Glen Innes

3

Project Description

3. Project Description

This section of the Environmental Assessment provides a detailed description of the works associated with the construction and operation phases of the proposed Glen Innes Wind Farm development. The components of the proposed wind farm project include the following items:

- up to 27 wind turbine sites located along the north-south Waterloo Range
- a substation and facilities and auxiliary services buildings
- underground electrical and control cables
- a short section of 132,000 or 66,000 volt overhead transmission line or underground cable for grid connection
- access tracks to turbine sites and the substation
- temporary construction facilities including a site office, parking and materials storage areas
- temporary and permanent meteorological masts
- optional items, include a mobile concrete batch plant and a quarry and crushing facility

The project design has been developed based on a number of considerations including energy resource analyses, likely equipment specifications, environmental studies and feasibility studies as well as issues raised during the community consultation program. Details of the design are described in the following sections.

It should be noted that the detail of the project may vary slightly from the detail described in this Chapter, as the design is refined following completion of any further site investigations or planning reviews and to address the conditions of approval and specific construction methods to be employed by the contractors.

In addition to the above matters, the number and model of turbines to be installed have not yet been confirmed. It is possible that a lesser number of turbines than the 27 identified in this Environmental Assessment will be installed, but all sites have been assessed and their final suitability will be determined through the planning approval process and the tender process for equipment supply.

3.1 Wind farm layout

The wind farm spans about 8.5 kilometres from north to south and about 3 kilometres from east to west with the 27 wind turbine sites located as shown in Figure 1.4. The layout has been developed in conjunction with consideration of the potential turbine specifications to take account of the following main technical and environmental objectives:

- maximise the wind farm electrical output
- maintain turbine spacings to minimise turbulence and airflow interactions between turbines
- avoid locations with unacceptable impacts on the flora and fauna and Aboriginal heritage values of the site
- maintain acceptable noise levels at adjacent residences
- accessibility in relation to delivery and construction of large turbine components
- achieve a wind farm scale required for project viability

It is considered that the proposed layout provides the optimum arrangement to address the above factors.

Table 3.1 indicates the general groupings of turbines, predominantly determined by those turbines on common topographic feature or with common access.

Table 3.1 - Wind turbine groups

Turbine Group	Number of Turbines	Turbine nos.	General Location
Substation	Not applicable		northern end of wind farm site near Sinclair Lookout and about 500 m south of Gwydir Highway
Northern	9	1 - 9	northern end of Waterloo Range from near Sinclair Lookout to about 500 metres south of Ross Trig Station
Central Eastern	4	10 & 20 - 22	small group of turbines about 1.5 km west of West Furracabad Road and north of Hillside Road
Southern	14	10B – 19	southern group located on ridges and isolated hilltops
Total	**27**	Note: Some sites numbered with letter prefix	

The estimated footprint of the areas required for the component parts of the wind farm development including temporary construction facilities are shown in Table 3.2.

Table 3.2 – Footprint of the project components and approximate area of disturbance

Project component	Approximate Dimensions	Estimated Area (hectare)	
		Long Term	Temporary
Turbine footings (27)	Each 18 by 18 metres	0.9	0
Turbine assembly hard-stand areas	Each 50 by 50 metres	5.7	0
Substation	80 by 50 metres	0.4	0
Facilities and auxiliary services building	10 by 20 metres	Included with substation	
New access tracks	8 metres wide by 14 km	11.2	1.5
33,000 volt underground cables	1 to 2m wide by 20 km	0	2.6
Underground ground connection	Less than 0.5 kilometres	0	0.1
Temporary construction facilities			
Site office	40 by 100 metres	0	0.4
Optional batch plant		0	0.3
Optional quarry and crushing facility	50 by 60 metres	0	0.5
Totals		**18.4**	**5.4**

Note: Parts of the cable routes will have more than one circuit.

While the total extent of the installed wind farm will be dispersed over the site length of about 8.5 kilometres, the actual area occupied by wind turbine footings and associated hardstands required for the turbine construction is only about 6.6 hectares (Table 3.2). The substation will require an additional 0.4 hectares. The new access tracks for the project will require about 11.2 hectares.

The area associated with the underground cables amounting to about 2.6 hectares will, once rehabilitated, still enable the current grazing activities to continue. Temporary construction facilities will be removed and the land restored and rehabilitated once construction has been completed.

The details of each of the component parts of the development are described in the following sections and in the associated figures. An outline of the construction and operational phases of the development is also provided in

Section 3.8. The expected time frame for the construction of the wind farm will be a minimum of six months and possibly up to 12 months.

3.2 Wind turbines

Each wind turbine will comprise several main component parts as described below. A schematic illustration of the proposed wind turbine proportions is shown in Figure 1.3.

Tower: The supporting structure will be a tapered steel tower fitted with internal ladder or lift. Its height will be about 80 metres and its approximate diameter will be 4.5 metres at the base and 2.5 metres at the top. To facilitate its production and transport the towers will be manufactured in three or four sections which will be assembled on site. The tower will be installed on a stub section embedded in the concrete footing.

Footing: The tower will be located on a reinforced concrete footing with a diameter of about 16 metres and approximately 1.3 metres thick. The base of the footing will be about 2 to 3 metres below ground level and the area above it will be backfilled with soil. An alternative arrangement at some sites could involve the top of the footing being above ground. This would only occur where strong rock is encountered prior to the target depth being reached during excavation. In such cases, rock bolting may be required to anchor the footing.

Turbine: Each turbine will be of the 3-bladed type with a rotor blade diameter of between 88 to 100 metres and a swept area of 6,084 – 7,857 m^2. The rotor rotation will be variable speed with a maximum rotation of about 18 revolutions per minute. The blades will typically be constructed of fibreglass and will be attached to a steel hub and shaft. Metallic conductors will be incorporated within the blades to conduct lightning strikes to earth. The turbine hub height will be about 80 metres above the ground.

Nacelle: The nacelle is the housing mounted on top of the tower that encloses a gearbox, generator, transformer, motors, brakes, electronic components, wiring and hydraulic and lubricating oil systems. The nacelle will be constructed of steel and fibreglass and will have dimensions of about 6 metres long, 3 metres wide and about 3 metres in height.

Motors within the nacelle are used to turn the turbine to face into the wind and to adjust the pitch of the turbine blades. Weather monitoring equipment located on the top of the nacelle will provide data on wind speed and direction for the automatic operation of the turbine. The generators typically generate electricity at 690 - 1000 volts, which is raised to 33,000 volts by the generator transformer located either within the nacelle or adjacent to the base of the tower on a concrete pad.

The turbines will be of the "upwind" design which means that they will have a control system that faces the rotor into the wind. It is proposed to finish the turbines and supporting structures with a matt off-white colour for the reasons described in Section 6 and Appendix C.

3.2.1 Wind turbine operation

A wind turbine converts wind energy into electrical energy. Wind blowing across the blades causes rotation of the rotor that is connected via a gearbox to a generator that produces the electrical output. The gearbox increases the rotation speed for the generator to about 1550 revolutions per minute. The output is generated at 690 - 1000 volts which is then stepped up to 33,000 volts by the generator transformer located at each turbine site.

The wind turbines will be designed to operate automatically whenever wind speeds are between about 4 and 25 metres per second (Table 3.3). When wind speeds exceed the wind turbine cut-out speed (25 metres per second) the turbines will stop so as to prevent turbine damage. Additionally, no generation occurs below the start–up wind speed of 3.5 to 4 metres per second. The typical wind speeds for operation of the wind turbines that could be selected for the Glen Innes Wind Farm are shown in the Table 3.3.

Table 3. 3 - Indicative wind speeds for typical turbine operational mode

Turbine operating regime	Wind speed at hub height	
	(metres/second)	(kilometres/hour)
No generation	less than 3.5	less than 12.6
Start-up wind speed	3.5 to 4	12.6 to 14.4
Rated wind speed	14	50.4
Cut-out wind speed	25	90
No generation	greater than 25	greater than 90
Survival wind speed	60 to 70	216 to 252

The wind turbines will have a maximum rotation speed of up to about 18 revolutions per minute (which means that each blade will rotate through 360 degrees about every 3.3 seconds. While the turbines appear to be turning slowly, at 18 rpm the speed of the tip of the blade, for a turbine of 100 metres diameter, is about 339 kilometres /hour).

While the wind farm is set for automatic operation, its size requires a small number of permanent staff to be located on site. These staff may be assisted from time to time by inspection and maintenance specialists.

3.3 Electrical works

The project's main electrical works external to the turbine will include underground cables, switchgear, earthing systems and a substation as indicated below:

- a generator transformer at each turbine, either within the nacelle or near the base of the tower
- about 20 kilometres of 33,000 volt underground cables
- about 20 kilometres of control cables in the same trenches as the power cables
- 33,000 /132,000 or 66,000 volt substation including one or two transformers
- 33,000 / 132,000 or 66,000 volt switchgear
- control and communications equipment to be located in the substation facilities building
- short section of 66,000 or 132,000 volt underground cables or overhead line for grid connection (electrical works for the grid connection are outlined in Section 3.7)

The generator voltage, nominally 690 - 1000 volts, is increased to 33,000 volts by the generator transformer located at each turbine. The output from each of the turbine generator transformers will be directed to 33,000 volt underground cables that are used to link the turbines to the substation. A schematic arrangement of the underground cables is shown on Figure 3.1.

The component electrical works are described in the following sections.

3.3.1 Generator transformers

The generator transformers at each turbine will be located either near the base of the towers on a small concrete slab (padmount) or within the turbine nacelle. The dimensions of any padmount transformer housings will be dependent on the supplier but will be of the order of 3 metres long by 2.5 metres wide and 2.5 metres high. The colour of the padmount transformer housing will be a low visibility shade of green due to their low height and position in the generally grassed paddocks. The transformers may be oil-filled or a dry type, depending on the turbine equipment supplier. If oil-filled transformers are used, containment measures will be incorporated to

prevent any oil loss reaching local watercourses. The volume of oil used for generator transformers is likely to be of the order of 1,000 litres.

3.3.2 Underground cables

Underground power cables will be used to connect each of the turbines and to transmit the generated output direct to the substation. The turbines will be subdivided into 3-4 groups (6 to 8 turbines per group) of electrically connected turbines, each with its own feeder cable to the substation (Figure 3.1).

The cable routes will be generally between turbines and where possible would be located alongside access tracks to minimise site disturbance. In practical terms this can be difficult to achieve in all cases. It is most economic for cables to be routed by the most direct route while tracks are required to be designed to suit local grades and provide sufficient curvature and width for vehicles of lengths up to 50 metres. This could require a less direct route for access tracks due to topographic variations and avoidance of environmentally sensitive zones. In some cases, two or more power cables will be placed side by side along the same route. This will occur for the northern section of the wind farm where the cables from several groups of turbines share the same route. Control cables that enable monitoring and control of turbine operation will be co-located in trenches excavated for the power cables.

Cable routes will mostly take a direct route between the turbines and the substation. The routes will be developed based on a range of considerations such as minimising route length, the ease of excavation, ground slope and stability and environmental sensitivities such as flora and fauna or heritage considerations.

The installation of buried earthing conductors and electrodes will also be required in the vicinity of the turbines, the facilities building and the substation.

3.3.3 Substation

The proposed location of the substation is at the northern end of the Waterloo Range close to the existing 66,000 volt line (Figures 1.4 and 3.5). The general location has been chosen after consideration of its proximity to the existing 66,000 volt overhead line, the property available and its low visibility from surrounding public viewpoints.

The actual substation site has been chosen to avoid existing woodland but utilises it as visual screening from surrounding areas (Plate 3.1). Screening by existing trees to the north of the substation site and the topography will limit the substation's visibility from the Gwydir Highway. It is also sited such that it will have limited visibility from Glen Innes due to the distance involved, the low profile of the substation, the local variations in ground level and the position of nearby trees. Following construction and, if warranted, small areas of tree planting could be undertaken to screen any parts of the substation that are visible from the surrounding country.

The proposed access to the wind farm site via the former Gwydir Highway alignment passes close by the substation site at the northern end of the wind farm (Figure 3.5). The former highway alignment provides an access route to the wind farm site that would be suitable for both light and heavy vehicles. Its temporary use for construction has been approved by Rural Lands Protection Board. Should this direct access not be available once the wind farm is operational, then suitable access to the substation is available via Rose Hill Road which has a longer travel distance.

The final location of the substation and the arrangement for the connection to the new 132,000 volt line or existing 66,000 volt overhead line will be determined in conjunction with TransGrid and/or Country Energy. The construction arrangement could involve underground cabling to one or more additional pole structures within or adjacent to the existing line, or smaller overhead structures. The point for connection will be influenced by structural considerations for the line and the suitability of the route between the substation and the connection point while minimising the impact on remnant woodland. The proposed substation site is about 400 to 500 metres from Sinclair Lookout.

The substation will occupy an area approximately 80 metres by 50 metres and will be surrounded by a 2 metre high security fence. The substation arrangement will include an array of busbars, circuit breakers, isolators, various voltage and current transformers and a static compensator-capacitor bank as agreed with TransGrid (or Country Energy). A buried earth grid will be installed within the substation area. The ground surface within the substation enclosure will be covered with crushed rock. The substation may include three small buildings including a switchroom, wind farm control room and an auxiliary services building. A conceptual layout is shown in Figure 3.2.

One or two transformers nominally of up to 85 MVA combined capacity, together with ancillary equipment will be constructed to step-up the voltage from 33,000 to 132,000 or 66,000 volts. As the transformer(s) may contain in the order of 20,000 to 25,000 litres of oil, provision will be made in the design for primary and secondary containment of any oil that may leak or spill from the transformers or the associated components. This would involve constructed concrete bunds around each transformer and a spill oil retention basin or oil/water separator outside the substation compound.

3.3.4 Facilities and auxiliary services buildings

A facilities building approximately 10 metres by 20 metres will be constructed adjacent to the substation structures to house wind farm control instrumentation, electrical and communications equipment, routine maintenance equipment and stores, a small work area and staff amenities.

An auxiliary services building may also be located at the substation site. It will contain 132,000 volt (or 66,000 volt) switchyard control equipment and batteries and be used by TransGrid and/or Country Energy. The dimensions of this building may be about 15 metres by 5 metres.

The building structures are likely to be slab on ground constructions with steel frame, metal or brick walls with a sheet steel roof. Alternatively, they could be a transportable type building constructed on piers similar to that shown in Figure 3.2. In either case, the buildings will be of sturdy construction, suitable for the weather conditions they will be exposed to and will be compatible with the rural environment. Roof drainage will be collected to rainwater tanks for domestic use but these may be required to be topped up with water from outside sources as required. A septic system or composting toilet system that complies with the local Council requirements will be installed to treat the small amount of waste water produced.

The substation compound will also include a switchroom containing 33,000 volt wind farm switchgear (Plate 3.2) and overhead busbars. The design of the substation, electrical installations and buildings will need to be developed in conjunction with TransGrid and/or Country Energy and comply with relevant electrical standards.

Plate 3.1 Substation general location on Waterloo Range (view east towards Glen Innes)

Plate 3.2 Typical substation building housing switchgear within secure compound

3.4 Site access works

This section provides a description of access works for the development. A comprehensive assessment of traffic and transport issues is provided in Appendix and is summarised in Chapter 9.

3.4.1 Site entry

The project locality can be reached via the New England and Gwydir Highways. Entry to the wind farm site will be via a 1.5 kilometre section of the former Gwydir Highway that crosses the top of the Waterloo Range (Figure 3.5). The entry to the former highway alignment from the Gwydir Highway is opposite the "Wattle Vale" residence on top of the Waterloo Range. The former highway formation is in good condition and is suitable for the purpose. It has a firm base with drainage on either side and has suitable curvatures that will permit its use by long vehicles.

The former highway alignment is within a Travelling Stock Route (TSR) 67474. While the TSR is referred to as Wattle Vale it is not part of Wattle Vale property. The TSR is currently under the custodianship of the Rural Lands Protection Board (RLPB) and has been leased for grazing. The RLPB has approved the use of the former highway alignment for temporary access to the site during the construction phase of the project Appendix B-2.

An alternative site access via Rose Hill Road and the existing track to Telstra's Ross Telecommunications facility on Waterloo Range is shown on Figure 1.4. While heavy vehicles could access all turbine sites via this route, the access from the top of Waterloo Range will involve a smaller overall impact and is proposed for use by all oversize vehicles.

The entrance to the wind farm site from the Gwydir Highway to the former highway alignment will be designed to allow long vehicles to safely exit from, or to re-enter the highway without disrupting traffic. Preliminary discussions on the locations for entrances have been undertaken with the Glen Innes Severn Council and further consultation will be undertaken with Council and the Roads and Traffic Authority to confirm the final design.

Aspects considered for safe access are further discussed in Appendix I and Chapter 9 and include sight distances, provision of signage and where necessary, use of escort vehicles to warn approaching vehicles of construction vehicle movements. Once the wind farm is operational and if continued use of this access is approved, a lockable gate, set back from the highway would be installed at the site entrance. If access via the former Gwydir Highway is not approved for the operational phase then the alternative access via Rose Hill Road will be used.

3.4.2 On-site access tracks

The on-site access tracks required for construction and ongoing operation and maintenance of the wind farm will be unsealed formations generally 5-6 metres wide but up to eight metres in width with suitable drainage.

Construction of the access tracks will involve clearing of pasture, minor clearing of trees, design to ensure that grades and curvatures are suitable for the required vehicles accessing the site and inclusion of drainage works as required. During construction, the tracks may be up to 8 metres wide to allow a large crane and oversize vehicles to travel between turbine sites. Following construction, it may be possible for the tracks to be reduced to a 5 metre width.

The proposed arrangement of tracks is shown in Figure 1.4, which includes existing tracks and new tracks. Parts of the existing tracks will require minor upgrades.

Tracks along each of the ridges will provide access to all turbine sites for construction, operation and maintenance. In general, tracks are of low to moderate grades. However, the southern half of the site consists of a number of discrete elevated ridge-tops and access up onto these will require several short steep sections of track. All grades and associated drainage will be designed to suit the proposed traffic and site conditions. The final locations of tracks will be determined based on design considerations, including grades, slope stability,

erosion hazard, visibility and environmental constraints. Some upgraded and new access tracks will improve access for the landowners around their properties.

The review of access options has identified routes which minimise clearing and that use the existing tracks along the ridgeline where possible. The final routes will be determined in conjunction with an ecologist to ensure that any impact on the remnant woodland and associated vegetation is minimised.

Some additional temporary tracks may also be required for construction of the cable routes and for access to any erosion control sites. The erosion control sites will enable the beneficial utilisation of any excess rock excavated from turbine footings and will be chosen based on consultation with the landowner, availability of excess material, the need for erosion repair and minimising the distance for material transport.

In the few locations where steeper grades are present there may be a need for the access track to be benched into the sides of the slope and track construction would include suitable batters with stabilisation to prevent erosion. The use of 'cut and fill' may also be required at a few locations to produce an even grade for the oversize vehicles delivering the longer items to the turbine sites. An example is the track construction required between turbine sites 9 and 10B. The development of a suitable access track between turbine sites 9 and 10B avoids several kilometres of access track construction.

The routing of access tracks will take into account the following considerations:

- minimise the length of tracks
- locate along the routes of existing tracks where possible
- locate where clearing of native vegetation including woodland is minimised
- construct with due regard to safety, erosion, sediment control and drainage
- position and design, as far as possible, to reduce visual impacts
- if not required for the ongoing operation and maintenance of the works, removal and revegetation on completion of the construction phase

3.5 Utility services

The design of the proposed development has been based on connection to Country Energy's existing 66,000 volt transmission system. However, as there are plans for the line to be upgraded to 132,000 volts in the near future, it is expected that the connection will be at 132,000 volts. The design of the substation and its overall size will vary dependent on whether connection is at 132,000 volts or 66,000 volts the difference does not significantly change the nature of the proposed development.

A telephone connection to the proposed facilities building, involving multiple telephone lines will be provided to enable remote monitoring and control of the wind farm. Mobile phone coverage is available on most of the ridges but can be limited in some of the valleys. While the wind farm will not rely on this form of communication, it is expected that construction teams will use mobile phones and possibly radio communication.

A radio link may also be installed at the substation for communications relating to network controls.

Water will be provided to the proposed facilities building from a storage tank that will collect roof drainage. An approved septic system or composting system will be installed to treat the minor quantities of waste water. The proponent will be responsible for removal of all other wastes from the site.

3.6 Ongoing wind monitoring

Glen Innes Wind Power has three existing 80 metre high guyed wind monitoring masts (M1 to M3) on site, located as indicated in Table 3.4. A fourth mast (M4) 40 metres high and operated by the NSW Department of Water and Energy is located near Turbine Site 12B. The locations of the existing on-site monitoring masts are also shown on Figure 1.4. The Department has been consulted as to whether Mast M4 is still required and

whether it can be removed to allow a turbine to be located close to the current M4 mast location. As the M4 mast was originally erected by the NSW Sustainable Energy Development Authority (SEDA) (now DWE) to promote wind farm development on the site it is anticipated that the proposed Glen Innes Wind Farm development will supersede the usefulness of the mast and DWE will agree to its removal.

Table 3.4 - Wind monitoring mast locations

Meteorological mast	Coordinates		Height (m)
	Easting	Northing	
M1 (Rose Hill)	364842	6710022	80
M2 (Nant)	367716	6704693	80
M3 (Glenroy)	367325	670234	80
M4 (DWE) *	-	-	40

Note: * Met mast M4 is operated by the Department of Water and Energy (former SEDA).
M4 is not part of the Glen Innes Wind Farm Project facilities

The existing guyed monitoring masts (M1 to M3) could potentially be used for turbine performance proving tests required after commissioning and also to comply with future wind forecasting and dispatch requirements. However, additional monitoring masts similar to the existing masts may also be required. If so, mast construction will involve constructing four small footings, erecting the monitoring mast and installing instruments.

Temporary wind monitoring masts will also be established for site calibration purposes at up to four turbine sites prior to construction of the turbines and will be removed as construction commences at the respective sites. The locations of the temporary wind monitoring towers will be confirmed several months prior to turbine construction.

Separate development applications are not required for the additional meteorological masts as they qualify for exemption under Clause 39 (2)(a) of the SEPP (Infrastructure) 2007. This is discussed in greater detail in Chapter 4 (section 4.3.3).

3.7 Overview of connection to the electricity grid

Glen Innes Wind Power has identified the existing Country Energy 66,000 volt transmission line that passes to the north of the project area as a feasible connection for the Glen Innes Wind Farm. The line runs between Glen Innes and Inverell and its route at the wind farm locality is generally east-west and to the north of the wind farm as shown in Figure 1.4.

Consultation has been undertaken with Country Energy to determine the requirements for connecting to the existing 66,000 volt line. Country Energy has indicated that its existing 66,000 volt line has sufficient capacity to accept the output of the wind farm with minor modifications to its Glen Innes substation. The initial discussions involved a wind farm of up to about 50 MW installed capacity.

A connection application has been submitted to Country Energy in accordance with National Electricity Code requirements for connection and a number of associated technical studies are being carried out.

It is possible that with upgrade of the line to 132,000 volts that the capacity of the wind farm could be increased and the current planning outlined in this Environment Assessment allows for up to 81 MW installed capacity, should that be shown to be commercially viable and environmentally acceptable. A connection application has also been submitted to TransGrid in anticipation that the line will be upgraded.

3.7.1 Proposed transmission connection works

This section has been prepared based on connection at 132,000 volts but is equally as applicable for connection at 66,000 volts should the line upgrade not be available for wind farm connection.

The 132,000 volt yard of the substation would form part of the Glen Innes to Inverell 132,000 volt line and facilitate the grid connection. This would involve the line being routed through the substation's 132,000 volt yard via an arrangement to be agreed with TransGrid (or Country Energy if connection is at 66,000 volts). The connection arrangement is likely to include busbars, circuit breakers, isolators, switching and protection devices and other necessary equipment.

If short sections of 132,000 volt overhead line are used to connect the existing line to the substation, then their location may be determined by the existing pole structure locations and the selection of a route that minimises impact on the remnant woodland at this locality. Depending on the design, there could also be the need for new pole structure(s) either within the existing line or between the existing line and the substation. As an alternative, the connection between the substation and the existing transmission line could involve underground cables.

Connection to the electricity grid may require the Glen Innes to Inverell transmission line to be taken out of service for one or more short periods. That interruption will be coordinated with TransGrid (or Country Energy) and is not expected to affect customers in the vicinity of the site who receive their supply via the local distribution network at lower voltages. Glen Innes and Inverell also have alternate supply arrangements and with Country Energy coordination, would not be expected to be inconvenienced. The connection will be carried out in accordance with TransGrid's (or Country Energy) normal procedures for maintenance works involving interruptions to supply.

3.7.2 Connection approvals process

Connection of the Glen Innes Wind Farm to the grid is considered here as an integral part of the development activities and is assessed in conjunction with the Wind Farm Project Application under Part 3A of the EP&A Act 1979. TransGrid or Country Energy as applicable may also choose to undertake a separate assessment of the necessary transmission line works under Part 5 of the EP&A Act, 1979.

3.8 Wind farm development phases

Provided the Project Approval and any other required approvals are obtained, the phases of the project indicated in Table 3.5 will be undertaken.

Table 3. 5 - Wind farm development phases – planning approval to operation

EA Section	Phase	Description	Approximate Duration
3.8.1	**Pre-construction** Project planning and Construction Certificate Approval	• Review of contract arrangements for civil works, equipment supply and electrical works • Submission of Construction Certificate Application • Review and certification • Preparation and approval of Construction Environmental Management Plan (CEMP)	3 months
3.8.2	**Construction**	• Establishment, site office establishment and signage, access works, foundation works, equipment delivery and ancillary aspects such as fencing and drainage works • Erection of turbines and meteorological masts, substation and associated buildings and installation of underground cabling. • Wind farm grid connection works	minimum of 6 months and up to 12 months

EA Section	Phase	Description	Approximate Duration
3.8.3	**Commissioning** (partly overlapping construction)	• Performance assessment of equipment to ensure compliance with specification and project approval conditions	2 months
3.8.4	**Operation**	• Generation and supply of electricity to the grid	About 25 years
3.8.4	**Maintenance**	• Monitoring of equipment, lubrication, cleaning, repairs, replacement of worn or broken parts, maintenance of access tracks	Periodic and as required
3.8.5	**Decommissioning or replacement** at the end of life (after 25 yrs)	• Removal of equipment and restoration of site, or • Replacement with newer equipment subject to any approvals required	At completion of operating life of wind farm

3.8.1 Pre-Construction arrangements and Construction Certificate

Once approvals have been obtained, the final design and construction arrangements will, if necessary, be updated to address the approval conditions and any other design related information obtained after preparation of this Environmental Assessment. This stage would also take account of geotechnical investigations, additional wind resource monitoring and updated energy modelling. However, any changes at this stage would be expected to be minor. Any significant change to the project to be implemented may review by Department of Planning to assess whether a modification to the project approval is required.

The Construction Environmental Management Plan (CEMP) will be developed in accordance with the Department of Planning (DoP) Guideline for Preparation of Environmental Management Plans and will be finalised prior to construction. It will address the proponent's Statement of Commitments (Chapter 15) and the Project Approval conditions. The CEMP will be referenced by the Contractor for the required construction works and equipment supply to ensure compliance and achieve the project environmental objectives. All subcontractors will also be required to address the aspects of the Construction Environmental Management Plan relevant to their component of the project construction works.

A Construction Certificate application will be lodged with the Approval Authority and this phase is likely to involve some aspects of project design being subject to review by approved certifiers.

3.8.2 Construction activities

The construction of the wind farm will occur over a period of about six months to 12 months. It will include activities such as site establishment, earthworks for access tracks and footings, erection of up to 27 turbines and up to 4 temporary meteorological masts, an additional permanent mast, construction of the substation and installation of underground cables. Construction will also involve connection of the wind farm to the Glen Innes to Inverell transmission line via the substation. Restoration of the site will follow the construction works.

The construction works are likely to progress sequentially through the different turbine groups over at least a six month period. Section 3.9 describes the above construction activities and Section 3.10 addresses the management of construction environmental impacts.

3.8.3 Wind farm commissioning

Pre-commissioning checks will be carried out on the high voltage electrical equipment prior to connection to the TransGrid (or Country Energy) transmission network. When the wind farm's electrical system has been "back energised", the wind turbines will be commissioned. The wind turbine array will be broken up into three groups each of about six to nine turbines and with commissioning of each group being undertaken consecutively. The

wind farm's generating capacity will therefore progressively come 'on-stream' as each group of turbines is commissioned.

The commissioning process will include assessment of performance and compliance with the equipment specifications and project approval conditions. The operation of the various components will be tested to ensure the wind farm's safe and reliable operation and equipment compliance with contract specifications and environmental requirements. Commissioning will commence after the substation and connection works have been completed.

Due to progressive commissioning of the turbine groups, some turbines will be commissioned and operational while others are still being constructed.

3.8.4 Operation and maintenance of the wind farm

Once commissioned, the wind farm will operate with a small on-site work force of up to four staff. Additional visits by other technical staff will be made where assistance is required for supplementary inspection and maintenance. Staffing will be managed to ensure continued safe and reliable operation. An Operational Environmental Management Plan will be implemented as outlined in Section 15 and monitoring of performance routinely undertaken.

3.8.5 Decommissioning or replacement of wind turbine equipment

At the end of its economic life the wind turbine equipment will either be replaced with comparable new equipment or the wind farm will be decommissioned. Decommissioning will involve dismantling and removal of the above-ground equipment and site rehabilitation. Turbine footings will remain buried at a level below the ground surface acceptable to the landowner. Access tracks may be retained depending on the landowners' wishes.

3.9 Construction impacts

This section of the Environmental Assessment describes the works to be undertaken during the construction stage of the project, a brief introduction to their potential impacts and the management measures to be incorporated to mitigate them. Additional details of the potential impacts and their management are provided in the following sections dealing with the respective environmental issues.

3.9.1 Construction Activities

The duration of construction works may vary depending upon the scheduling of activities such as site access and any delays that may be encountered due to factors such as unfavourable weather conditions or supply of equipment or materials. A minimum of six months is expected.

The principal activities involved in the construction phase will include the following:

- initiation of community notification/awareness program prior to commencement of construction activities
- site establishment (temporary facilities including site office, equipment storage areas)
- if required, establishment of a temporary concrete batch plant
- if required, establishment of a quarry and crushing facility
- daily transport of people, equipment and materials to the site via local roads
- earthworks for:
  - access track construction
  - turbine and substation footing construction
  - cable trenches
- formation of concrete footings for turbines and substation
- erection of temporary and permanent wind monitoring towers as required
- erection of up to 27 turbines and supporting structures
- installation of underground cables and generator transformers

- substation and facilities building construction and electrical testing
- grid connection works
- commissioning of the wind farm
- removal of temporary facilities and restoration of the site

The above activities are described in the following sections.

3.9.2 Community construction awareness program

Prior to the commencement of the site construction activities, a program of community awareness initiatives will be implemented. Information will be disseminated to the local community by local newspapers and direct mail out to advise them of the nature of the construction activities, their timing and potential impacts. Contact details will be provided for individuals to gain further information or if required to express concerns or complaints.

Updates on the progress of construction works and relevant impacts will be provided during the construction period.

3.9.3 Site establishment

The construction phase will involve up to about 40 staff working on the site at any time. Much of the work will take place outdoors at various locations on the site and the contractor will also require temporary site office and storage facilities.

Site Office: Options that have been considered for the location of the contractor's temporary site office include:

- an area of cleared land adjacent the Gwydir Highway that is currently used by Council to store gravel for its highway maintenance activities. Use of this site depends on approval by RLPB and Council
- a site adjacent the proposed substation site on Rose Hill property and adjacent the main access route to the wind farm
- a site south of Rose Hill Road on Rose Hill property beside the existing access track leading up to Ross Hill

Each of the site options is regarded as being suitable for the purpose as described below and has been selected as avoiding areas that are regarded as having environmental constraints.

The site office may include several demountable buildings, an amenities block and portable pump-out toilet facilities which will be located on the site for the duration of construction work. A typical wind farm construction site office is shown in Plate 3.3. Arrangements will be made for power and communications at the main site office. Sufficient parking will be provided to allow for the expected usage.

Plate 3.3 Typical Site Office and Storage Area

Plate 3.4 Typical Portable Concrete Batch Plant

One or more additional smaller temporary office facilities may also be constructed at locations distant from the main facility to provide temporary shelter for workers and temporary storage areas at these locations, if required. Construction staff will be accommodated away from the construction site and camping on site will not be permitted.

Mobile Concrete Batching Plant: A mobile concrete batching plant could be used to produce the concrete required for the project, however at this stage it is considered more likely that concrete would be delivered from Glen Innes rather than an on site batch plant. The decision to install an onsite batch plant or to deliver concrete from Glen Innes will be determined by the contractor. If the contractor wishes to install a temporary batch plant then the locality needs to be determined, approval from the relevant landowner and consent authority sought and environmental controls applied.

If an on-site batching plant was proposed it would occupy an area of approximately 50 by 60 metres and be likely to consist of a trailer mounted concrete mixer, cement bins, sand and aggregate stockpiles and a storage container for various equipment and tools. Sufficient area will be required to allow use of front end loaders, delivery of materials and entry and exit of agitator trucks. A typical mobile concrete batch plant is shown in Plate 3.4 above.

A batch plant would be powered by diesel generator and have a production capacity of approximately 50 m^3/hour. A single location for the batching plant would be sufficient for supply to all 27 turbine sites and substation footings during the construction period. Such a plant may only operate on about 30 days over a period of 3 to 6 months of the construction phase and its establishment may not be warranted.

Quarrying and Crushing Facility - A supply of road base material will be required for construction of access tracks to turbine sites and the substation. Part of the road base requirement may be sourced from material extracted from turbine footings but the bulk of material is expected to be imported to the wind farm site.

During site investigations, a potential site for obtaining basaltic road base material was identified on the Rose Hill property. While the rock material may be suitable and it is close to where it will be used, the decision on suitability of rock material and its source will be made by the contractor. If any extraction of gravel is proposed from an on-site location for the formation of roads then the contractor will seek approval of the relevant landowner and regulators for that activity. Landowners have asked that any material brought on to site be reviewed to ensure that it does not give potential for introduction of weeds to the site and this aspect will be addressed by the project construction environmental management plan..

3.9.4 Earthworks for access works

As discussed in Section 3.3, the principal access from the Gwydir Highway to the wind farm for construction vehicles will be via the unsealed former highway alignment on top of Waterloo Range. In addition, there could be a light vehicle access to the wind farm via Rose Hill Road. The entrances will be designed to enable safe access and minimise disruption to local traffic.

On-site access track construction will involve grading and removal of topsoil as required, to provide a formation of up to 8 metres width. This will involve placing and compacting of suitable gravel road base and the provision of minor drainage works. Some additional minor clearing may be required along access tracks to turbine sites.

Due to the nature of the loads being delivered to the site, special consideration will be given to access track gradients and layout geometry to ensure safe access in and around the site for long, heavy vehicles. The maximum access track grade required for the type of vehicles involved is typically 14 degrees and most tracks will be much less than the maximum.

However, it is likely that access to a number of turbine sites will require sections of steeper access track which may necessitate additional construction measures. This could include assistance by towing the heavy equipment with one or more bulldozers up a short section of steep track to reach the turbine sites with the steepest access.

In designing the access tracks, particular attention will be given to the management of stormwater drainage to minimise erosion and sediment transport. The site works contractor will be required to formulate a site specific Erosion and Sediment Control Plan prior to any works commencing on site.

Excavated topsoil will be stockpiled during the construction of the access tracks and later used in the rehabilitation of the site. The stockpiles will be stabilised to prevent dust generation and loss of material. If necessary, the stockpiles will be situated in a sheltered location. Weed control measures will be incorporated in all earthworks and rehabilitation of disturbed areas.

At the conclusion of the construction phase, any tracks not required for subsequent operation and maintenance of the wind farm will be restored and revegetated.

3.9.5 Earthworks for footing construction and hardstands

Whilst the detailed footing design is yet to be finalised, it is estimated that the excavation for each turbine footing will be approximately 18 metres by 18 metres and up to 2 to 3 metres deep. Excavation for the turbine footings will be carried out by mechanical equipment. If the geology of some sites includes strong rocks unsuited to use of mechanical excavators, it may be necessary to use controlled low level blasting. In such cases it is possible to avoid blasting by using a shallower excavation and a raised footing together with rock bolts. Should controlled blasting be required, it will be carried out in accordance with all relevant statutory requirements and project approval conditions by qualified practitioners. In addition, the ANZECC guidelines for controlled blasting will be followed to limit impacts at residences, should controlled blasting be required. The detailed assessment of individual sites will be undertaken once planning approval has been obtained for the project and a project contractor has been appointed.

Each footing will be a reinforced concrete pad poured against natural ground or formwork. The concrete pad will be about 1 to 1.5 metres thick and will be covered by soil and grass. It is expected that the concrete will be produced off-site and transported from Glen Innes to each footing in conventional agitator trucks. Any agitator trucks movements from Glen Innes to the site are likely to enter via the former Gwydir Highway alignment. If required, there may also be limited use of Rose Hill Road.

Topsoil from the excavation will be stockpiled separately adjacent to the excavation. It will be used for backfilling over the constructed footing with the excess being evenly spread around the disturbed turbine site to assist its restoration once construction is complete. Excavated material can also be used to prepare a level hardstand area for the large crane required for erection of the turbine and for laydown of the component turbine parts. The laydown areas may vary in size as indicated in Figure 3.4 but will generally aim for the unconstrained arrangement where conditions permit this (see section 3.9.7). Hardstand areas at the turbine sites will be retained to enable a crane to be brought back to site and for laying down turbine components, should maintenance be required. Any excess excavated material may be utilised elsewhere on the property (in consultation with the landowner) to rehabilitate existing areas of erosion. Rehabilitation of the disturbed areas will be undertaken at the completion of construction to prevent site erosion.

3.9.6 Earthworks for underground power and control cables

Underground cables will be buried in trenches generally about one metre in depth to give a minimum cover of 0.75 metres. The width of the trenches for individual cables will be about 0.5 to 0.75 metres with power cables and control cables being installed in the same trench. In some cases two or more cables may be placed side by side requiring wider trenches. A temporary access track may also be constructed alongside the trenches for construction vehicles.

The excavation methods will vary based on the rock types encountered. At this stage it is expected that the bulk of the trenching will be undertaken by a hydraulic rock breaker and excavator. The time that trenches are open will be minimised and they will be backfilled and compacted using excavated material.

Marker tapes will be placed above the buried cables at about 20 centimetres below ground level in accordance with the relevant standards to identify the presence of the cables if the areas were ever subject to excavation in the future. Marker posts will also be installed on the surface at regular intervals to indicate the presence of buried cables below.

Any surplus material will be distributed over the surrounding area to blend in with the natural landform and will be revegetated. All trenches will be installed and backfilled with due consideration to the site erosion and sediment control plan. In particular, where trenches are oriented down slopes, measures will be incorporated to slow stormwater flows and prevent scouring of the open trench or disturbed ground prior to re-establishment of grass cover.

3.9.7 Turbine erection

Following completion of the footings, the erection of each tower, nacelle and rotor using a large crane may be completed over a relatively short time involving from one week to several weeks depending on suitable weather conditions occurring. For efficiency of construction it is desirable to deliver all turbine components to each turbine site after formation of the footing and hardstand prior to the lifting of the turbine components. Sequential completion of the lifting operations for each turbine minimises the transit of the large crane between sites.

The transport of large equipment components to the site in advance of turbine erection will be subject to an approved traffic management plan. The component parts will be temporarily stored on assembly hardstands at the turbine sites (Figure 3.4). Details of typical component parts required for assembly of the wind turbines are listed in Table 3.6.

Table 3.6 – Details of typical turbine components

Item	No. of parts per turbine	Total number of parts	Approximate weight of each part (tonnes)	Approximate length of each part (metres)
Tower	3 or 4 sections	108	35 to 45	12 to 30
Nacelle	1 part	27	67	6
Turbine blades	3 blades	81	7	Up to 49 metres
Hub	1 part	27	10	2

A hardstand area will be formed at each turbine site to provide a relatively flat bench that the large crane will be located on as well as a laydown and assembly space required for the component parts prior to them being lifted into place. Most of the turbine sites for the Glen Innes Wind Farm have relatively flat cleared areas with sufficient space for the construction operations. However, several sites are constrained and may require special erection procedures where component parts are transported to the turbine site and lifted directly from the transport vehicle to the turbine structure under construction. Figure 3.4 shows hardstand arrangements for constrained and unconstrained situations. The unconstrained arrangement provides the most efficient arrangement and will be used in all situations except those where site constraints limit the available area for the hardstand. Turbine site 11 has been identified as requiring a reduced hardstand area due to site constraints. The contractor will need to review procedures to be used at the site given the constraints of the adjacent woodland and steep slopes. Turbine sites 13B, 20B, 18 and 19 may also require a constrained hardstand arrangement.

The turbine supporting towers will be bolted to a stub section embedded within the footings that will be constructed in advance of tower erection. The footing will also include provision for connection of underground cables to the turbine generator transformer or generator depending on the location of the generator transformer.

The tower sections will be progressively raised into place by a large crane and bolted together. The nacelles will then be lifted onto the towers and the rotor assembled.

The turbine blades could be up to 49 metres in length and weigh about seven tonnes. Rotor assembly will be carried out "in the air" with the hub and each blade lifted into place individually. All lifting operations will be dependent on favourable wind conditions and extended periods of unfavourable weather can extend construction times.

Once the turbine has been constructed it will need to be checked prior to energising and commissioning. The commissioning phase may take place some time after the construction depending on the status of the substation construction and grid connection.

3.9.8 Substation

Construction of the 33,000 to 132,000 (or 66,000) volt substation will include the clearing and levelling of an area of about 80 by 50 metres, construction of footings for the transformer(s), buildings and structures, concrete containment bund(s) for the one or two large transformers and installation of the necessary structures and component parts. The bund(s) will be sized to enable capture of the full amount of oil that could be lost from the main transformers. Secondary oil containment capability will also be provided (Figure 3.2).

The transport of equipment from the main access route through the site involves a relatively short length of access track. Other aspects of the construction will include a surface layer of crushed rock approximately 120 millimetres thick and a buried "earth grid". Lightning protection masts will also be installed.

A short section of overhead line will be constructed for the grid connection with the arrangement subject to the TransGrid (Country Energy) requirements.

3.9.9 Facilities and auxiliary services buildings and equipment storage area

A facilities building and possibly an auxiliary services building will be constructed at the substation site. A septic system or composting system will be installed to treat the small amount of waste water produced within the building. An area will also be included for the storage of spare parts. The construction of the buildings will have relatively minor impacts that will be managed in conjunction with the substation construction.

3.9.10 Removal of temporary facilities and restoration of the site

Following construction and commissioning of the wind farm, the site will be restored by removal of contractor's facilities and any wastes or surplus materials, removal and restoration of any temporary construction tracks and ongoing maintenance of any land stabilisation until adequate ground cover is established. Management of weeds in the disturbed areas will be integrated with the site restoration.

3.10 Environmental management of construction impacts

Best practice environmental management requires that the environmental issues associated with construction projects are identified and managed in accordance with an Environmental Management Plan (EMP). An EMP will be developed for the construction phase that addresses the DoP Guideline for preparation of EMPs. The process for construction environmental management is described in Chapter 15.

The principal environmental issues typically associated with construction works for wind farm developments include:

- construction traffic management
- constraints on the location and extent of site earthworks
- soil and water management

- dust control for road construction and soil stockpiles
- management of any quarrying activities and associated crushing plant if used
- management of issues associated with any concrete batch plant if used
- construction noise controls
- fuel storage and handling
- waste storage, handling and disposal
- bush fire prevention
- coordination with property owners and affects on stock
- weed control and site restoration

Specific aspects of these issues are outlined in the following sections and the process for their management is outlined in Chapter 15.

3.10.1 Construction traffic

The proposed access for the wind farm project is described in Section 3.4. A comprehensive review of traffic issues is provided in Appendix I and summarised in Section 9 of this Environmental Assessment. Key points for management during the construction phase are outlined here.

During construction, traffic will be generated by the delivery of materials and equipment as well as by the construction workforce of about 40 persons travelling to and from the site on a daily basis. Table 9.1 provides a list of the types of vehicles involved in the construction stage. As shown in the table there will be approximately 2,426 to 4282 one-way trips by trucks and about 4,000 one-way trips by cars over the construction period.

Some of the required equipment and materials will be delivered on trucks that are typically classified as 'Over-mass', 'Over-size' or both. Such vehicles will require special permits and/or escorts to travel on public roads. Given the nature of such vehicles (up to 50m in length) some disruption to local traffic flows could be experienced on some sections of the roads in the locality especially where manoeuvrability is restrictive. The proposed movement of the larger vehicles avoids less suitable roads and will be timed to minimise the impact on local traffic.

On a regular daily basis, the majority of extra traffic movements will be due to employee traffic and involve cars and small commercial vehicles.

To minimise disruption to local traffic and ensure community safety, a Traffic Management Plan for the use of the public roads by construction vehicles will be prepared in consultation with the local Traffic Management Committee and implemented as part of project management.

The construction traffic generated by the project also has the potential to impact on the physical condition of the lesser standard local roads. The condition of the existing road and factors such as weather and time of year will most likely determine the extent of any damage. It is possible that damage to local roads may result from the increased passage of heavy vehicles and that maintenance will be required during the construction period. The proposed access arrangements have been developed to avoid local roads. If any significant use of local roads managed by Council were needed then an agreement may need to be negotiated between Glen Innes-Severn Council and Glen Innes Wind Power for that use of local roads.

Tracks within the site will be constructed and maintained to suit the type of vehicular traffic and the intensity of use during the construction stage. Erosion and sedimentation measures will be incorporated in the design of the tracks and during construction. Clearing of vegetation will be minimised and, where necessary, an ecologist will be engaged to confirm the suitability of the final location of access tracks in sensitive parts of the site.

3.10.2 Constraints on the location and extent of site earthworks

The extent of the site works will be constrained to prevent excessive clearing and site disturbance and to ensure that identified areas of environmental or heritage sensitivity are not impacted. These constraints will be shown on construction plans and where warranted identified on the ground, by flagging, fencing or similar effective means.

3.10.3 Soil and water management including dust control

A Soil and Water Management Plan (SWMP) will be prepared for the project in consultation with DoP. Requirements of the SWMP will form part of the Construction Environmental Management Plan and earthworks will be undertaken in accordance with the SWMP. Detailed plans for erosion and sediment control will be prepared by the relevant contractor(s) relative to their works. They will also be required to implement and maintain the necessary procedures and measures to prevent and control any adverse effects. Approval of the contractors' detailed erosion and sediment control plans by the project owner or its representative will be a prerequisite to the commencement of specific contract works.

In general terms, the work will be designed to minimise land degradation and the contractors will be required to carry out the whole of the work to avoid erosion and sedimentation within the site, surrounding areas, watercourses and streams. Management of wind or rain erosion of soil stockpiles, batters and bare soil and prevention of dust generation and sediment discharge will be incorporated in the SWMP. An outline of the soils at the site and erosion and sediment control measures is provided in Section 5.5.

3.10.4 Management of construction noise

Construction noise is addressed in Section 10 of the Environmental Assessment and Appendix H. Noise sources will be associated with traffic movements, use of mobile plant and cranes on site, excavation of footings and trenches, and if relevant, operation of the concrete batch plant and quarrying and crushing activities. The construction noise at any location will be temporary and, in most cases, distant from surrounding residences. The impact of much of the construction on surrounding neighbours is therefore likely to be low and times of working will be limited to avoid noisy operations occurring outside day-time hours. However, there may be a need to undertake some activities outside normal daylight working hours due to practicalities of the specific tasks such as:

- Erection of towers and turbine structures during favourable low wind conditions in early morning or late evening
- Completion of concrete pour in a single day, but potentially extending beyond normal working hours

Where there is a requirement to work outside normal hours consideration will be given to the distance from neighbouring residences and potential noise impact. Approval will be sought for such operations.

Consideration of vehicle noise impacts will also be addressed during the development of the Traffic Management Plan.

3.10.5 Excavation of rock

Excavation of rock will be undertaken by earthmoving equipment or rock breakers. Should any controlled low level blasting be required it will be undertaken in accordance with all relevant statutory requirements.

3.10.6 Fuel and oil storage and handling

In the event of the contractor storing diesel fuel and/or oil on site it will be stored in a suitably bunded area. Handling procedures will be defined in the project EMP.

3.10.7 Waste management and disposal

The principal wastes to be disposed of will consist of surplus topsoil, surplus excavated material, packaging material, general construction debris and minor amounts of domestic wastes.

- Surplus topsoil will be spread on the site to blend in with the natural landform and will be revegetated
- Surplus excavated material will be disposed of on the relevant property at one or more locations as agreed with the property owner. Disposal sites will be finished with topsoil and revegetated. Where feasible, existing erosion areas will be selected for backfill and treatment.
- Subject to the Council's agreement, it is proposed to dispose of packaging material, general construction debris and all other waste at the Glen Innes waste disposal area. Where feasible, recyclable items such as metals, glass or timber will be separated and directed to an appropriate local facility. Any putrescible general waste material will be stored in sealed containers until it is removed from site.
- Disposal of sullage from any of the contractor's pump out toilet facilities will be to the local Glen Innes treatment plant or other suitable facility as agreed with Council.
- Any waste oil arising from equipment servicing will be stored in sealed containers in a covered and bunded area until it can be removed off site to a suitable waste oil facility.

3.10.8 Bush fire prevention

Measures to mitigate the risk of initiating bush fires will include the exclusive use of diesel fuel by construction vehicles, implementation of procedures for hot-work activities and adoption of response measures to control any incident. It is proposed that the Rural Fire Services be consulted in regard to the adequacy of the bushfire prevention measures to be incorporated in the CEMP. The management of the bush fire risk is addressed in Section 12.5 of this Environmental Assessment.

3.10.9 Coordination with property owners

Glen Innes Wind Power will consult with the respective landowners regarding the on-site impacts of the construction stage of the project. Some changes to normal grazing activities are expected but these are only likely to affect a relatively small part of the land at any one time and be a temporary impact.

3.10.10 Site safety during construction

The safety issues for the project are addressed in Chapter 12. In respect of construction, the main issues relate to the movement of oversize vehicles around the site, staff working at heights, the use of mobile plant and work in proximity to steep slopes. The safety of the workforce will be managed by the implementation of strict work procedures, good design of site tracks (particularly in relation to grade and curvature) and regular maintenance. Access tracks will include adequate area for turning vehicles and areas to allow vehicles to pass safely.

At the commencement of construction liaison will be carried out with local ambulance and emergency services to establish specific procedures for medical and emergency events on site should they occur. Such procedures would include the establishment of specified meeting points at which site staff would meet emergency service personnel and direct them to the required site location. In the event of accident, communication to ambulance or medical services will be by phone and/or radio.

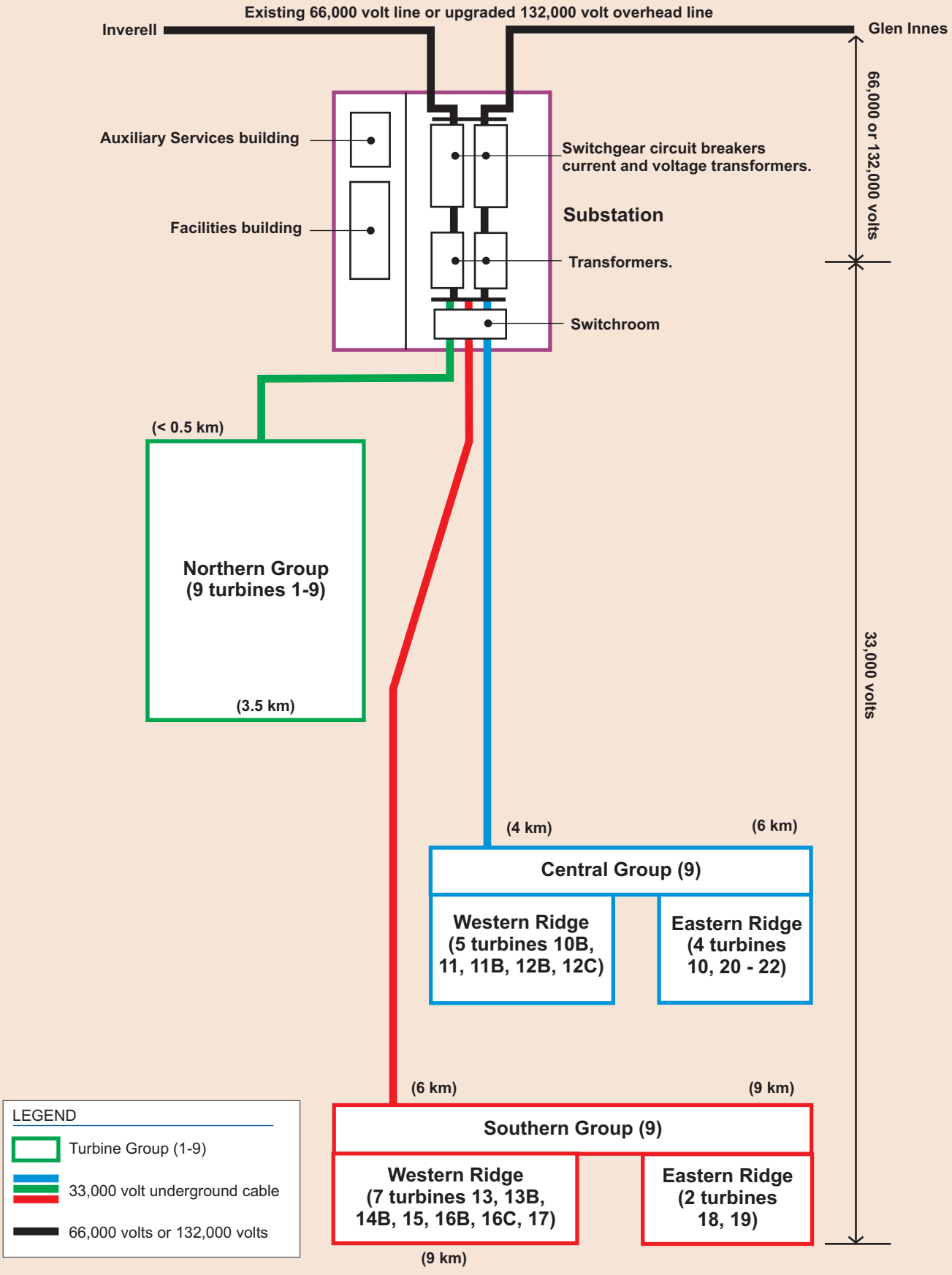

Figure 3.1

Schematic Arrangement - Electrical Cables and Grid Connection

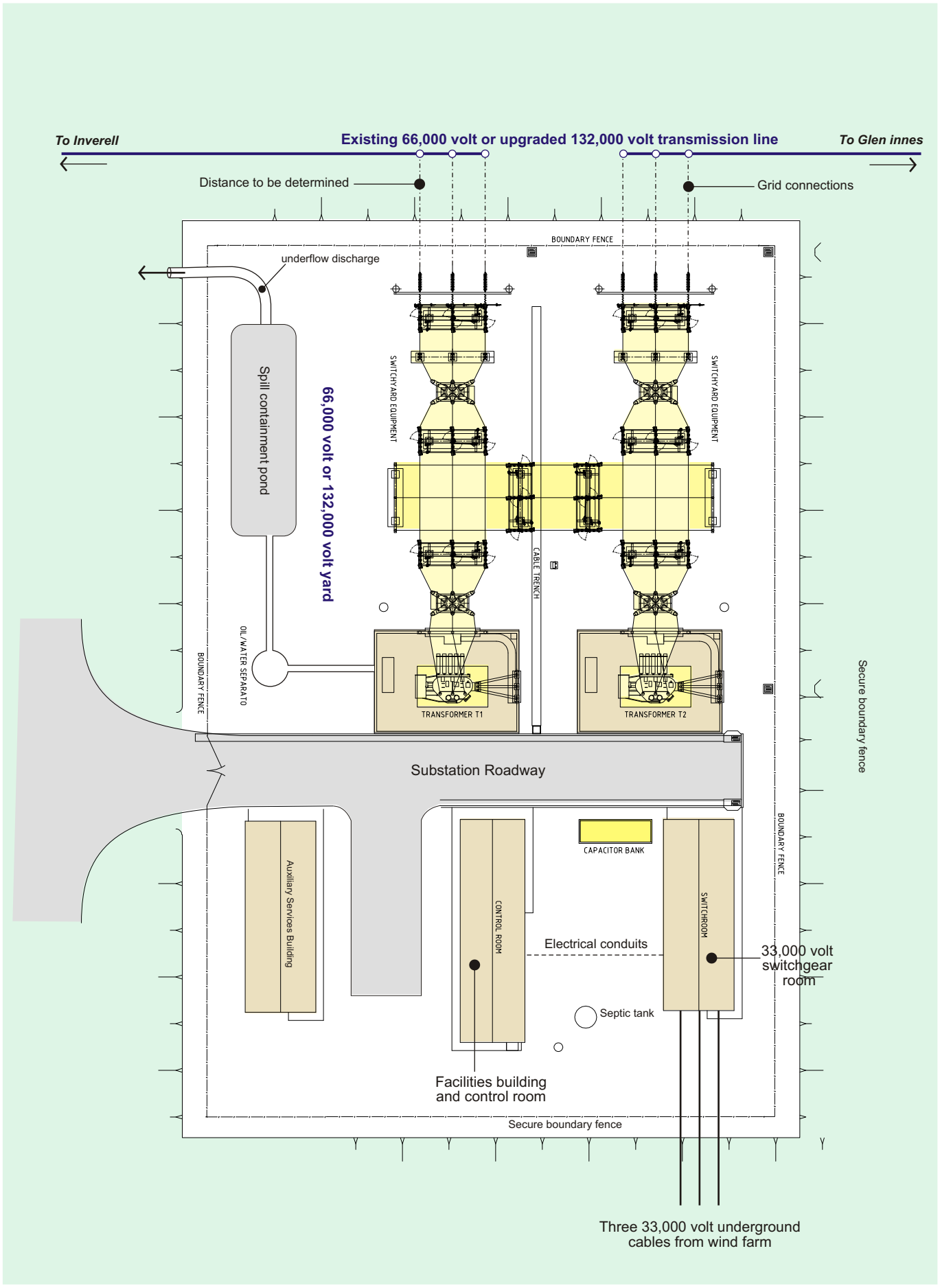

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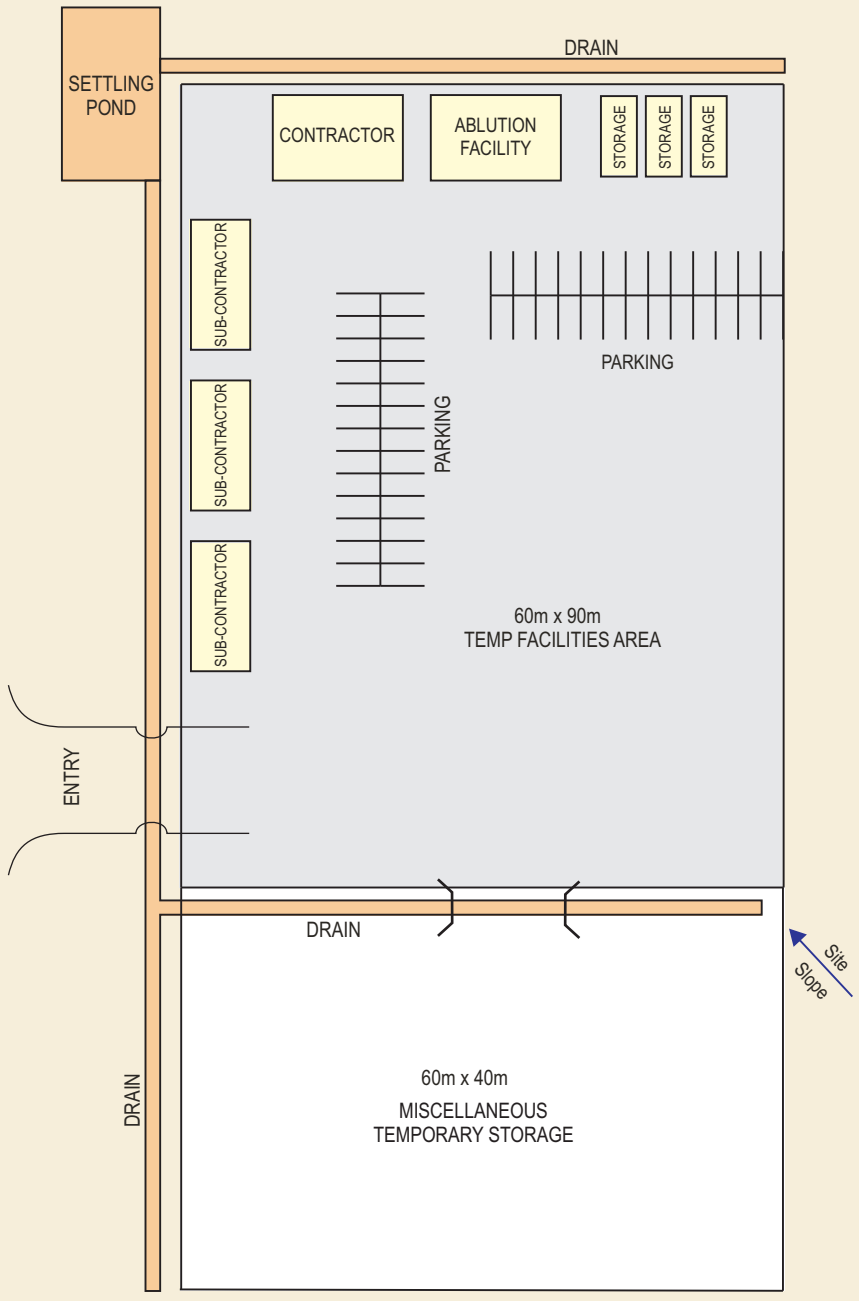
Figure 3.2

Conceptual Substation Layout



Notes: 1. Generalised layout only
2. May be modified for selected site
3. Sediment trap provided by drainage to settling pond

N
0 15 30m
SCALE

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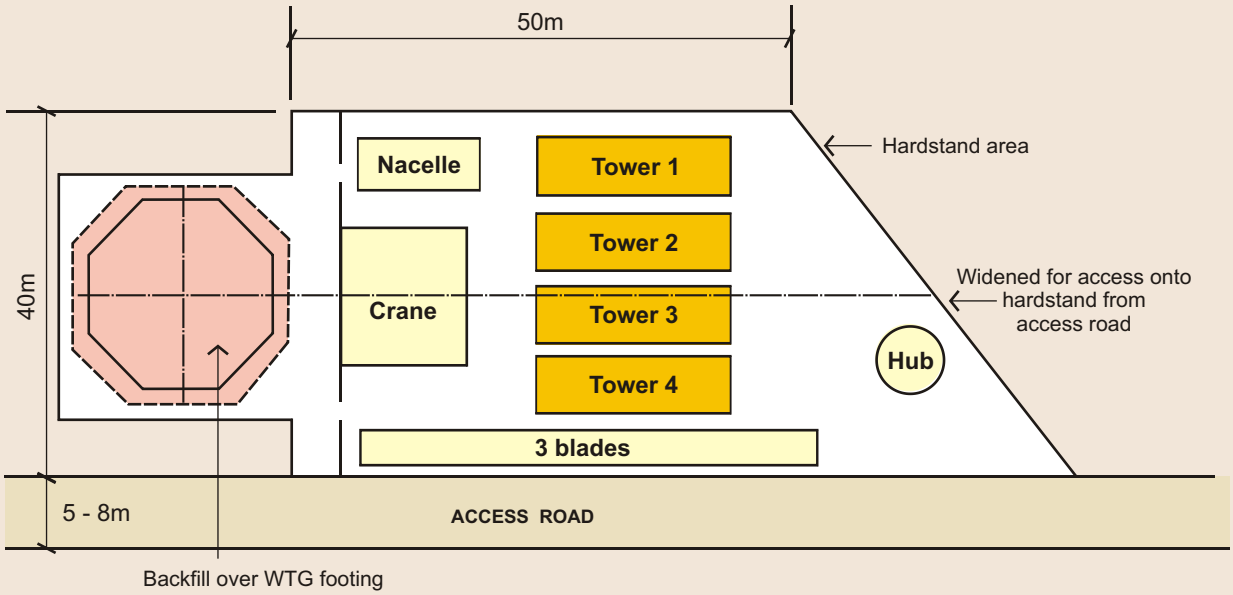
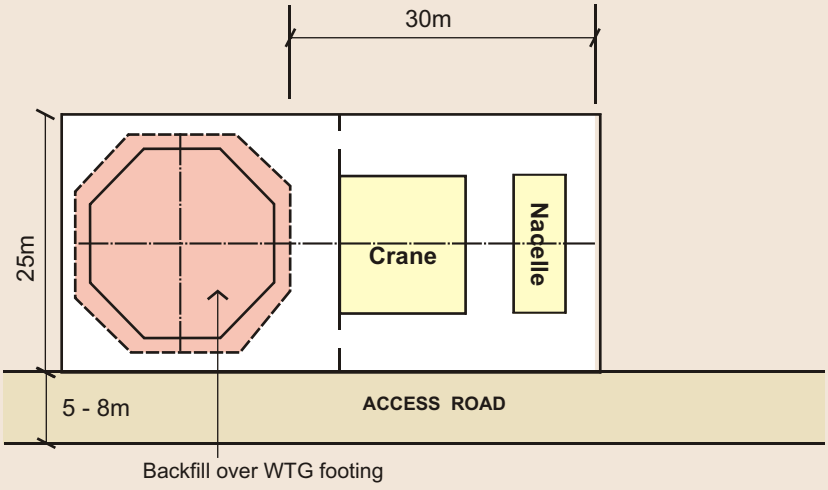
Figure 3.3

Construction Site Office General Layout



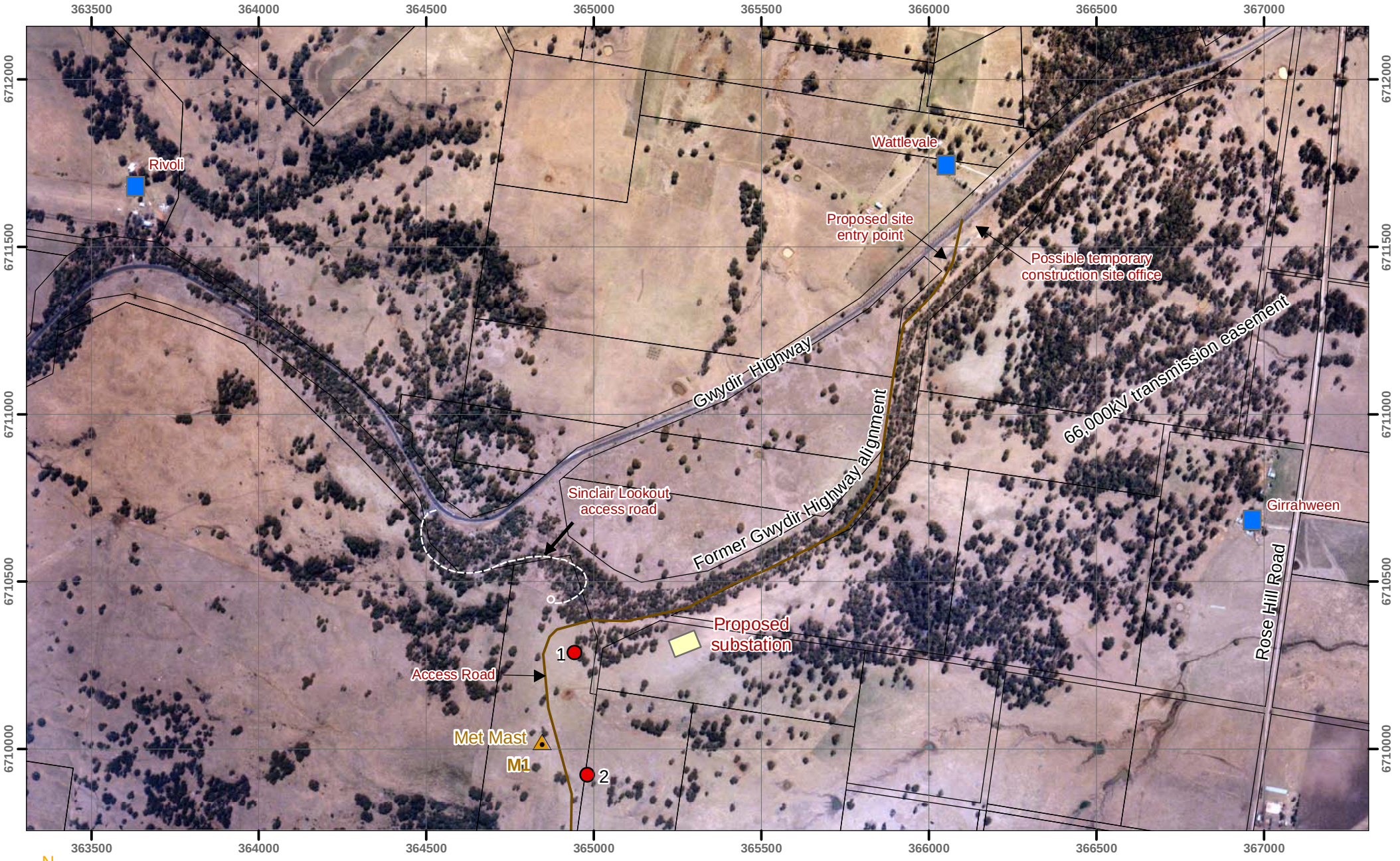
A: TYPICAL TURBINE CONSTRUCTION HARDSTAND - UNCONSTRAINED LAYOUT



B: TURBINE CONSTRUCTION HARDSTAND - CONSTRAINED LAYOUT

Figure 3.4

Typical Turbine Construction Site Layout



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Source:
Grid: MGA56 projection, datum GDA94
Air photo mosaic has some distortion and is only approximately matched to map grid

Figure 3.5

Proposed Site Entry and Substation Location