7. Description of the project

ERM Power proposes to develop an open-cycle gas-fired peaking power station, and associated gas supply pipeline and compressor station (pipeline inlet facility) in Central Western NSW (‘the project’).

The proposed power station would be located approximately 2 kilometres north-north-east of the outskirts of Wellington on Gulgong Road and adjacent to TransGrid’s 330/132 kilovolt (kV) Wellington substation (see Figure 7-1). The proposed power station would be located on approximately 45 hectares of land. The operational footprint would be approximately 6 hectares, with the remaining land used as a buffer zone for mitigation measures such as visual screening. The proposed power station would connect directly to the Wellington substation via two short 330 kV circuits.

Gas would be supplied to the proposed power station via a new 100 kilometre gas pipeline from the Central West Pipeline near Alectown (see Figure 7-2). The proposed gas pipeline would be constructed within a 25–30-metre wide corridor. A preferred pipeline route has been selected to minimise impact on environmental, cultural and social values. To account for potential variation in the proposed gas pipeline route as a result of geotechnical assessments during the detailed design phase, a 200-metre wide buffer corridor was surveyed by biodiversity and heritage specialists (see Sections 9.5, 9.6 and 10.2). When operational, the proposed gas pipeline would require an easement 20–25 metres wide.

The proposed compressor station would be constructed adjacent to the Central West Pipeline near Alectown (see Figure 7-2). It would be developed within a land parcel approximately 500 metres by 200 metres, and would connect the proposed gas pipeline with the Central West Pipeline to safely provide the proposed power station with its annual requirement of approximately 3 petajoules of natural gas.

The following sections provide a detailed description of the main components of the project, including its construction and operation.

7.1 Power station

The main components of the proposed power station comprise:

- four open-cycle gas-fired turbines including four exhaust stacks
- ancillary plant items, such as generator-transformers, gas receiving station, water treatment plants and water tanks, air-cooled condensers, evaporation pond and emergency diesel generator
- control room/office and workshop facilities.

Figure 7-3 provides an indicative layout of the proposed power station, and includes both construction and operational features. Figure 7-4 provides an indicative operational layout of the proposed power station site off Gulgong Road.

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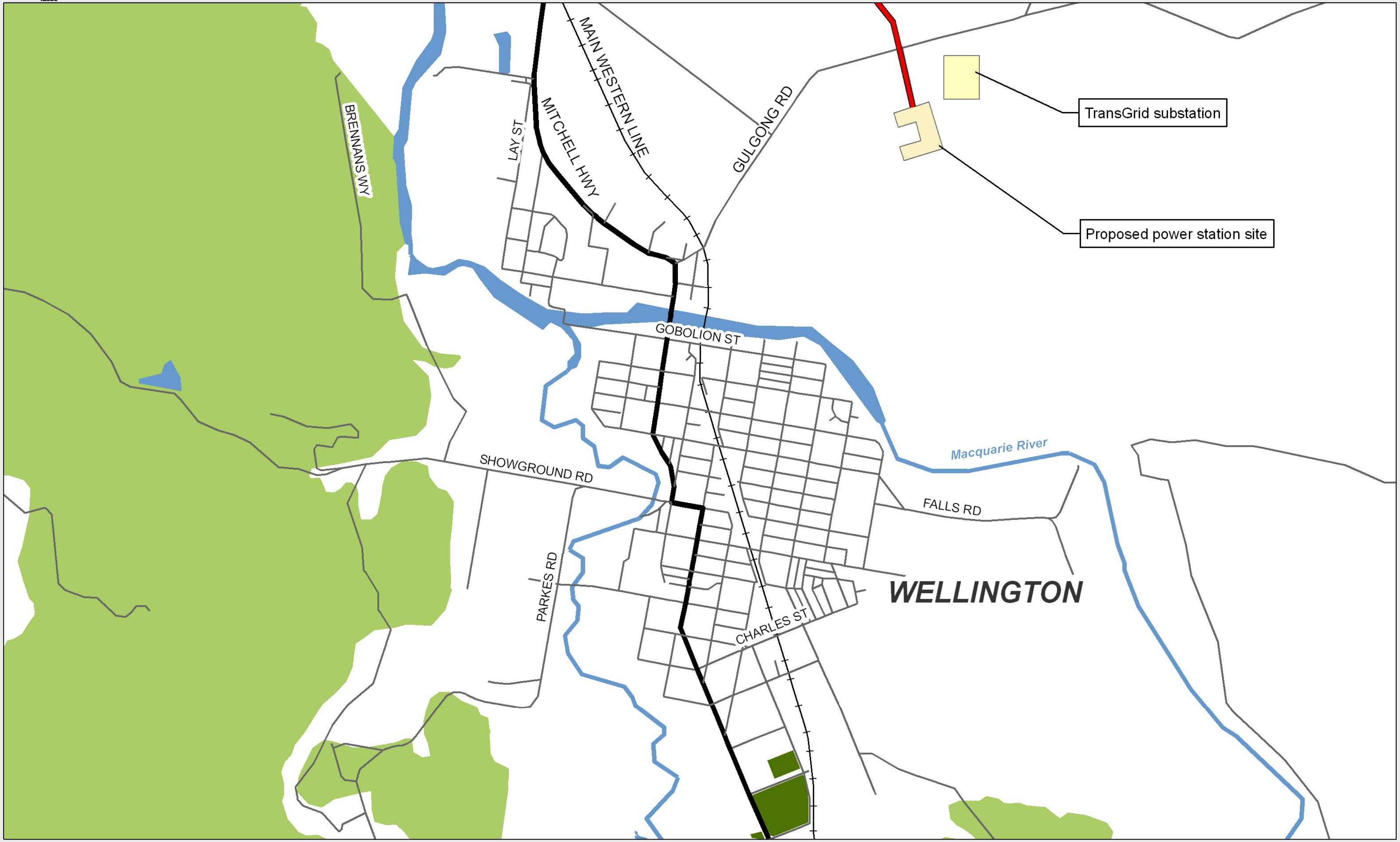

Proposed pipeline route
Proposed power station site
Rail line
Major roads
Minor roads
Major drainage
Water body
National Park Estate
Vegetation

0 500 1,000 Metres

Figure 7-1 Proposed power station overview

2116720A_2133_Fig7_1_Power_station_overview. GK 14 April, 2008

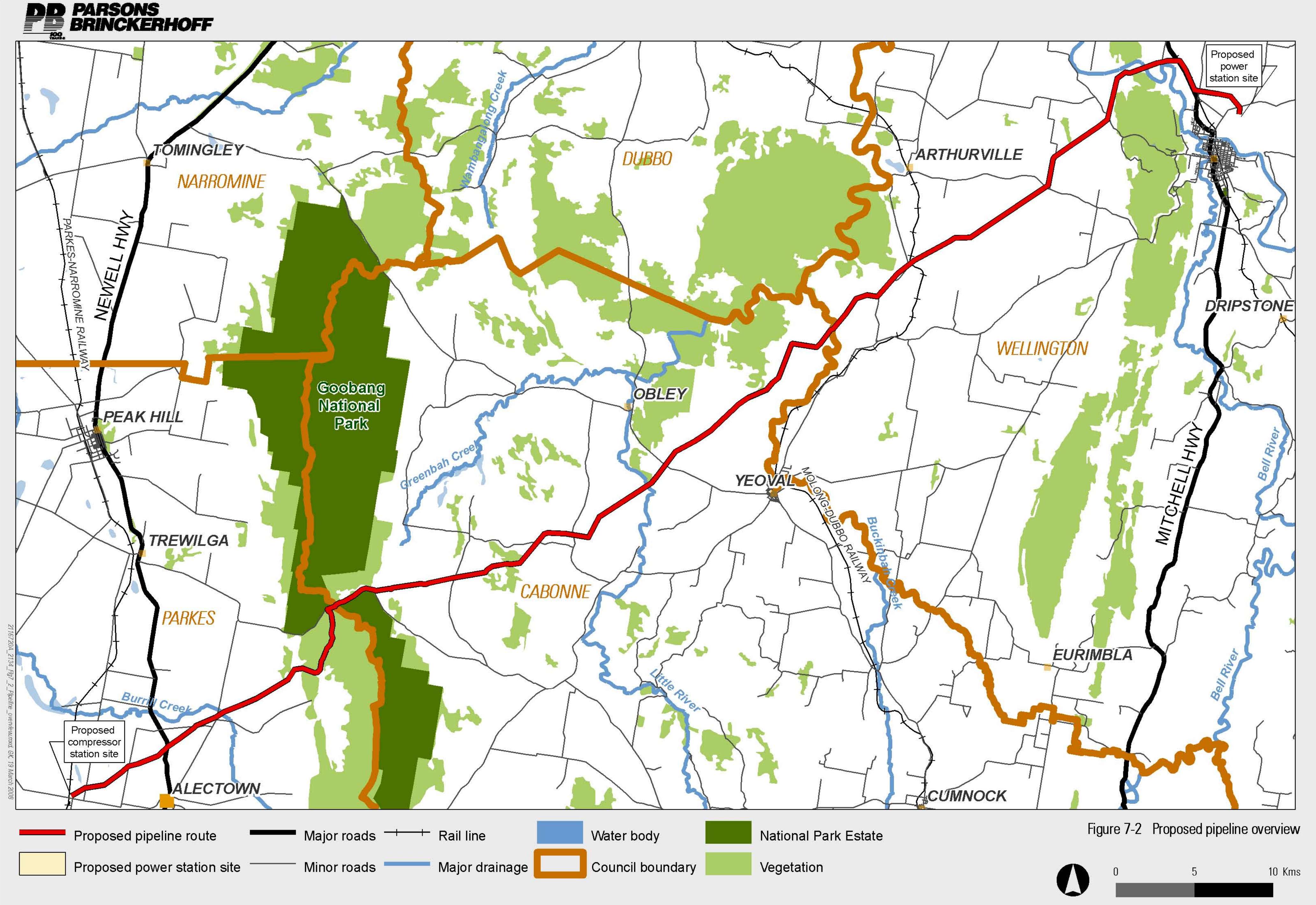

Figure 7-2 Proposed pipeline overview

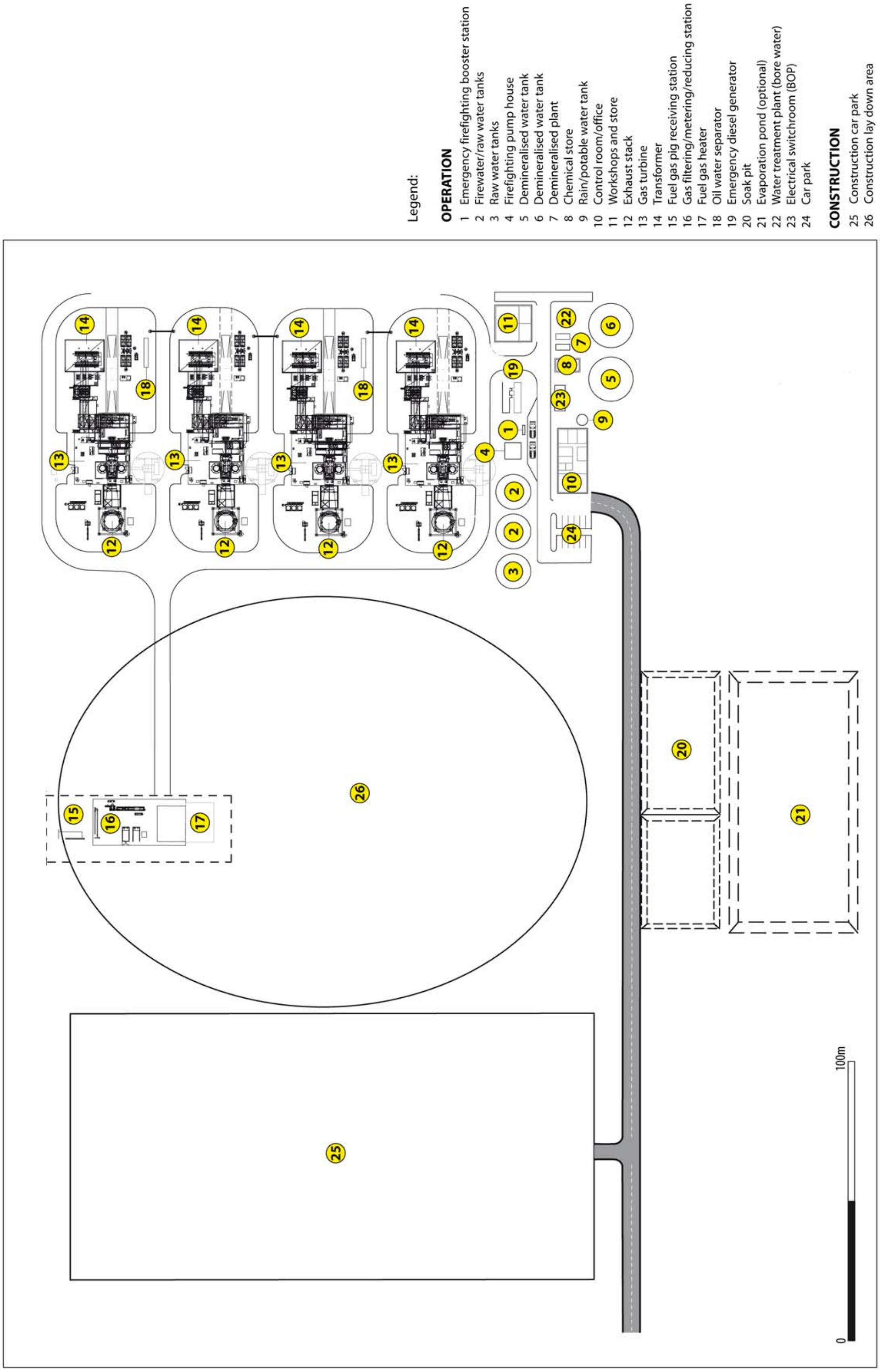

Figure 7-3 Indicative layout of the construction and operation components of the proposed power station

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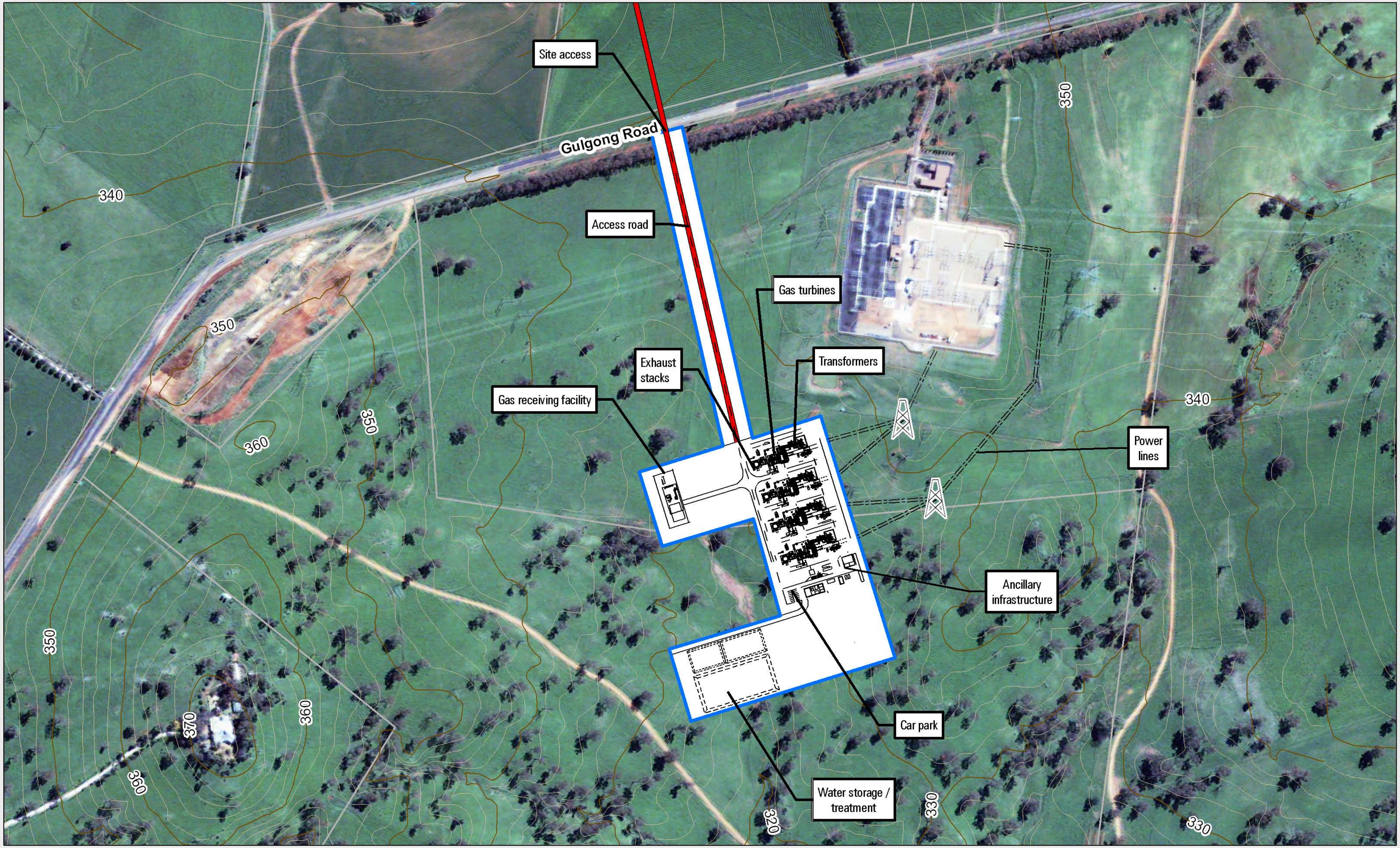


Figure 7-4 Indicative operational layout of the proposed power station site

Access road
Operational boundary
Power lines
Proposed pipeline route
2 m contours
10 m contours
Transmission line towers

0 37.5 75 150
Metres
1:7,144

2116720A_2121c_Fig7-4_Operational_boundary_A4.mxd GK April 14, 2008

The results of preliminary environmental assessments were used to determine the most appropriate orientation of the proposed power station within the site to minimise impact on the environment and surrounding properties (see Section 6.2.3). Specifically, the preliminary assessment focused on optimising the location of the four gas-fired turbines and corresponding exhaust stacks as being key to minimising noise, air quality and visual impacts. The preferred location and orientation of the turbines and stacks that was selected following preliminary assessment is shown in Figure 7-4. If, through design development, the locations of any of the four gas-fired turbines and exhaust stacks change, the environmental impacts of any such change will be reviewed to ensure they are consistent with the environmental impact predictions made in this Environmental Assessment. Any increase in the environmental impact of the final design will be assessed, and mitigation measures developed accordingly, prior to the commencement of construction.

The indicative proposed layout of the ancillary equipment may alter during the detailed design phase or as a result of matters raised during the project approval process. The layout of this infrastructure would be finalised during the detailed design phase, and would adhere to all necessary standards and guidelines (e.g. Australian Standard *AS 2885-2007 Pipelines: Gas and liquid petroleum* and *Dangerous Goods (General) Regulation 2007* requires a minimum separation distance between gas-fired turbines and human-occupied infrastructure of at least 40 metres to reduce potential for hazard and risk escalation). Any changes to the layout of ancillary equipment will be consistent with the environmental impact predictions made in this Environmental Assessment.

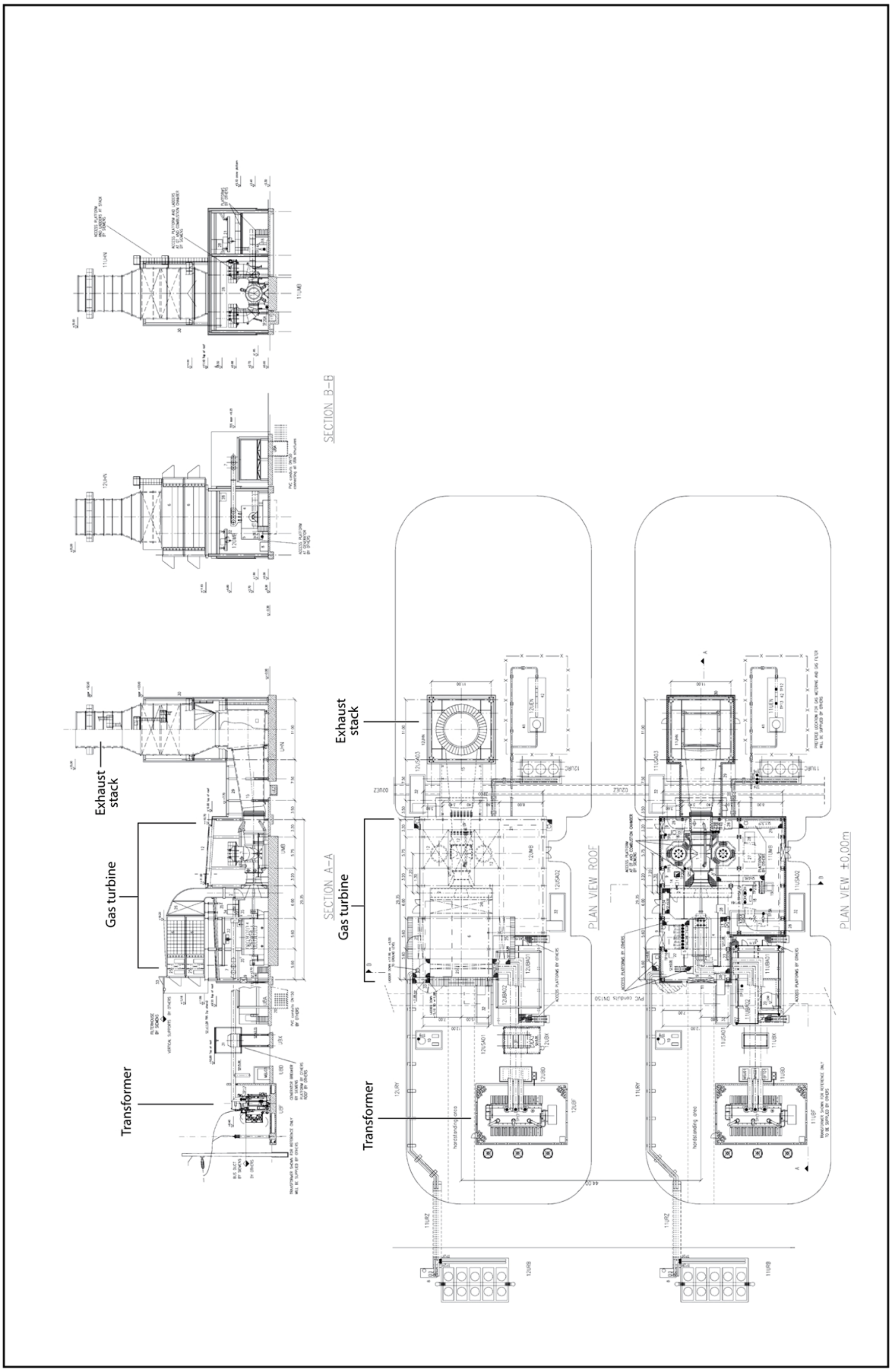
7.1.1 Open-cycle gas-fired turbines

The process used by an open-cycle gas-fired turbine to generate electricity is relatively simple; the turbine draws cooled, filtered air through a compressor, where it is mixed with natural gas and injected at high pressure into the combustion chamber of the turbine for combustion. Hot gases drive the turbine, which in turn drives the generator to produce electricity. The hot exhaust gases are vented to the atmosphere at high velocity and temperature (about 40 metres per second and 500°C respectively) via a 6-metre diameter, 35-metre high exhaust stack fitted at the end of each gas-fired turbine unit. Exhaust silencers would be fitted to minimise noise.

Details of a typical open-cycle gas-fired turbine are provided in Figure 7-5.

The project would entail the installation of four open-cycle gas-fired turbines. Each turbine would have a nominal capacity of 150 megawatts (MW) (depending on the manufacturer's specifications and detailed technical planning), with a total output capacity of approximately 600 MW. The gas-fired turbines would use dry, low oxides of nitrogen (NO_x) technology and, during normal operational mode, would be expected to achieve best-practice NO_x emissions for gas-fired power stations of 25 parts per million.

While some of the environmental assessments have been based on a Siemens model gas-fired turbine (see Chapter 9), this would not necessarily be the preferred solution — a final technology supplier would be selected during detailed design and would be required to comply with the environmental performance criteria and assumptions set out in this document.



Source: ERM Power

Figure 7-5 General arrangement for a typical open-cycle gas-fired turbine

Water would be required for evaporative cooling. To improve the performance of the gas-fired turbines, particularly during hot summer conditions, the inlet air stream to the gas-fired turbines would be cooled via an evaporative cooling system using demineralised water to cool the air before it enters the turbine's combustion chamber.

The gas-fired turbines would also be equipped for water injection, which is an efficient means of increasing maximum power output by up to 8% at times of concurrent high temperatures and high energy demand. NO_x emissions for this mode of operation would not exceed 35 parts per million.

7.1.2 Gas receiving facility

The gas receiving facility would be located within the proposed power station site (see Figures 7-3 and 7-5) and would comprise the following equipment:

- header pipeline connecting the facility to the gas-fired turbine facility
- an actuated isolation valve installed at the inlet to the facility
- gas filtration, heating and pressure regulation equipment
- over-pressure protection and emergency venting systems
- process control and communications equipment.

Header pipeline

The header pipeline would be constructed above ground to safely connect the gas receiving facility to the gas-fired turbines. Specifically, it would connect the pressure regulation station of the gas receiving facility to the inlet gas manifold of the gas-fired turbine facility. The pipeline would be designed to comply with requirements of Australian Standard *AS 4041 Pressure piping* and may be more than 100 metres long and approximately 450 millimetres in diameter. The actual dimensions of the header pipe would be determined during the detailed design phase.

Pressure regulation station

The pressure of the gas to be delivered to the gas-fired turbines would need to be regulated using a series of control valves. Because the proposed power station would comprise multiple gas-fired turbine units, it would be necessary to provide adequate control during the plant start-up, normal operations and plant shut-down (or trip). In principle, one valve would be smaller than the other, with the smaller valve designed to open first and the larger one opening when demand had sufficiently increased.

Safety features

Over-pressure protection would be provided at the facility via the following three methods:

- rapid control valve closure under process alarm conditions
- slam-shut isolation valve closure at the inlet to each control valve run
- pressure relief valve opening.

The pressure relief valve would protect the pipework from overpressure between the pressure regulation station and the proposed power station as a result of a sudden reduction in gas demand following a plant trip. The detailed design phase would analyse the capacity of the control valves and slam-shut valves to close in response to a plant trip signal, and determine whether the pressure relief valve can be eliminated from the design, minimising the potential for gas release.

The delivery facility would incorporate equipment to vent gas from the pipeline if required during an emergency situation, or to permit pipeline maintenance. The length and location of the vent pipeline required to provide the necessary safe release of gas would be determined during the detailed design phase.

Facility layout

A minimum separation distance of 100 metres between the gas receiving facility and turbines would be required to maintain an appropriate level of system performance, it may be necessary to vary this distance depending on specific design outcomes from the detailed design phase. The facility would require an area of approximately 50 metres by 50 metres to accommodate the pipeline terminal, pressure regulation station and a small control hut.

7.1.3 Ancillary services and infrastructure

Water storage

Water would be required for evaporative inlet cooling, water injection (if adopted), fire services and domestic use. Subject to Council approval, water would be sourced from a Council water main pipeline passing the site to the newly established Wellington Correctional Centre. Raw water would be required for the following activities:

- evaporative cooling for the gas-fired turbine inlet air cooler
- fire services
- domestic use.

It is anticipated that a small demineralised water plant would also be installed on-site, and storage tanks would be provided to store the town and demineralised water. Demineralised water would be required for the following activities:

- gas turbine water injection for power augmentation
- compressor washing.

Based on the expected operating profile of 4% annual capacity factor, the annual water requirement would be expected to be less than 20 megalitres. This water consumption is considered to be low and is unlikely to have a significant impact on the local potable water supplies.

Water management at the proposed power station is further discussed in Section 10.6.

Fuel storage

The gas-fired turbines would not use distillate fuel. As such, there would be no requirement to store bulk fuel on-site. However, a limited amount of diesel (approximately 2 x 200 litres) would be maintained on-site for use in the emergency diesel generator.

Chemical storage

Due to the nature of the proposed gas turbine facility, only minor quantities of chemicals and/or dangerous goods would be stored at the proposed power station site. These substances would generally be associated with day-to-day maintenance and house keeping activities, and would comprise small quantities of lubricant oils and cleaning chemicals. These substances would be stored within a designated bunded area within the administration building.

It is envisaged that the maintenance contractor would bring any materials required during major maintenance activities onto the facility and any waste materials would be taken off-site when the works were completed.

Transmission connection

The proposed power station would connect directly to TransGrid's Wellington substation via two short 330 kV circuits, which would be wholly contained on TransGrid's land surrounding the substation. Each of these circuits would join the output of two generating units on approximately 40-metre high double circuit lattice steel towers adjacent to the proposed power station. The northern circuit would connect to a gantry structure at the southern end of TransGrid's substation. The southern circuit would connect to the northern end of the substation and undercross existing circuits entering the substation from the east (see Figure 7-4). Intermediate structures would comprise concrete or wood poles up to approximately 24 metres in height. Minor alignments of existing circuits would be contained within TransGrid's land. Only minor modifications would be required to the substation itself.

Air pollution control

The gas-fired turbines would use dry, low NO_x technology, and during normal operational mode, would be expected to achieve the best practice NO_x emissions for gas-fired power stations of 25 parts per million, which would comply with the regulatory emission limits stipulated by the Protection of the Environment Operations (Clean Air) Regulation 2002.

The monitoring of emissions to air required for the project would comprise:

- in-stack sampling of emissions on commissioning and at regular intervals thereafter
- passive gas sampling of the ambient air to ensure pollutant concentrations are low.

Other air emission control equipment is generally not required for peaking plants. However, all appropriate controls would be included in the finalisation of the detailed plant design.

Emergency generators

An emergency diesel generator of 500 kilovolt-amps would be installed to provide emergency power in the event that electrical connection to the transmission network was lost. This generator would require minimal diesel to be stored on-site.

Fire protection

Fire detection and suppression systems conforming to the National Fire Protection Association 850 *Recommended Practice for Electric Generating Plants and High Voltage Direct Current Converter Stations* would be installed at the site, with prescribed fire-fighting water systems, spray deluge systems, carbon dioxide fire suppression systems and portable fire protection equipment.

A comprehensive fire alarm and detection system would be installed at the proposed power station site to monitor conditions. A gas leak detection system and installation of quick response emergency isolation valves, and a remotely activated shut-off system would also be installed at key areas of the facility to ensure safe shut-down of the gas turbines in the event that a dangerous situation was detected by the system.

Fire safety, and hazard and operability studies would be conducted during the detailed design phase to ensure any such hazards were managed and controlled in a safe, effective manner, thus minimising risks to human life and the environment — both within the proposed power station and at the adjacent substation.

Fire training exercises and general staff education would be conducted on a regular basis to ensure the operational readiness of the staff and corresponding fire-fighting equipment.

Subject to Council approval, fire-water would be sourced from a Council water pipeline passing the proposed site. The fire safety assessment mentioned above would assess whether or not additional fire-water storage capacity would be required to meet the fire-water supply requirements (in terms of pressure and flow) of the proposed power station.

Emergency response

When the detailed design of the proposed power station is completed, an operational environmental management plan (OEMP) would be developed prior to commissioning. The plan would include strategies for risk management and emergency response, and would be subject to review by appropriate stakeholders and relevant agencies including NSW WorkCover, the NSW Fire Brigades and Rural Fire Service. Strategies relating to risk management and emergency response would include:

- design specifications for layout, selection of materials, construction and operation of the facility preventative measures
- specific details of natural gas handling, metering and management procedures
- control measures
- non-technical measures including organisational and systems measures
- safety training
- emergency plans (on-site and off-site)
- monitoring
- incident and safety reporting
- community consultation and information.

In accordance with NSW emergency response practices, an evacuation zone would be established around the proposed site for emergency events (e.g. 1–2 kilometres). The Wellington Fire Brigade would provide emergency response to off-site hazardous material incidents. The emergency procedures and the OEMP for the proposed power station would include fire and spill response for any off-site or transportation incidents, and remediation.

These risk management approaches would follow the *National Standard for the Control of Major Hazard Facilities* developed by the National Occupational Health and Safety Commission. A copy of the approved plan would be issued to the local State Emergency Services and the NSW Fire Brigade for their information. All emergency response procedures would be revised and adapted as new industry standards are established.

Process control

The proposed gas-fired power station would be controlled using screen-based monitors.

Facility security

The facility would be security-fenced to restrict unauthorised access and a closed-circuit camera system would be installed for site security.

7.2 Gas pipeline

The proposed gas pipeline would comprise a 350-millimetre diameter lateral steel pipeline connecting the Central West Pipeline near Alectown to the proposed power station. The lateral pipeline would also be equipped with a small compressor station near the off-take point to pack the pipeline with gas for use by the proposed gas-fired turbine facility (refer Section 7.3). The gas supply concept comprises the following key components:

- an underground pipeline (approximately 100 kilometres) connecting the Central West Pipeline Alectown to the proposed power station at Wellington
- an inlet facility near the off-take point to the Central West Pipeline near Alectown, including a small compressor station, flow control, metering and safety systems
- a delivery facility at the proposed power station site containing pressure regulation and safety systems to deliver natural gas to the proposed power station site
- two aboveground pipeline main line valves, located at approximately 30-kilometre intervals along the pipeline.

With the 100-kilometre pipeline full of stored natural gas, the proposed power station would be provided with approximately 3 days of gas supply for electricity generation.

It is proposed that a gas pipeline easement would be negotiated between ERM Power and the land owners directly affected by the proposed pipeline route. The width of the operational gas supply easement would be approximately 20–25 metres. Within this easement, the pipeline would likely be offset to one side to enable sufficient space to undertake maintenance or repairs on the pipeline.

A brief description of each of the above components is provided in the subsequent sections. Figures 7-6, 7-7, 7-8 and 7-9 provide details of the key components of the proposed gas supply concept.

7.2.1 Pipeline design and installation details

The pipeline design would comply with the requirements of Australian Standard *AS 2885-2007 Pipelines: Gas and liquid petroleum* and *Dangerous Goods (General) Regulation 2007* and would be required to operate at high pressure to meet the gas supply requirements of the proposed power station. A summary of the key design parameters of the proposed gas pipeline is provided in Table 7-1. The proposed pipeline installation details are shown in Table 7-2.

Table 7-1 Proposed pipeline design parameters[1]

Parameter	Value
Maximum design pressure	15.3 megapascals (MPa)
Maximum operating pressure	12.0 MPa
Minimum operating pressure	2.5 MPa
Length	100 kilometres (approximately; subject to detailed alignment)
Outside diameter	350 millimetres
Wall thickness	6.2 millimetres (minimum)
Coating	HDPE fusion-bonded epoxy or tri-laminate
Compressor size (inlet facility)	< 3 MW
Compressor type and driver	Reciprocating gas engine

Note: 1: These parameters may change during the detailed design phase

Table 7-2 Proposed pipeline installation details[1]

Parameter	Value
Burial depth to top of pipe	750 millimetres (minimum for land)
	1,200 millimetres (minimum for railway and road crossings, when in proximity to residential housing and at other locations where there is an increased risk of external interference)
	1,200 millimetres (power station site)
Corrosion protection	▪ External coating of pipeline. ▪ 'Holiday' detection (testing of coating integrity) prior to burial. ▪ Impressed current cathodic protection system. ▪ Gas quality with minimal corrosion-enhancing components. ▪ Intelligent pigging to assess pipeline condition.
Induced AC control	▪ Pipeline electrically isolated from upstream and downstream facilities. ▪ Earthing systems installed to provide personnel protection in accordance with AS 4853 in locations where the pipeline is installed near high-voltage powerlines.
Corrosion monitoring	Test points installed at nominal intervals of 2 kilometres
Marker signs	In accordance with AS 2885.1 and warning marker tape installed over pipeline

Note: 1: These parameters may change during the detailed design phase

During the detailed design phase of the project, the design and installation parameters of the gas pipeline would be determined. Table 7-1 identifies a proposed minimal pipeline wall thickness of 6.2 millimetres. This was calculated based on a proposed minimum operating pressure of 12 MPa and a pipeline diameter of 350 millimetres. Heavy wall thickness pipe may need to be provided at locations where there is an increased risk of external interference. This would also reduce the likelihood of corrosion resulting in pipeline releases.

In rural locations, AS 2885 requires a minimum depth of cover to the top of a pipeline of 750 millimetres. However, as identified in Table 7-2, additional depth of cover would be required where the pipeline route passes near residential housing, at road and rail crossings, and at other locations where there is an increased risk of external interference (including at the proposed power station site).

7.2.2 Pipeline mainline valves

The principle purpose of mainline valves is to enable sections of the pipeline are isolated in the event of damage or programmed maintenance. Given the length of the pipeline, two mainline valves would be required, positioned at intervals of approximately 30 kilometres.

Mainline valves include above-ground infrastructure and are typically housed in security-fenced and gravelled areas of approximately 25 metres by 25 metres. Minimal ancillary infrastructure would be required at the mainline valve stations, although solar panels may be installed for valve instrumentation and control, and for security lighting purposes.

Figure 7-6 Proposed gas pipeline route section A

2116720A_2135_Fig7_6_Proposed_gas_pipeline_A.mxd GK March 19, 2008

Pipeline centreline
Alternative route
Major roads
Minor roads
Local roads
Rail line
Major drainage
Water body
National parks

0 1 2 Kms

Figure 7-7 Proposed gas pipeline route section B

2116720A_2136_Fig7_7_Proposed_gas_pipeline_B.mxd GK March 19, 2008

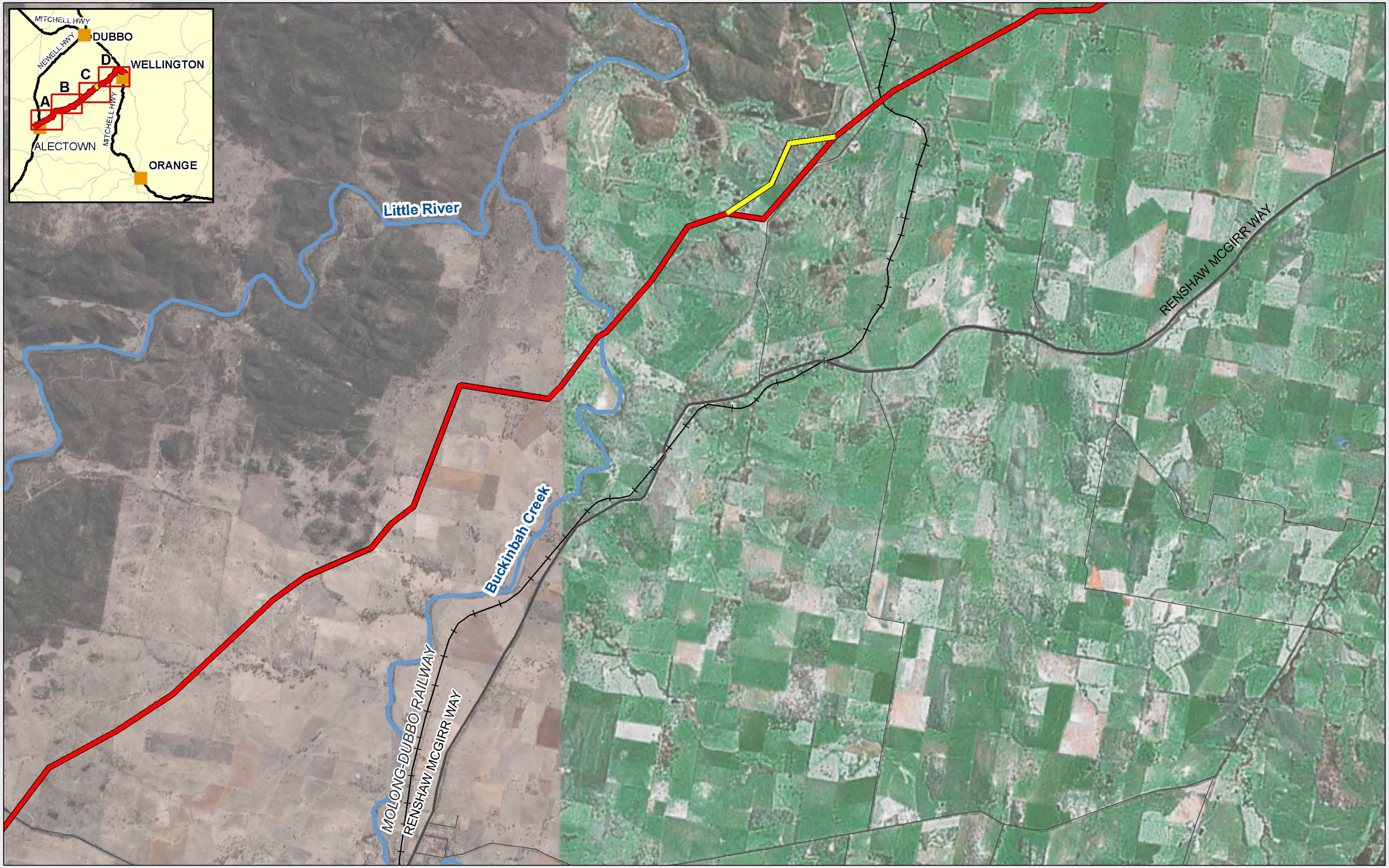
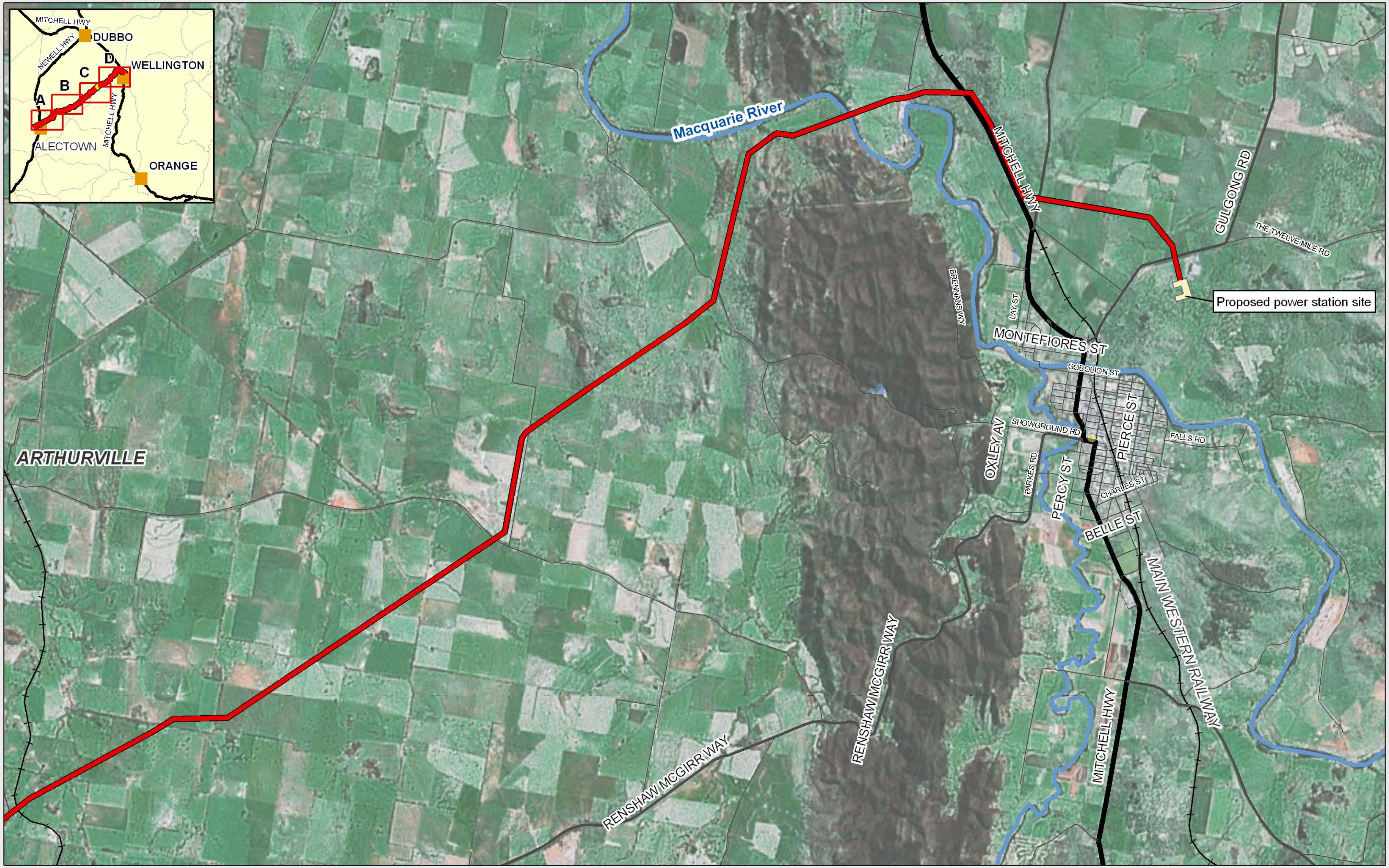


Figure 7-8 Proposed gas pipeline route section C

2116720A_2137_Fig7_8_Proposed_gas_pipeline_C.mxd GK March 19, 2008



Pipeline centreline
Alternative route
Proposed power station site
Major roads
Minor roads
Local roads
Rail line
Major drainage
Water body
National parks

0 1 2 Kms

Figure 7-9 Proposed gas pipeline route section D

7.3 Compressor station

The compressor station (or pipeline inlet facility) would be designed for remote, unattended operation. It would be constructed near the Central West Pipeline on land that would either be purchased or leased for this purpose. The pipeline inlet facility would comprise the following equipment:

- inlet shut-off valve
- a gas compressor station comprising two reciprocating gas compressors and an associated reciprocating gas engine inside a fully enclosed and ventilated building, equipped with noise suppression insulation to minimise noise emission levels
- exhaust vent stack
- pipeline inlet valve
- gas filtration, custody transfer metering and flow control
- compressed-gas cooling
- process control and communications equipment.

An indicative layout of the proposed pipeline inlet facility is provided in Figure 7-10.

The location of the pipeline inlet facility (where the gas pipeline connects to the Central West Pipeline) would meet relevant TransGrid and AGL gas network requirements. Its indicative location and orientation has been selected such that it would not adversely affect the future use of the surrounding land.

Gas cooling

Gas compression, particularly at relatively high compression ratios, raises gas temperature. Consequently, the gas must be cooled prior to delivery into the lateral pipeline. The project assumes that an air-cooled heat exchanger would be installed at the compressor discharge point.

Facility layout

The compressor station facility would require a land area of approximately 200 metres by 500 metres (see Figure 7-10). The facility would be security-fenced to prevent unauthorised access.

The facility would comprise two separate compressor enclosures, each enclosure being a lightweight prefabricated structure designed for noise attenuation. The compressor buildings would likely be 5 metres by 10 metres in area and 4 metres tall. A minimum separation distance of 40–50 metres would be maintained between the compressors and the exhaust vent stack.

Safety features

The compressor buildings would be ventilated to control heat build-up. A number of critical safety devices would also be incorporated into the design of the building to ensure the safe operation of the facility. Proposed safety devices include:

- building ventilation fans
- gas detectors installed at the ventilation outlet
- actuated isolation and vent valves installed outside the building
- a process control and monitoring system.

The compressor buildings' ventilation fans would be started if gas was detected at 25% of the lower explosion limit. The compressor station would be tripped (shut down) if gas was detected at 50% of the lower explosion limit. Any ultra-violet and/or infra-red signals would also trip the gas turbine and inlet facilities.

The compressor station would be monitored and controlled using computerised process control and monitoring equipment. The status of the inlet facility would be remotely monitored at control rooms located within the proposed power station. Appropriate response actions would be taken by operating staff in the event that abnormal or unsafe conditions were detected by the control system.

A preliminary hazard analysis has been conducted for the proposed compressor station (see Section 9.7). However, the final design and operation of the pipeline inlet facility would be subject to rigorous hazard identification and prevention processes to ensure the facility's operation meets all relevant safety standards and regulations.

7.4 Operation of the project

7.4.1 Power station

The proposed power station would operate mostly during summer, when there is likely to be a greater peak demand for electricity. The proposed power station would only come on-line during peak demand periods or in response to system emergency or black out conditions.

The proposed power station would be available to provide electricity 24 hours per day, 365 days per year. However, it is expected that the proposed power station would have an annual capacity factor of around 4% — this equates to between 350 hours per year (all four gas turbines operating) and 1,400 hours per year (one gas turbine operating) of operation. In practice, two or three gas turbines would likely run simultaneously and, accordingly, the annual hours of operation would be approximately midway between 350 and 1,400 hours.

It is expected that only six full-time personnel would be employed, with shifts likely to run from 7 am to 6 pm Monday to Friday. As such, a maximum 6–8 vehicles per day would be expected. Vehicles delivering small amounts of hazardous materials (e.g. 1–1.5 tonnes of sulfuric acid and/or caustic soda) to the site would be expected approximately every 6 months during operation of the proposed power station.

ERM Power would apply to the Department of Environment and Climate Change for an Environment Protection Licence for the facility following the completion of commissioning activities and prior to the commencement of operations.

7.4.2 Gas pipeline

Patrol officers would conduct weekly inspections along the nominated gas pipeline easement. These officers would monitor the status of the pipeline inlet facility and underground pipeline to ensure no activities were taking place within the easement that could jeopardise the safety of the pipeline. Vehicular access along the easement would be oriented to minimise damage to vegetation, and would generally occur via farm tracks and across open paddocks.

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Proposed pipeline route
Major roads
Rail line
Minor roads

Figure 7-10: Indicative layout of the proposed compressor station

0 50 100 Metres

7.5 Construction of the project

A detailed construction staging plan and methodology would be determined by the appointed contractor prior to commencement of construction. This plan would need to be in agreement with all applicable conditions of approval and other statutory requirements. Consequently, details of the actual construction methodology and staging described below could vary due to detailed design changes and subsequent stakeholder consultation.

7.5.1 Construction period

Construction of the proposed power station would be expected to take 18–20 months. Construction of the gas pipeline would be expected to take 12–14 months, with construction of the pipeline inlet facility (compressor station) expected to take 3 months.

Construction activities would be undertaken between 7 am and 6 pm Monday to Friday, and 8 am to 2 pm Saturday. No work would be undertaken on Sundays or public holidays. Should the project require construction activities to be undertaken outside these times, approval from the relevant regulatory authorities would be sought and affected residents notified.

7.5.2 Power station

Site preparation works

Construction of the proposed power station would involve earthworks and site preparation works, construction of concrete footings and pads, and installation of associated pipework, controls, power and other ancillary services.

The land upon which the proposed power station would be located is undulating — the elevation varies approximately 10 metres across the site. Consequently, cut and fill would be required to ensure the gas-fired turbines are positioned on even ground. Assessment of the proposed indicative layout determined that earthworks would be minimised if the gas-fired turbines and associated plant were positioned at a relative level (RL) of 331 metres. Much of the other infrastructure associated with the proposed power station site could potentially be located at a slightly higher or lower elevation, subject to the need to safeguard against visual impacts, thus minimising the amount of cut and fill required.

The final layout and elevation of the proposed power station would be determined during the detailed design phase of the project (see Section 7.1). As such, for the purposes of this assessment, it has been assumed that the entire footprint of the operational infrastructure for the proposed power station would be positioned at an even elevation (RL 331 metres).

During construction, the site would also include a construction car park and a lay-down area (see Figure 7-11). These would be decommissioned upon completion of construction, and constructed to minimise impact on the environment.

All excavated material found to be suitable would be re-used as backfill material on-site and at other construction sites associated with the project. Material unsuitable for this purpose would be retained on-site for landscaping purposes, where possible. Any spoil unsuitable for on-site re-use would be transported to an appropriately licensed landfill for disposal.

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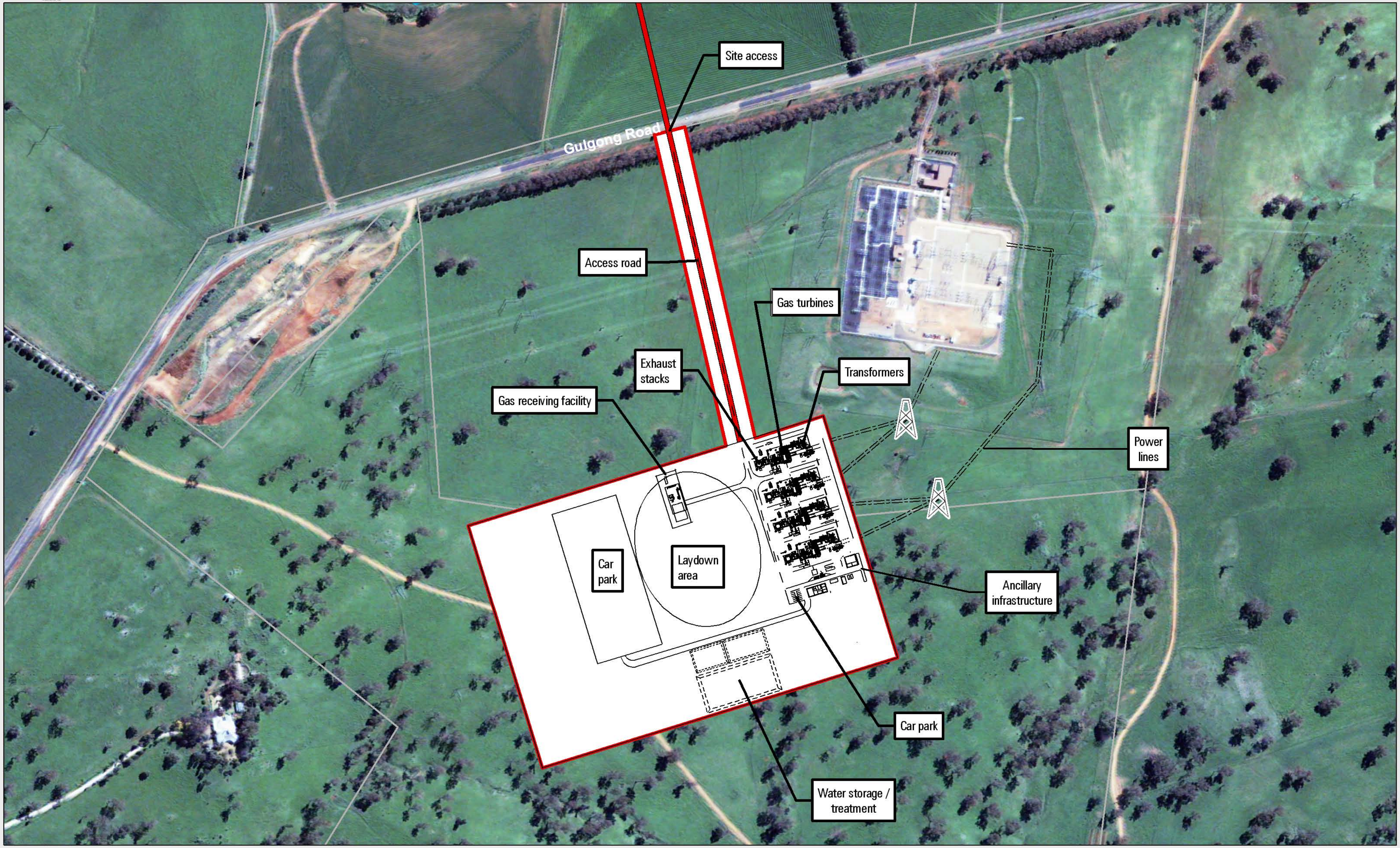

Access road
Construction boundary
Power lines
Proposed pipeline route
2 m contours
10 m contours
Transmission line towers

Figure 7-11 Indicative construction layout of the proposed power station site

0 50 100 200
Metres

2116720A_2120_Fig7-11_Construction_boundary.mxd GK April 14, 2008

Once the concrete footings are laid, the remainder of the works would entail the placement and installation of largely pre-fabricated plant equipment.

The appointed construction contractor would be required to prepare a waste management plan prior to the commencement of works to ensure appropriate re-use and recycling measures are implemented, where possible or feasible, at all stages of the construction period.

Given that the site has been in long-term grazing use, the site is unlikely to be contaminated. As such no contaminated land assessment has been undertaken as part of this Environmental Assessment.

Transport of plant and equipment

The proposed power station comprises a number of very heavy plant items, including the turbines, generators and transformers. Transport of these items would require significant planning and coordination to ensure the route used to transport the equipment is safe, and able to withstand the loads and height clearances imposed by the type of equipment being transported.

The equipment would most likely arrive at the Port of Newcastle, where it would be loaded onto purpose-built trailers designed to carry large and heavy loads. From there it would be transported to the site via an appropriate route.

A specialist heavy equipment transport contractor with specific experience in lifting and transporting this type of equipment would be engaged to undertake this. The contractor would design and confirm the proposed route and obtain the necessary approvals from the relevant authorities to carry out the task.

Once all relevant approvals are obtained and any route preparations are completed, the task of actually transporting each item of heavy plant to the site would take a few days.

Construction workforce, plant and equipment

Throughout construction of the proposed power station, mechanical, electrical and civil personnel would comprise the majority of the workforce. The workforce would be expected to peak at around 200 personnel on site per day, which would persist for a few months during the core construction activities. On either side of this peak period, during preparation and commissioning, daily workforce numbers would fluctuate between approximately 10 and 150 personnel.

Table 7-3 outlines the anticipated construction vehicles and equipment required for the duration of the proposed power station construction phase.

Table 7-3 Estimated power station construction vehicles and equipment

Vehicle type	Maximum volume during construction[1]
Light vehicles	75 per day
Concrete/gravel trucks (approximately 5 cubic metres)	800 over the construction period (9 per day for 3 months)
Semi-trailers (26 tonne)	104 over the construction period (for transport of plant)
B-Double (40 tonne)	8 over the construction period
Licensed loads (2 x 5 trailer and low-loader)	8 over the construction period

Note: 1: Volumes indicate one-way traffic

Based on the information provided in Table 7-3, the estimated maximum daily movement of vehicles can be determined as: 75 light vehicles, 9 concrete trucks, up to 2 semi-trailers and 1 B-double. This equates to 150 two-way vehicle movements and 24 two-way truck movements.

There may be a requirement for the import of construction-quality spoil. However, most surplus material excavated within the site would be used for fill or as landscaping within the proposed power station site. Traffic associated with spoil import (and export, if required) would be determined following geotechnical testing and design development.

Parking during the construction phase would be within the proposed power station site at all times (see Figure 7-11).

7.5.3 Gas pipeline

The proposed gas pipeline would be constructed using either open-cut trenching or directional drilling methods. The preferred pipeline construction method would depend on the physical circumstances along the pipeline route (including geotechnical conditions) and detailed design constraints. It is anticipated that open-cut trenching would be the dominant construction method (see Figure 7-12). Directional drilling or microtunnelling would be used where trenching is not possible due to the presence of surface obstacles such as roads, rail or major watercourses (see below). A brief description of these construction techniques is provided below. The construction techniques likely to be used at key locations along the pipeline are also discussed.

Gas pipeline installation

The key steps involved in gas pipeline installation process would be as follows:

- excavating a trench approximately 1 metre wide and 1.2 metres deep using a trenching machine, within the excavated material be suitably stored within the working strip to minimise loss due to wind and water erosion
- preparing the pipeline bed by placing, compacting and levelling a suitable grading of sand or soil to ensure the pipeline and its protection would not be damaged
- stringing, welding and laying the pipe lengths
- backfilling and compacting the trench to appropriate standards
- hydrostatic testing of the pipeline to prove strength and the absence of leaks
- restoring the surface cover with topsoil and either replacing with previously existing vegetation (on agricultural land) or native vegetation root stock (in naturally vegetated areas) to re-establish the vegetation disturbed during the construction period.

Typically, the construction footprint would be the length of the pipeline and the width of the construction zone. This would include a vehicle access track, the trench, spoil stockpile and pipe-length stockpile. The width of the construction zone would typically be 25–30 metres in open space areas and approximately 10 metres in areas where there may be sensitive ecological communities or existing structures such as transmission towers. The width of the construction zone would be selected to minimise impact on farming activities, and agricultural infrastructure and management.

Hydrostatic testing

Once the pipeline has been installed and backfilled it would be hydrostatically tested at a pressure of at least 1.25 times the rated or design maximum operating pressure, to demonstrate its integrity and establish the actual maximum operating pressure. Because the pipeline would be fitted with two mainline valves, one-third of the pipeline could be hydrotested at a time, with the water subsequently transferred into the next two sections of the pipe and testing undertaken. Consequently, an estimated 3.3 megalitres of water would be required for hydrostatic testing.

Hydrotesting procedures, including water sourcing and disposal, would be determined during the detailed design. Water could be sourced from the main town supply but could also be sourced from a local dam or bore. Approvals would be obtained from the necessary authorities and land owners. Due to the extended length of time the water would be in the pipeline, it would need to be treated with an oxygen scavenger to inhibit corrosion, and may be treated with a biocide to kill any biological organisms. As such, the water may not be suitable for crop irrigation or stock watering. However, reuse of the water would be maximised where possible, either on the project site or surrounding land (the latter in consultation with land owners). Any water unable to be reused would be disposed of in accordance with environmental standards and the wastewater management principles outlined in Section 10.6.

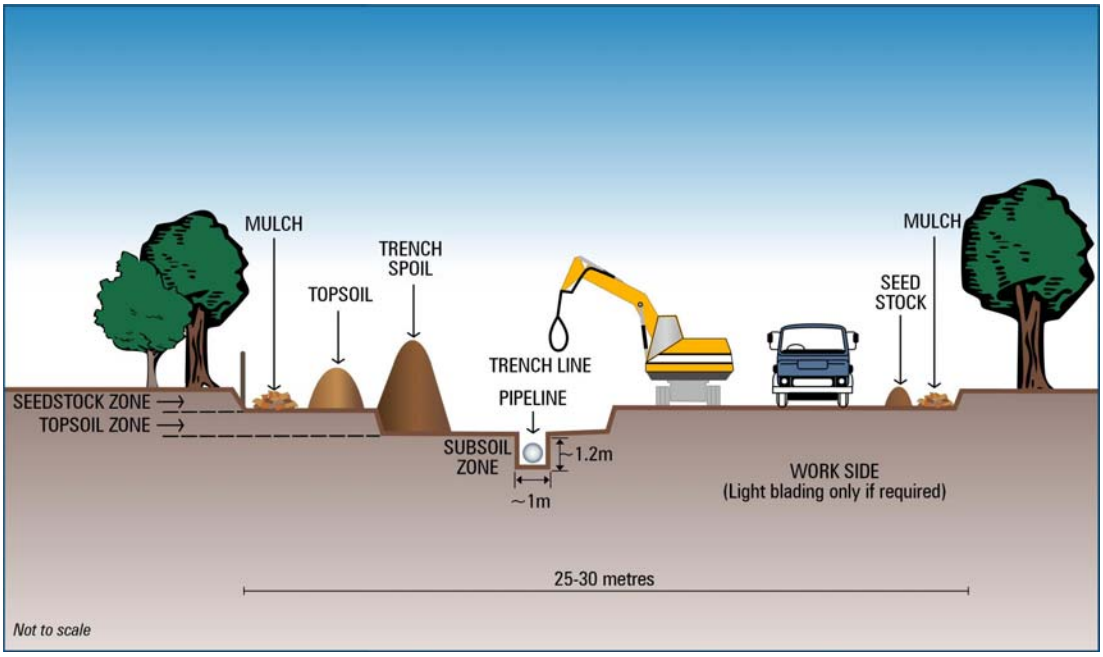

Figure 7-12 Typical cross-section of pipeline construction corridor

Directional drilling

Directional drilling is a non-disruptive construction technique that would be used to cross major roads, rail crossings, the Macquarie River and sensitive environmental areas. The technique involves drilling a hole along a pre-determined alignment to allow the pipe to be pushed/pulled into a borehole. Spoil is then removed to the surface. Drilling equipment would be guided by the drill head, which would steer the pilot hole in the desired direction before reaming operations. A tracking system could also be used to ensure the drill stays on course.

Drilling and pipe installation activities would generally be carried out from launch and retrieval pits, located at either end of the directional drill. The launch pit would contain the drilling rig, power source for the drill rig, drill rods, pipeline lengths and general site equipment.

Bentonite slurry would be used to lubricate the cutting head and drilling equipment, and to transport drill cuttings to the surface. Bentonite is a non-toxic, naturally occurring clay, and would be processed and re-used in the drilling process. The launch pit would also contain a drilling-mud processing plant to remove drill cuttings from the drilling fluid. Care would need to be taken when disposing of the slurry.

The launch and retrieval site layouts would be configured to avoid trees and other sensitive sites during the detailed design and installation phases of the project. Both the launch and retrieval sites would be fenced and made secure, with site access control implemented as appropriate. An area would also be required to lay out the pipe before it is installed into the borehole; this area would be selected to minimise impact on sensitive areas. The welded pipe section used in the directional drilling pull would be pretested to prove its strength and ensure it is leak-tight prior to installation.

Microtunnelling

Microtunnelling is another non-disruptive construction technique that would be used to cross major transport services and environmentally-sensitive areas. It is a particularly accurate technique with good control, allowing installation of very flat grades. Microtunnelling would require the construction of a launch shaft from which a remote-controlled tunnelling shield would be launched and behind which a succession of smooth-walled pipes would be jacked. Pipe or pipe segments would form a tunnel beneath the physical obstruction when the shield reached the destination or reception shaft. The tunnel would be lined with a concrete or steel casing heavy wall pipe.

Excavated spoil would be removed by an auger flight or by mixing with water and pumping to the surface for treatment and disposal. Bentonite may be used to lubricate pipes through areas of resistance.

Once the tunnel has been constructed and the pipeline inserted, the annulus between the two would be filled with cement grout to preserve the integrity of the cathodic protection system and subsequently reduce the need for maintenance.

Railway crossings

Two railways would be crossed by the proposed gas pipeline: the Bowenfels–Dubbo Line of the Main Western Railway (approximately 7 kilometres north-north-west of Wellington) and the Molong–Dubbo Railway (approximately 3.5 kilometres north of Walner) (see Figures 7-8 and 7-9).

These railway crossings would require the gas pipeline to be installed using a non-disruptive technique under the railways, most likely either directional drilling or microtunnelling. Installation techniques would be designed in accordance with Australian Standard *AS 2885.1 Pipelines: Gas and liquid petroleum and AS 4799 Installation of underground utility services and pipelines within railway boundaries* and the American Petroleum Institute's Standard *API RP 1102 Steel pipelines crossing railroads and highways*. The final crossing designs would be determined after detailed consultation with, and approval from, the Australian Rail Track Corporation.

Highway crossings

Two major highways would be crossed by the proposed gas pipeline: the Mitchell Highway (approximately 7 kilometres north-north-west of Wellington) and the Newell Highway (approximately 3.5 kilometres north of Alectown) (refer Figures 7-6 and 7-9).

These highway crossings would require the gas pipeline to be installed using a non-disruptive technique under the highways, most likely directional drilling. The minimum length of the directionally-drilled pipe would be 200 metres, which would allow the pipe to be installed beneath the full width of the highways; the actual length constructed using directional drilling would be determined during the detailed design phase and would be based on factors such as the profile of the crossing, the soil conditions and the flexibility of the pipe used in the crossings.

Installation techniques would be designed in accordance with the requirements of Australian Standard *AS 2885.1 Pipelines: Gas and liquid petroleum* and the American Petroleum Institute's Standard *API RP 1102 Steel pipelines crossing railroads and highways*. The final crossing designs would be determined after detailed consultation with, and approval from, the NSW Roads and Traffic Authority.

Minor road crossings

Although the proposed gas pipeline route has been selected to minimise the number of road crossings, as it would be approximately 100 kilometres long, many minor road crossings are unavoidable. Approximately 20 of the minor roads that would be crossed are managed by the Cabonne, Parkes or Wellington local government areas (LGAs), some are managed by the Department of Lands (Crown), while others appear to be associated with residences. The majority of the minor roads crossed by the proposed pipeline route are unsealed.

For the majority of minor roads, the construction technique used to install the proposed pipeline would be open-cut trenching. To allow such construction, traffic management measures (e.g. temporary closure or diversions) would need to implemented.

During the detailed design phase of the project it may be discovered that the traffic volume on some of the minor roads is considerable, such that open cut-trenching may not be an appropriate installation technique. In such cases, alternative techniques (e.g. directional drilling) would be considered.

Installation techniques would be designed in accordance with Australian Standard *AS 2885.1 Pipelines: Gas and liquid petroleum*. The final crossing designs would be determined after detailed consultation with local Councils, the Department of Lands (Crown) and land owners, as appropriate.

Disturbance to local road networks due to open cut trenches or directional drilling activities across roads would be minimised.

Watercourse crossings

The proposed gas pipeline would undercross one major river, the Macquarie River, approximately 7.5 kilometres north-west of Wellington (see Figure 7-9).

The crossing of the Macquarie River would require the gas pipeline to be installed using a non-disruptive technique under the river, most likely directional drilling. Such a construction technique would minimise impact on the river's flow and its surrounding riparian areas. The crossing would be designed in accordance with the requirements of Australian Standard *AS 2885.1 Pipelines: Gas and liquid petroleum* and would be undertaken after detailed consultation with the Macquarie River's consent authority.

The land through which the proposed gas pipeline traverses has many small creeks and ephemeral streams. As such, although the route was selected to minimise the number of creek crossings, more than 20 crossings of small creeks and ephemeral streams would be made by the proposed gas pipeline across the 100 kilometres. Open-cut trenching would be the preferred construction technique across these small watercourses, which would be best undertaken when dry.

Electricity transmission easement crossings

The proposed gas pipeline would need to cross a number of electricity transmission line easements, as follows:

- 7 x 132 kV transmission lines
- 2 x 66 kV transmission lines.

Two of the 132 kV lines and one of the 66 kV lines are crossed at the proposed power station site where the lines connect to TransGrid's substation.

TransGrid requirements stipulate that all excavation works are to take place at least 15 metres from any transmission tower or other infrastructure within an electricity transmission easement.

Installation techniques would be designed in accordance with Australian Standard *AS 2885.1 Pipelines: Gas and liquid petroleum*. The final crossing designs would be determined after detailed consultation with, and approval from, TransGrid and other relevant authorities.

Undertaking construction activities near active high-voltage powerlines requires significant efforts to ensure the safety of construction workers. Consequently, all construction works undertaken for the project near such power lines would be carried out in accordance with the Electrical Supply Association of Australia's *National Guidelines for the Safe Approach Distances to Electrical Apparatus*. The pipeline construction contractor would be required to prepare work procedures and safe work method statements to ensure the works activities strictly comply with these guidelines.

Water supply crossings

The proposed gas pipeline would need to cross the Parkes to Peak Hill Water Supply. This would occur at the western end of the pipeline near Alectown.

The Parkes to Peak Hill Water Supply pipeline is constructed of asbestos cement pipe. It is, by nature, very brittle and is typically buried 600–700 millimetres below the surface (*pers. comm.* Parkes Shire Council 2007).

During the detailed design phase of the project, consultation with Parkes Shire Council would be undertaken to ensure construction of the gas pipeline would not threaten the integrity of the Parkes to Peak Hill Water Supply.

Construction workforce, plant and equipment

Pipeline construction would proceed progressively along the route with approximately 70% of the construction personnel concentrated in a 5–7-kilometre section of the pipeline at any time. Around 80 personnel and associated vehicles would be required along the pipeline at any one time. A peak workforce of around 100 personnel would be expected.

A construction camp would need to be established approximately halfway along the pipeline. Design, construction, maintenance and management of this camp would be determined during the detailed design, and would be undertaken in accordance with the principles of best practice management to minimise impact on the environment and surrounding land uses.

Construction of the proposed gas pipeline would be undertaken in the following tasks:

- fencing (temporary fencing and reinstatement)
- clear windrow and topsoil separation
- pipe haul and string
- excavation
- directional drilling (where required)
- welding X-ray joint and wrapping
- pipe lay
- back fill and top soil spread
- installation of mainline valves
- signage
- hydrostatic testing
- seeding and restoration.

Vehicles and equipment required for construction of the proposed gas pipeline would vary from task to task, but would generally include:

- 4WDs and minibuses
- graders
- dozers
- excavators
- back hoes
- trenching machines
- drilling rigs
- tip trucks
- tray trucks
- semi-trailers
- front-end loaders
- mobile cranes
- tractors.

Most tasks would require a one-off delivery to site of equipment at the beginning of task start-up using semi-trailer floats and tip trucks. Other vehicular movements would include transport of workers to site each day by mini-bus or 4WD. A small number of deliveries would be expected to each site each day. The ‘pipe haul and string’ task would be the most intense in terms of heavy vehicle movements, which would include an estimated 10 semi-trailer deliveries per day.

7.5.4 Compressor station

Site preparation works

The land on which the proposed pipeline inlet facility would be located is flat and predominantly cleared of vegetation, having been used for many years for agricultural purposes. Consequently, very minimal vegetation clearance would be required. Similarly, minimal cut and fill would be required to ensure the pipeline inlet facility was positioned on even ground.

Construction of the proposed compressor station (or pipeline inlet facility) would involve earthworks and site preparation works, construction of concrete footings and pads, and installation of associated pipework, controls, power and other ancillary services. Once the concrete footings were laid, the remainder of the works would entail the placement and installation of largely pre-fabricated plant equipment.

The appointed construction contractor would be required to prepare a waste management plan prior to the commencement of works to ensure appropriate re-use and recycling measures are implemented, where possible or feasible, at all stages of the construction period.

Given that the site has been in long-term grazing use, the site is unlikely to be contaminated. As such no contaminated land assessment has been undertaken as part of this Environmental Assessment.

Transport of plant and equipment

The proposed pipeline inlet facility comprises a few large and heavy plant items, namely the gas compressors. Transport of these items would require planning and coordination to ensure the route used to transport the equipment is safe, and able to withstand the loads and height clearances imposed by equipment being transported. This would be undertaken in the same manner as described for the proposed power station in Section 7.5.2.

Station installation

Other than the compressors, all facilities (i.e. gas filters, metering, etc.) would be delivered as preassembled skid-mounted packages and the mechanical installation would be limited to the pipework necessary to connect the various pieces of equipment. The compressors themselves are also a skid package and would require minimal site installation. The compressor buildings may or may not be in place when the compressors are delivered — this would be determined during the detailed design.

The control room would likely be a prefabricated building delivered to site with control panels, UPS and lighting installed. As such, minimal installation would be required.

The control cabling, power cabling and earthing systems associated with the facility would need to be installed on-site.

Construction workforce, plant and equipment

Construction of the compressor station is expected to take approximately 3 months. It would require a multi-disciplined labour force totalling around 24 personnel with a peak of 15–16 personnel on site at any time.

Construction of the compressor station would occur in three distinct stages: civil works, mechanical works and electrical works. Approximately 20 light vehicles would be present at all times during construction and 12 heavy machinery vehicles would be required for the first month. The vehicles and equipment required for construction of the proposed compressor station would be similar to that described for the proposed power station in Section 7.5.2.