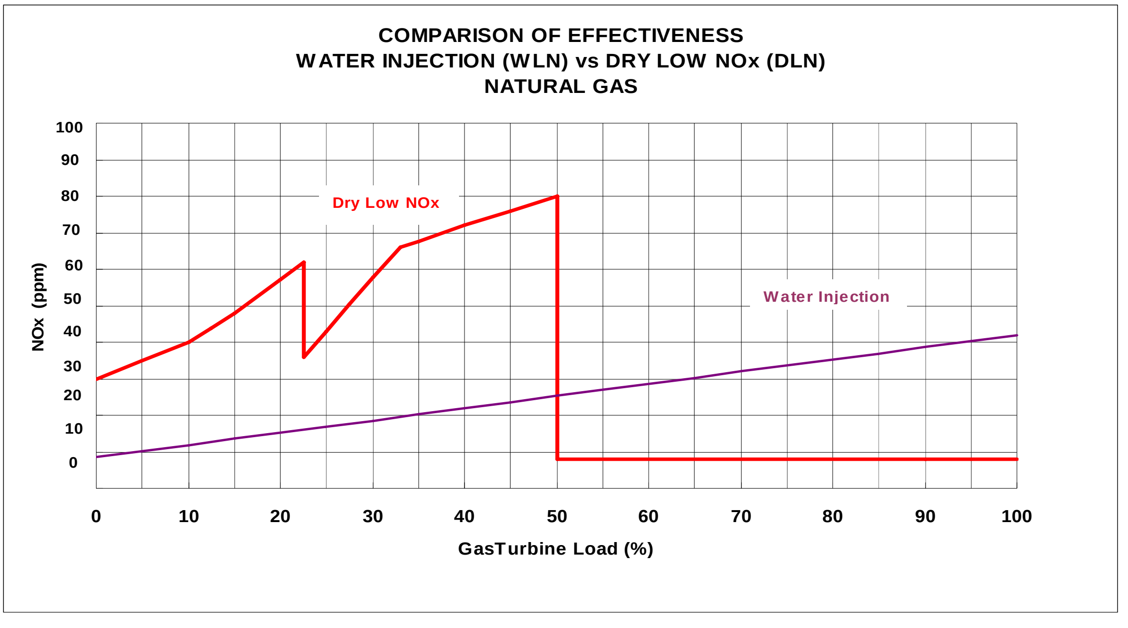
Dry Low $NO_x$ (DLN), a more recent technology, consists of a physically longer combustion chamber such that air is introduced in a staged manner over the length of the chamber thereby reducing peak flame temperatures and hence reducing the production of NOx, which is a product of fuel combustion in air. DLN technology does not begin reducing NOx emissions until the gas turbine unit has reached around 50% output. For example, that is when the unit has reached say 25MW of its peak 50MW load capability.

Wet Low $NO_x$ (WLN) or water injection, an older technology also targeted at reducing $NO_x$ emissions, consists of introducing a fine mist of water to similarly reduce flame temperatures. WLN achieves NOx reductions across the full load range of the gas turbine unit although it is noted that it is less effective than DLN at higher loads.

The fundamental difference between the two technologies is that, once in operation, the DLN technology would reduce $NO_x$ levels to around one quarter of the WLN effectiveness at 100% load. Conversely, below 50% load, DLN technology has poorer performance than WLN as NOx levels may be some three to four times those emitted using WLN technology.

This comparison is illustrated in a simplified form in **Figure 3-1**.

**Figure 3-1 Comparison of WLN vs DLN Effectiveness over Load Range**




*Source: IPRA 2007*

Only one or the other technology can be fitted to plant of the size proposed by IPRA.

IPRA consider that it may be appropriate for plant intended to always run at between 50% to 100% load to be equipped with DLN technology, which is ideally suited for larger plant with that target operational regime. However IPRA intends that its plant be capable of serving a range of market and system purposes and the Parkes Peaking Power Plant would operate across the full load range of the gas turbine units, from full speed, no load (a “reactive power” mode) through to 100% load, for which WLN is the more appropriate NOx control technology.

For example, if IPRA installed a single 120MW or 150MW gas turbine and the circumstances called for generation of only 50MW (being 30-40% load for that turbine), a gas turbine fitted with DLN would produce significantly more NOx than a smaller unit equipped with WLN technology.

To ensure a prudent level of service availability and reliability, IPRA has opted to install smaller units and has therefore sought to balance its projected operational regime against potential NOx emissions and proposes to equip its gas turbines with WLN technology.

The plant would be equipped with turbine exhaust stack continuous NOx monitoring instrumentation and would comply with emission levels stipulated in the Environmental Protection Licence.

### 3.4.2 $PM_{10}$ and VOC Emissions and Control

Oxidation catalyst technology has been used in some applications to control emissions of particulates and VOC. In order to address any suggestion that this technology may be applicable to the proposed plant, IPRA undertook an investigation of the applicability of this technology to gas turbine operation.

Oxidation catalyst technology has mainly been promoted by environmental agencies in the USA primarily to reduce CO emissions but also to reduce $PM_{10}$ and VOC’s.

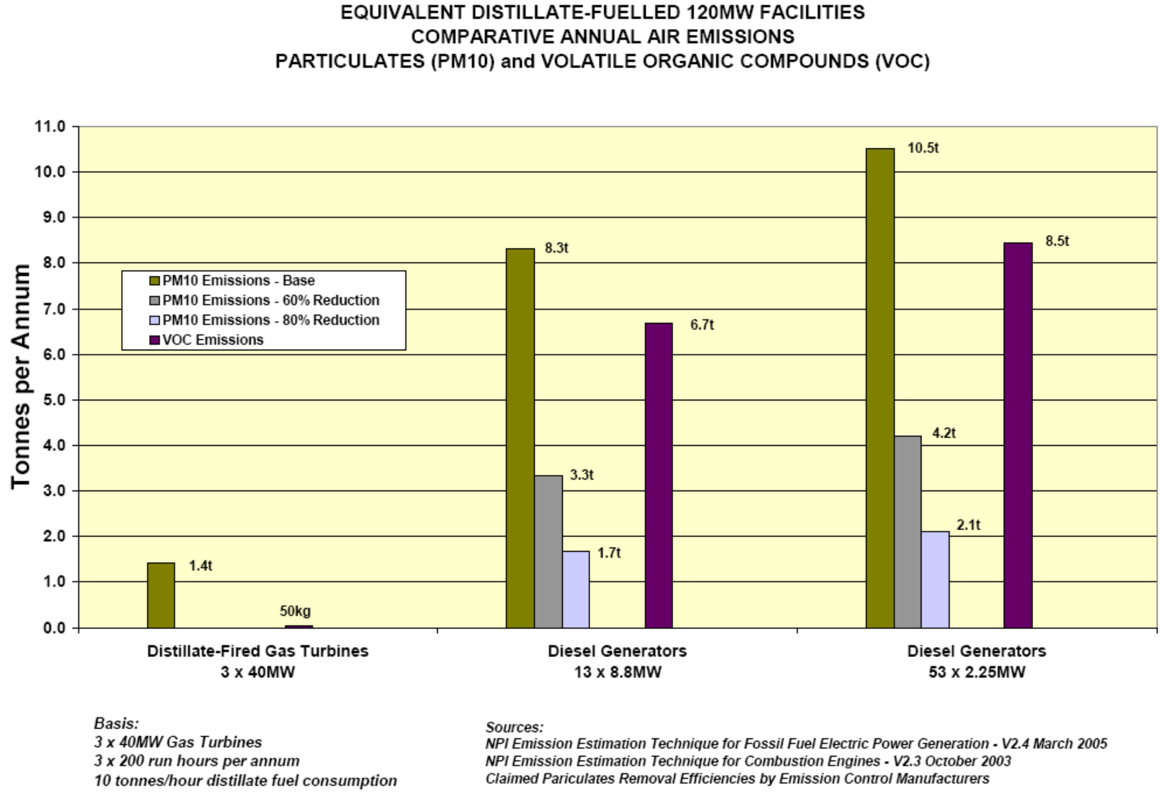
IPRA’s investigations concluded that oxidation catalyst technology may have application for internal combustion engines. However, due to the fundamental differences between internal combustion engines and gas turbine technologies as outlined in **Section 3.3.1** above, the cost and effectiveness on gas turbine plant does not warrant its use on gas turbines technology. It is also noted that oxidation catalyst technology is not as effective if the plant is operated at part load, as is the scenario for the operation of the Parkes plant. The effectiveness of oxidation catalyst technology would also be limited by the inability to regulate turbine exhaust temperatures to the operating range of the catalyst (as would be technically feasible for a combined cycle plant operating at a high capacity factor).

In addition, comparative emission levels between gas turbine plant and internal combustion units or reciprocating gas engines of equivalent total capacity are illustrated in **Figure 3-2**. The $PM_{10}$ emission improvements for internal combustion engines claimed by some emission technology suppliers still result in emission levels exceeding those from gas turbines.

The specialist studies and modelling demonstrate that $PM_{10}$ and VOC emissions from the proposed Parkes facility would fall well within prescribed NSW limits.

Further discussion of Air Quality impacts is presented in **Chapter 7**.

**Figure 3-2 Comparison of PM10 and VOC Emissions - Gas Turbines vs Reciprocating Gas Engines**




*Source IPRA 2007*

## 3.5 Summary of Power Plant and Emissions Control

The proposed Parkes Peaking Power Plant would comprise three gas turbines fuelled by natural gas supplied via a new 10 km long pipeline from the existing Central West Pipeline at Parkes. The gas turbine plant would have a "dual fuel" capability to allow a seamless transition to burning distillate as the backup fuel to ensure continuity of generation during natural gas supply interruptions.

IPRA has initiated tenders for gas turbine procurement and, whilst the specific gas turbines have yet to be finalised, all tendered plant is capable of meeting the specified technical performance parameters and would conform to relevant environmental regulations.

The gas turbine units under consideration range between 40MW and 50MW output capability.

Final plant selection would depend upon plant availability and "deliverability" (that is, Tenderers guaranteeing off-shore manufacture schedules (in a period of high global demand) to meet IPRA's construction schedule) and finalising other commercial issues.

NOx air emissions would be controlled through water injection being the most appropriate and cost efficient control mechanism to meet the required air emission standards. Other air emissions would also meet or be well below prescribed emission limits without specific emission controls. Further, all gas turbine air intake ducts would be equipped with filter mediums which would also reduce particulate dispersal via the exhaust ducts.

## 3.6 Site Selection

Desktop studies identified two primary sites and two secondary sites in reasonable proximity to the Parkes load centre, the high voltage grid and natural gas from the Central West Pipeline as the preferred fuel option. The four sites identified in IPRA's desktop study and shown in **Figure 3-3** were:

***Primary***

- Adjacent the TransGrid 132/66kV substation approximately 10km east of Parkes
- At Alectown West some 23km north of Parkes

***Secondary***

- Adjacent the North Parkes Mine some 22km northwest of Parkes
- Adjacent or in close proximity to the Country Energy 66/11kV substation on the western perimeter of the Parkes township

The key site selection considerations are identified in the Summary at the beginning of **Chapter 3**

### 3.6.1 Alternative Site 1 – Parkes Township

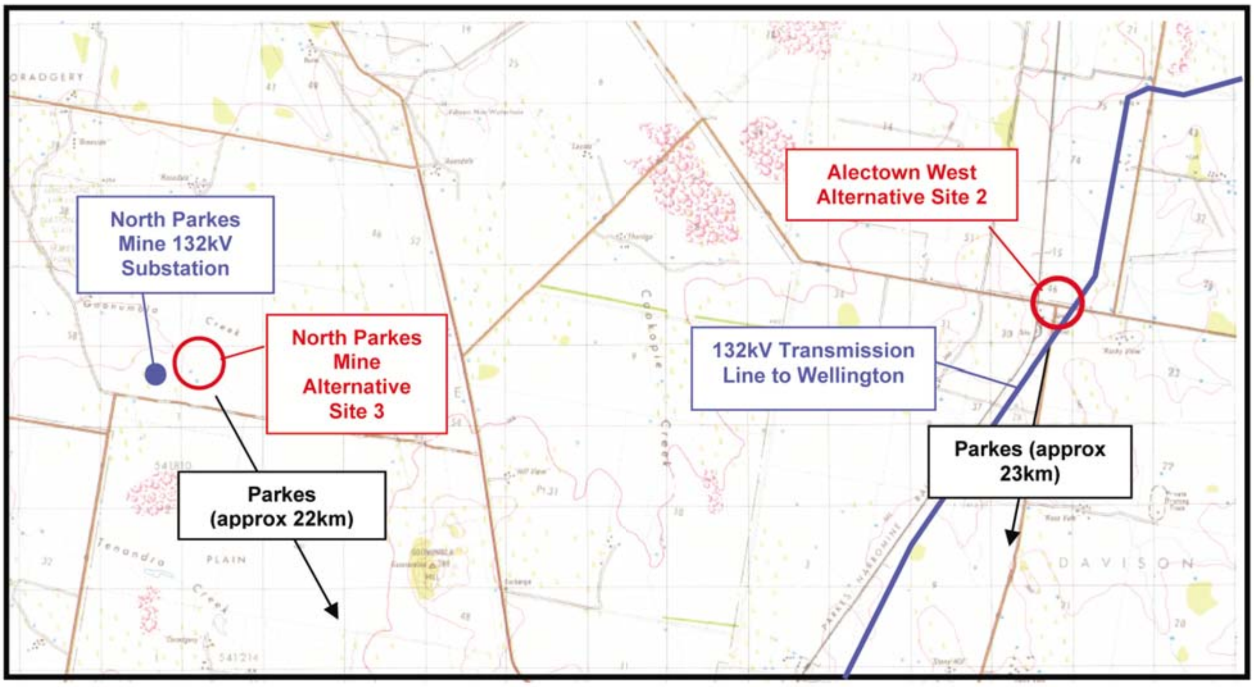
This was considered a "Secondary Site" at the time of the desktop study.

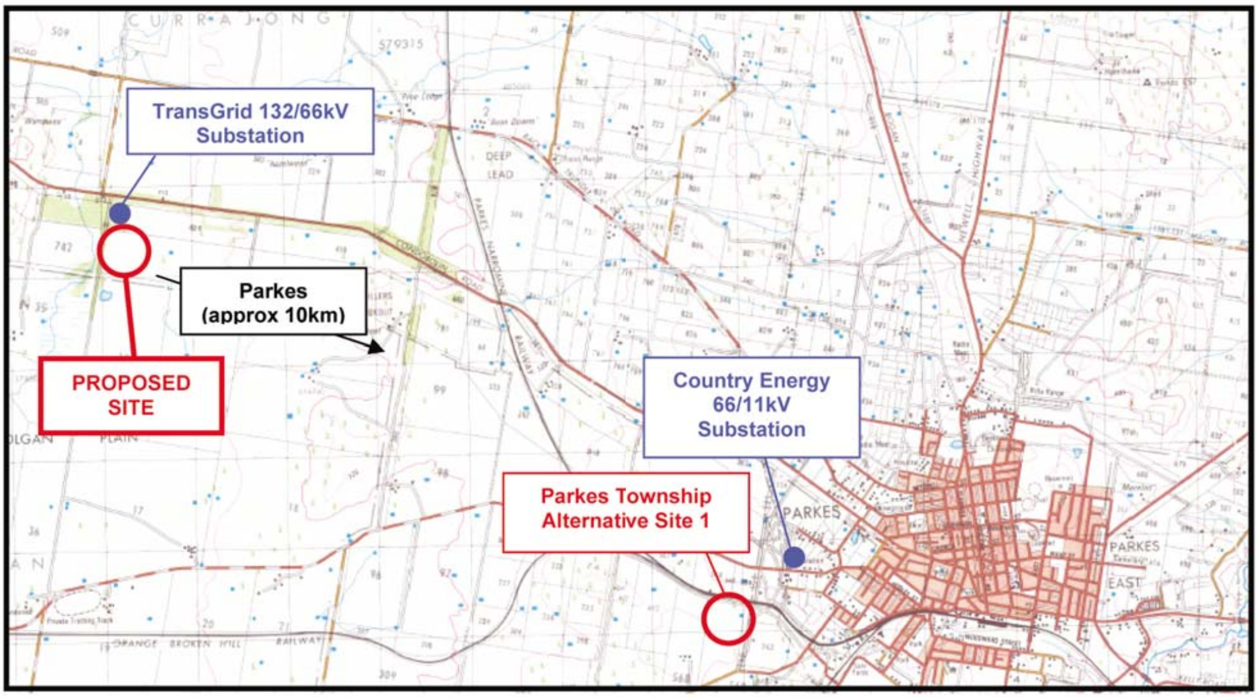
Field inspection confirmed that the main **advantages** were:

- a very short natural gas lateral requirement of less than 1km to tie into the Central West Pipeline;
- proximity to transport and other infrastructure; and
- a capability to provide energy directly to Country Energy's 66kV substation at times of high load.

The main **disadvantages** included:

- potential adverse air and noise emission impacts on the local community;
- land zoning and future community encroachment with township growth;
- potential land availability problems; and
- a lack of flexibility in providing direct support to TransGrid's wider regional 132kV system.




Source: IPRA, 2006

| Client | Project | | | Title |
|---|---|---|---|---|
| INTERNATIONAL POWER (AUSTRALIA) PTY LTD | ENVIRONMENTAL ASSESSMENT - PARKES PEAKING POWER PLANT | | | **LOCATION OF ALTERNATE SITES ASSESSED** |
| URS | Drawn: AJW | Approved: CJ | Date: 21/08/2007 | Figure: **3-3** |
| | Job No: **43177456** | File No: 43177456.035.wor | | |

### 3.6.2 Alternative Site 2 – Alectown West

This was considered a "Primary Site" at the time of the desktop study.

Field inspection confirmed that the main **advantages** were:

- a very short natural gas lateral requirement of less than 200m to tie into the Central West Pipeline;
- a very short 132kV line to tie into the 132kV transmission line to Wellington;
- low proximity to residences;
- reasonable transport access; and
- likely low land zoning and availability problems.

The main **disadvantages** were:

- a lack of system support flexibility with only an "in and out" tie-in to the 132kV system; and
- distance from Parkes infrastructure

### 3.6.3 Alternative Site 3 – North Parkes Mine

This was considered a "Secondary Site" at the time of the desktop study only in consideration that the mine is a major electricity consumer.

Field inspection confirmed that the main **advantages** were:

- potential to supply directly into Country Energy's 132kV line to the mine;
- low proximity to residences;
- reasonable transport access; and
- likely low land zoning and availability problems.

The main **disadvantages** were:

- a lack of system support flexibility with only an "in and out" tie-in to the 132kV system;
- length of natural gas lateral from the Central West Pipeline; and
- distance from Parkes infrastructure.

### 3.6.4 Alternative Site 4 – Adjacent the TransGrid Parkes Substation

This was considered a "Primary Site" at the time of the desktop study mainly because of IPRA's South Australian experience (refer **Section 2.3.1**) with transmission network and grid support provision over many years.

Field inspection confirmed that the main **advantages** were:

- optimum flexibility to provide network and grid support by tying directly in to TransGrid's high voltage substation bus;
- capability to tie in to the TransGrid electrical bus at 132kV or 66kV;
- low proximity to residences;
- reasonable access to Parkes' infrastructure
- reasonable transport access; and
- likely low land zoning and availability problems associated with the main plant site.

The main **disadvantages** were:

- 10km length of natural gas lateral from the Central West Pipeline;
- possible difficulties in obtaining natural gas pipeline easements; and
- potential outcomes of environmental and other requisite studies along the pipeline route.

## 3.7 Preferred Site Location

Following further desktop studies and investigations the preferred site was identified as being Alternative Site 4 - adjacent the TransGrid 132/66kV substation some 10km west of Parkes on the Condobolin Road.

IPRA's experience in this field determined that the overwhelming advantage of this site is the flexibility that direct connection to TransGrid's high voltage substation bus allows in providing the range of network and grid support services sought by TransGrid.

The substation is also close enough to the township of Parkes and the North Parkes Mine to be able to provide power supplies in the event of system emergency.

The Development Site is agricultural land and has a rural 1(a) zoning. The proposed development would be permissible within this land use zone with consent from the appropriate authority.

IPRA has secured an option to purchase the site if the project is approved and options for the natural gas pipe easements have been secured from relevant landowners.

Reasonable access to infrastructure, land availability and the low proximity of sensitive receptors were also determining factors in selecting the Condobolin Road site.

The altitude for this region is approximately 280m and is common to each site and any constraints to power output in hot weather would be mitigated by evaporative cooling.

Environmental and other studies included in this Application have demonstrated that there are no major impediments to the project proceeding provided that appropriate plans are in place to manage the issues identified.

## 3.8 Plant Footprint Considerations

The Parkes Peaking Power Plant site footprint would:

- require approximately 4 hectares of land;
- require no vegetation clearing as it is currently a cultivated paddock;
- allow a minimum of 20m wide perimeter landscaping and vegetation on all but the northern perimeter, which abuts the TransGrid substation;
- be laid out to meet relevant bushfire considerations;
- satisfy the recommendations of the hazard assessment presented in **Chapter 18**;
- be laid out and designed to minimise visual impact.

## 3.9 Natural Gas Pipeline Route Selection

Selection of the route of the natural gas pipeline considered the optimal route over which tenure could be acquired and the pipeline constructed, operated and maintained for its design life.

The two main considerations in locating the pipeline route were:

- construction of the pipeline requires a corridor approximately 25m wide for the most cost efficient construction techniques, although the corridor can be narrower (preferably only over limited distances) to overcome problems associated with specific physical features, environmental / heritage issues, land use etc; and
- operations and maintenance activities requires access to, and along the route over its life.

Potential routes were identified and considered against the following selection criteria:

### *Direct route*

The most direct route is preferable in order to minimise:

- ‘whole of life’ pipeline risk management issues;
- the construction cost;
- operation and maintenance costs;
- the potential design complications associated with longer, less direct routes;
- the number of land easement negotiations and associated compensation issues; and
- the extent of necessary Development Approval studies and other project “Consent” issues.

### *Corridor location*

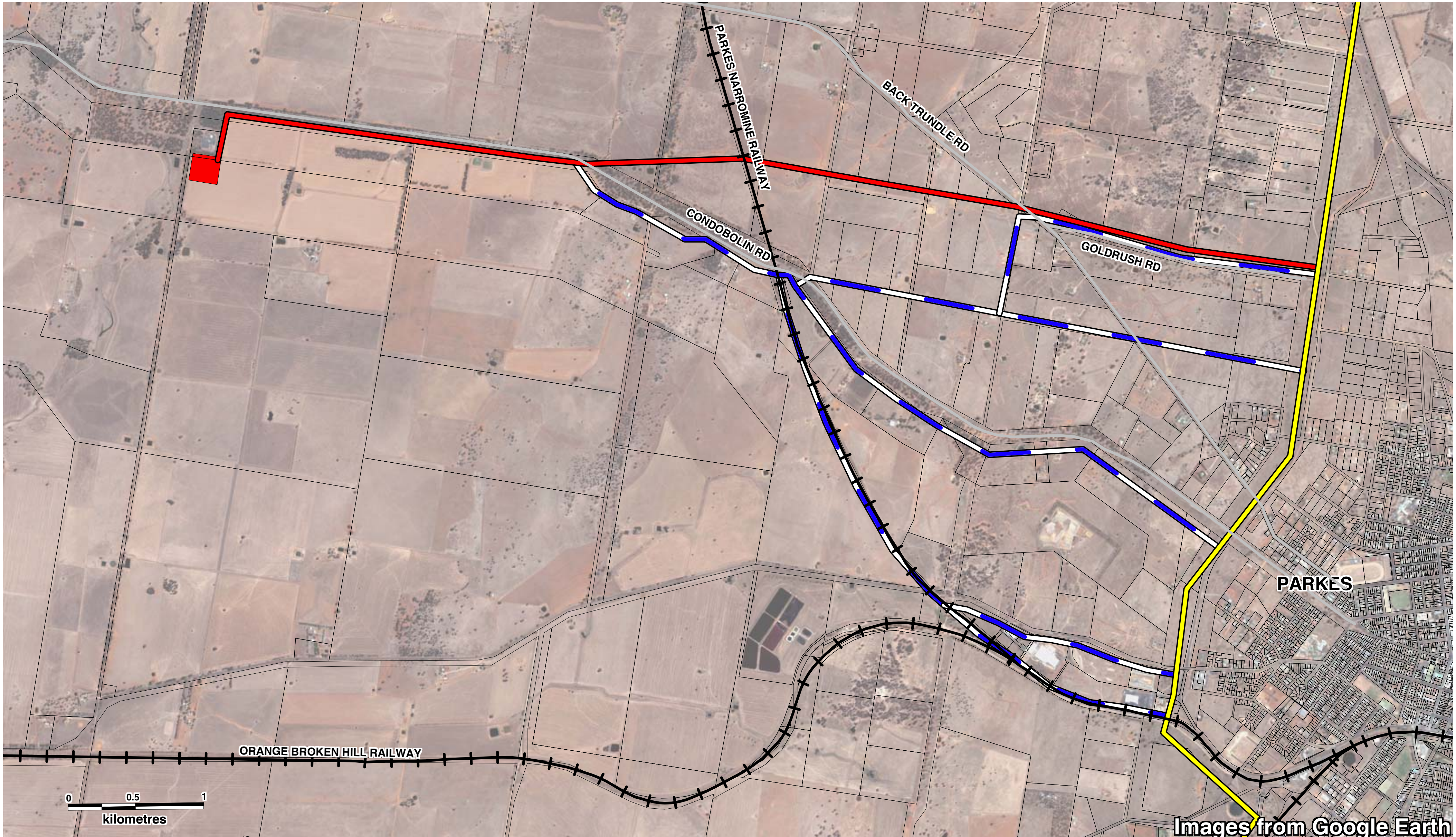
The selection of the route corridor also considered the following criteria:

- where possible, to utilise existing “natural corridors” such as roads, railways and existing service easements (such as communications, electricity, water, drainage, etc.)
- avoid or minimise impact on areas of native flora and fauna;
- minimise the number of landowners directly impacted by the pipeline being on their land and with whom easements and land use compensation must be negotiated;
- avoid or minimise the number of landowners or residents indirectly impacted by the pipeline being near their land and affected by construction and operation and maintenance activities;
- avoid or minimise topographically adverse land (swamps, rocky ground etc)
- when crossing private land to run adjacent to fence lines in order to minimise land use impacts during and after construction and easements unnecessarily “splitting” property titles.

Using the above criteria, an iterative process of route selection was undertaken through the project development phase as property negotiations progressed and the results of the field surveys incorporated. **Table 3-2** describes the iterative process.

**Table 3-2 Iterative Process of Pipeline Route Selection**

| Date | Consideration | Implication for route selection |
|---|---|---|
| July 2006 | A desktop study identified the existence of the Central West Pipeline (CWP) and its notional (north/south) route immediately west of the Parkes township with the exact location confirmed by a site visit during August 2006. | Broad area identified for potential connection |
| August 2006 | The power plant site fixed the natural gas delivery point and land negotiations for the site included acquisition of a 25m wide easement on that property which extends some 3km east towards Parkes immediately adjacent to Condobolin Road. | Power Plant site location identified. |
| July/August 2006 | A desktop study using the above criteria identified six potential routes from the secured easement on the property in which the power plant was proposed, to five potential natural gas "take-off" points from the CWP. | Six routes identified as shown in **Figure 3-4.** |
| August 2006 | Property easement consultants conducted an desktop review and initial title searches identifying stakeholders | Stakeholders identified along the potential routes.<br>- The Parkes Shire Council<br>- The NSW Road Traffic Authority (RTA)<br>- The Australian Rail Track Corporation (ARTC); and<br>- Private Landowners |
| August 2006 | Property easement consultants conducted field review and identified a preferred route as best satisfying the criteria | Preferred route negotiated |
| August- October 2006 | Property easement consultants contact stakeholders and negotiate with the landowners along the preferred route. | Preferred route identified as shown in **Figure 3-5**. |
| October/November 2006 | Heritage field survey identified a "scarred" tree of possible Aboriginal origin on a property adjacent to the crossing of Condobolin Road. | Decision made to avoid impact to potential scarred tree and deviate into the Condobolin Road reserve. Preferred route as shown in **Figure 3-5** |
| February 2007 | Concern raised about the impact on the Endangered Ecological Community Fuzzy Box Woodland. IPRA revisit the site to refine route and identified an alternative crossing and route along the Condobolin Road reserve. | Crossing of Condobolin Road refined to further reduce impact on Fuzzy Box Woodland as shown in **Figure 3-6.** |
| March 2007 | Negotiations not successful with property owner for section Alternative 1. | Alternative 1 not viable. |




**Legend**

- Existing Gas Pipeline
- Potential Alternative Gas Pipeline Routes
- Barry Maloney Preferred Gas Pipeline Route (August 2006)

Source: Map compiled using Cadastral Plus, 2004 MapInfo Australain Pty Ltd and PSMA Australia Ltd.

Client: INTERNATIONAL POWER (AUSTRALIA) PTY LTD

URS

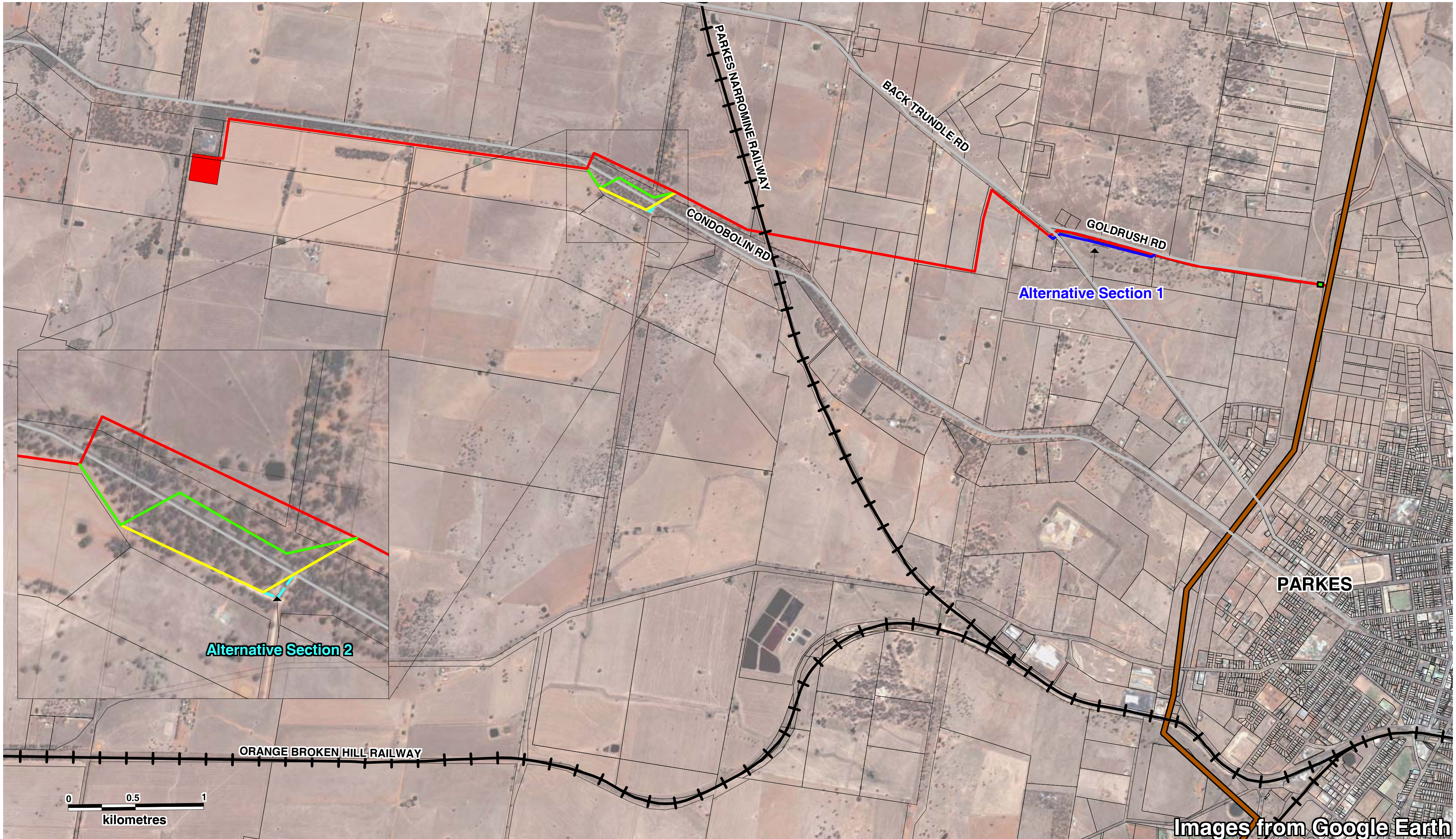
Project: ENVIRONMENTAL ASSESSMENT - PARKES PEAKING POWER PLANT

Drawn: AJW | Approved: CJ | Date: 21/08/2007

Job No: 43177456 | File No: 43177456.040.wor

Title: **POTENTIAL PIPELINE ROUTES**

Figure: **3-4**

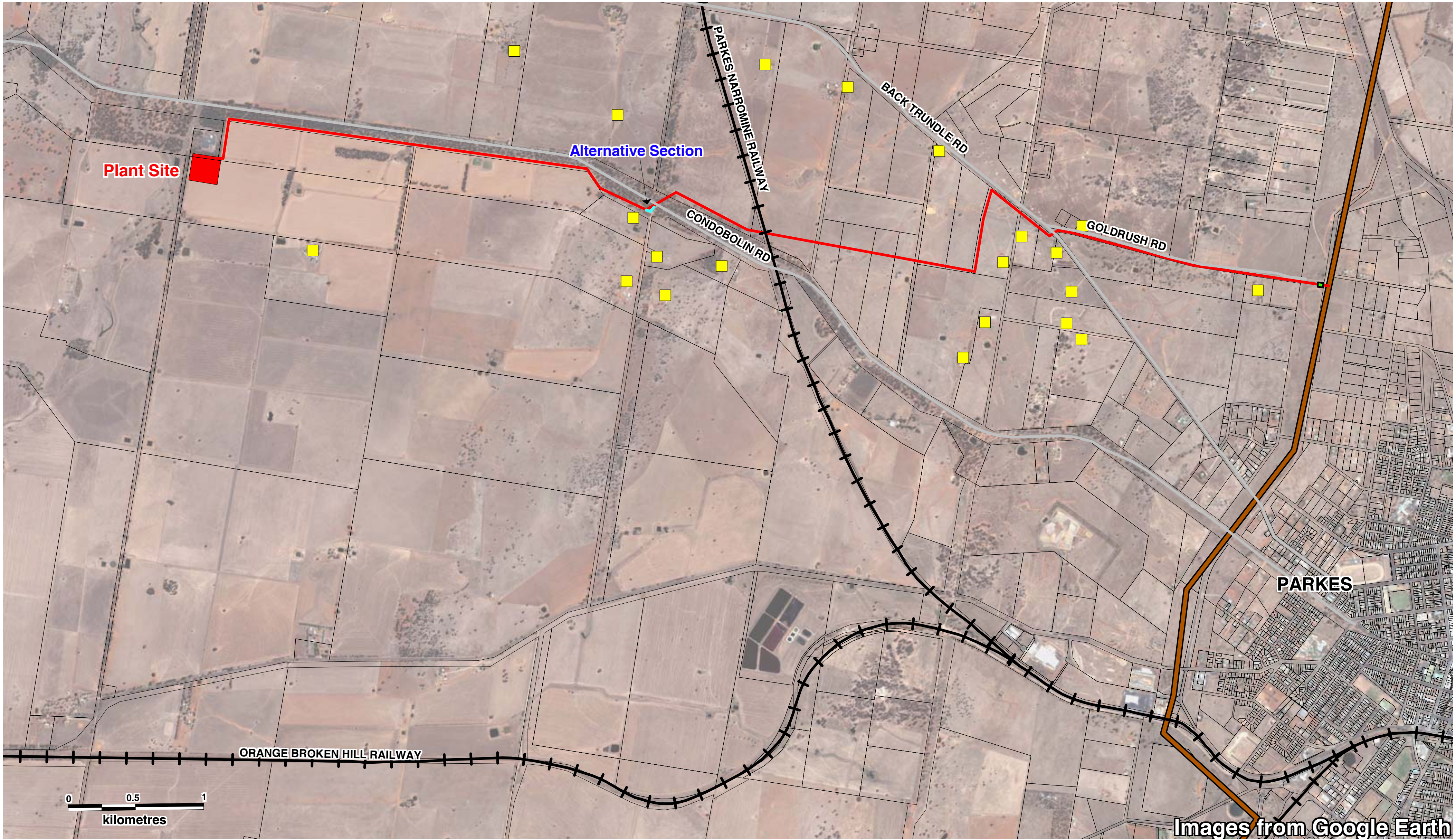



**Legend**

- Existing Gas Pipeline
- Route (October 2006)
- Refinement of Route to Avoid Possible Scarred Tree (November 2006)
- Further Refinement of Route to Minimise Impact on Fuzzy Box Woodland (February 2007)

Source: Map compiled using Cadastral Plus, 2004 MapInfo Australain Pty Ltd and PSMA Australia Ltd.

| Client | Project | Title |
|---|---|---|
| INTERNATIONAL POWER (AUSTRALIA) PTY LTD | ENVIRONMENTAL ASSESSMENT - PARKES PEAKING POWER PLANT | **REFINEMENT OF GAS PIPELINE ROUTE** |
| URS | Drawn: AJW / Approved: CJ / Date: 21/08/2007 | Figure: **3-5** |
| | Job No: **43177456** / File No: 43177456.041.wor | |




**Legend**

N

- Existing Gas Pipeline
- Proposed Route
- Gas Pipeline Take-off Point
- Houses

Source: Map compiled using Cadastral Plus, 2004 MapInfo Australain Pty Ltd and PSMA Australia Ltd.

| | | | |
|---|---|---|---|
| Client<br>INTERNATIONAL POWER (AUSTRALIA) PTY LTD | Project<br>ENVIRONMENTAL ASSESSMENT - PARKES PEAKING POWER PLANT | | Title<br>**PROPOSED GAS PIPELINE ROUTE** |
| URS | Drawn: AJW | Approved: CJ | Date: 21/08/2007 |
| | Job No: **43177456** | File No: 43177456.042.wor | Figure: **3-6** |

Following the iterative process described in **Table 3-2** the natural gas pipeline route was finalised as it provided the following benefits:

- provided the most direct route addressing the identified criteria;
- avoid likely opposition by ARTC to building along their rail corridor for risk management reasons;
- minimise impact on the extent of vegetation along Condobolin and other road reserves;
- minimise the number of landowners on alternative "cross-country" routes;
- the three southern alternative natural gas take-off points could prove problematic due to either their physical location or other existing infrastructure.
- the route utilised Gold Rush Road reserve for some 40% of the un-acquired route.
- from Gold Rush Road to the Power Plant site, this direct route generally crossed broad acre farming lots with low potential environmental impact.
- Issues identified with crossing of the Condobolin Road were addressed through further refinement of the route to avoid the potential Aboriginal scarred tree and minimise the crossing distance and area of impact across the Endangered Ecological Community Fuzzy Box Woodland.

In addition, it is understood that the Gold Rush Road reserve is proposed to be developed as a local road and that the developer has initiated progress on this development.

## 3.10 Do Nothing Scenario

The "do nothing" option was not considered by IPRA to be an option in light of the NSW Government Green Paper, the NEMMCO SOO 2006 and 2007 load growth forecasts for NSW and the TransGrid Needs *Statement* (March 2006) and *Request For Proposals* (October 2006) as discussed in **Chapter 2**.

## 3.11 Conclusion

In summary:

- Of the plant options considered, open cycle gas turbines are ideal for operations to meet peak load demand and generally represent best practice technology for this type of role. The gas turbines would be fired by natural gas with the capability of using distillate as the back-up fuel in the event of an interruption to or constraint of the natural gas supply.
- Water injection would be used to control NOx air emissions as it is most appropriate NOx control technology for the operating scenarios proposed.
- For the site selection, several target areas were identified, visited and assessed. The Parkes region, and specifically the Condobolin Road site, provides the optimal electricity transmission network connection.