

Appendix G Visual Assessment



Marulan Gas Turbine Facility

Environmental Assessment

PROJECT APPLICATION

VOLUME 2

APPENDICES

August 2008

Appendix G – Part 1 of 2

Delta Electricity Marulan Gas Turbine Facility

VISUAL IMPACT ASSESSMENT

Prepared for

URS Australia Pty Ltd

3rd April 2008

GREEN BEAN DESIGN
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1.1 Introduction

A Visual Impact Assessment has been prepared by Green Bean Design for URS Australia Pty Ltd (URS), on behalf of Delta Electricity. The Visual Impact Assessment has been prepared as part of the requirements for the preparation of an Environmental Assessment for a proposed Gas Turbine Facility situated at Marulan in New South Wales.

The visual assessment involved a detailed evaluation of the visual character of the landscape in which the Facility and associated structures will be located, and an assessment of the potential visual impacts that may result from the construction and operation of the Facility, taking account of appropriate mitigation measures.

A primary objective of the Visual Impact Assessment was to determine the potential visual impact of the Facility and associated infrastructure on people living, working and travelling through the area surrounding the proposed development.

The overall methodology adopted by Green Bean Design for the Visual Impact Assessment has been applied to a number of similar projects.

The Visual Impact Assessment is based on technical and design information relating to the Gas Turbine Facility and associated infrastructure provided to Green Bean Design by URS.

Delta Electricity proposes to construct a combined cycle facility in two stages:

Stage 1 Two open cycle gas turbines for the provision of peaking power; and

Stage 2 Conversion of the open cycle gas turbines to combined cycle for the provision of base load power.

1.2 Methodology

The methodology for the Visual Impact Assessment comprised the following activities:

- Desktop study addressing visual character of the surrounding area;
- Fieldwork;
- Assessment of visual impact; and
- Cross sections.

1.2.1 Desktop study

A desktop study was undertaken to identify the potential view catchment of the proposed Facility. This was carried out by reference to 1:25,000 scale topographic maps as well as 1:50,000 scale aerial photographs of the Marulan site and surrounding area. The topographic maps and aerial photographs were also used to identify potential view locations to be verified during the fieldwork component of the assessment.

The desktop study identified the visual character of the surrounding landscape including features such as the site context, landform and elevation.

The desktop study mapped a total of 49 potential view locations from which the proposed Facility, or upper portions of the structures, may be visible.

1.2.2 Fieldwork

The fieldwork involved:

- An inspection to determine the potential extent of visibility of the proposed Facility;
- Determination of the various view locations from which the proposed Facility could potentially be visible; and
- Preparation of a record of each view location assessed.

Initial fieldwork did not include assessment from private property. Potential views from residential properties were assessed by making observations from public roads and from areas within the Marulan site toward surrounding properties.

1.2.3 Assessment of Potential Visual Impact

The potential visual impact of the Facility would result primarily from the combination of the following factors:

- Level of visibility or extent to which the Facility structures would be visible from surrounding areas; and
- Degree of visual contrast between the structures and the landscape surrounding the site that would form the visible background from surrounding view locations.

The visibility rating is generally determined by a combination of the following factors:

- Category and type of situation from which people may view the proposed Facility (eg resident or motorist);
- Potential number of people with a view toward the Facility from any one view location;
- Distance between the viewer and the Facility; and
- Duration of time the viewer may view the Facility.

An underlying rationale for the visual impact assessment process is that if people are not normally present at a particular view location, such as areas of agricultural pasture, then there is likely to be no visual impact at that location.

1.2.4 Cross sections

In order to illustrate the potential influence of landform and elevation on views toward the proposed Facility, a series of cross sections were prepared from a selection of view locations surrounding the proposed Facility.

Cross section locations were selected to provide a representative sample of view locations and were prepared at corresponding horizontal and vertical scale to avoid any vertical exaggeration.

2.1 Proposed Project Description

Details of the various components and structural elements associated with the Facility are described in detail in the Environmental Assessment. The key visual aspects of the proposed Facility are summarised below.

2.2 General Infrastructure for Delta Electricity Stage 1 (Open Cycle) Facility

The open cycle facility will include the following systems and/or built elements:

- Two gas turbine enclosures (incorporating air inlet, gas turbine, generator) generally up to 10m high depending upon final plant selection and two exhaust stacks up to 40m high.
- Two electricity step-up transformers and associated equipment for connection to the existing Marulan switchyard;
- Control room incorporating offices and ablutions, switch room, workshop and auxiliary structures;
- Various storage tanks generally up to 8m high;
- A gated security fence around the Facility;

2.3 General Infrastructure for Delta Electricity Stage 2 (Combined Cycle)

The Delta Electricity combined cycle Facility will include the following systems and/or built elements:

- Two heat recovery steam generators, (around 35m long, 8m wide and 25m high);
- A steam turbine, (around 8m long, 5m wide and 5m high);
- An air cooled generator (around 12m long, 5m wide and 5m high);
- Air cooled condensers (around 70m long, 70m wide and 32m high);
- An extension to and provision for, additional various high voltage and electrical plant; and
- An extension to, or the provision for, additional service Facility and administration buildings or workshops.

2.4 Associated Infrastructure

The built elements associated with linear infrastructure components include the following:

- A sealed access road from Canyonleigh Road;
- New transmission lines connecting the Facility to the existing TransGrid switchyard. The design of the transmission lines will be finalised at the detailed design stage. It is envisaged the conductors would be supported by a 35m tall low profile tubular steel pole with approximate spacing of 250m.
- Transformers and associated equipment for connection to the existing TransGrid switchyard;
- Control room incorporating offices and ablutions, switch room, workshop and auxiliary structures;
- Underground natural gas supply pipeline with metering and regulating station.

2.5 Proposed transmission line

The design of the proposed transmission line connection between the proposed Facility and the existing TransGrid switchyard would be finalised at the detailed design stage, however it is possible that it would be a single (spur) overhead transmission line. The conductors would be supported by 35m high low profile tubular steel poles at an approximate spacing of 250m.

The existing transmission line pylons extending from the TransGrid switchyard are approximately 50 metres high. Accordingly, the proposed transmission line connection would not be expected to be as visually prominent as the existing transmission lines.

2.5 Proposed gas pipeline

Natural gas would be supplied to the proposed Facility via an underground lateral pipeline connection to the existing Moomba to Sydney pipeline located to the south of the proposed Facility. The majority of the gas pipeline route would be located beneath existing agricultural land. The visibility of machinery and excavation for the construction and installation of a gas supply pipeline would be temporary.

Potential landscape and visual impacts associated with the construction and operation of the proposed natural gas pipeline connection will be assessed as part of a separate Project Application.

3.1 General Description

The construction footprint for the proposed Facility is located to the north of the TransGrid switchyard and is accessed from Canyonleigh Road.

The Facility will be located around 14km north east of the Marulan Township. Canyonleigh Road runs approximately east to west around 1km to the south of the Facility, with the Hume Highway approximately 6km to the southeast.

The character of the landscape in the vicinity of the proposed Facility is largely dominated by the existing Marulan switchyard which is located around 500m to the south of the Facility. The landscape to the south of the Facility also includes a number of high voltage overhead power lines, which extend through surrounding areas.

The construction footprint for the Facility is located on gently sloping land falling west toward the Wollondilly River corridor. The river corridor extends along the west boundary of the Marulan site. The Wollondilly River is generally not visible from the Marulan site or Canyonleigh Road, and is contained by steep embankments with mature tree vegetation growing alongside.

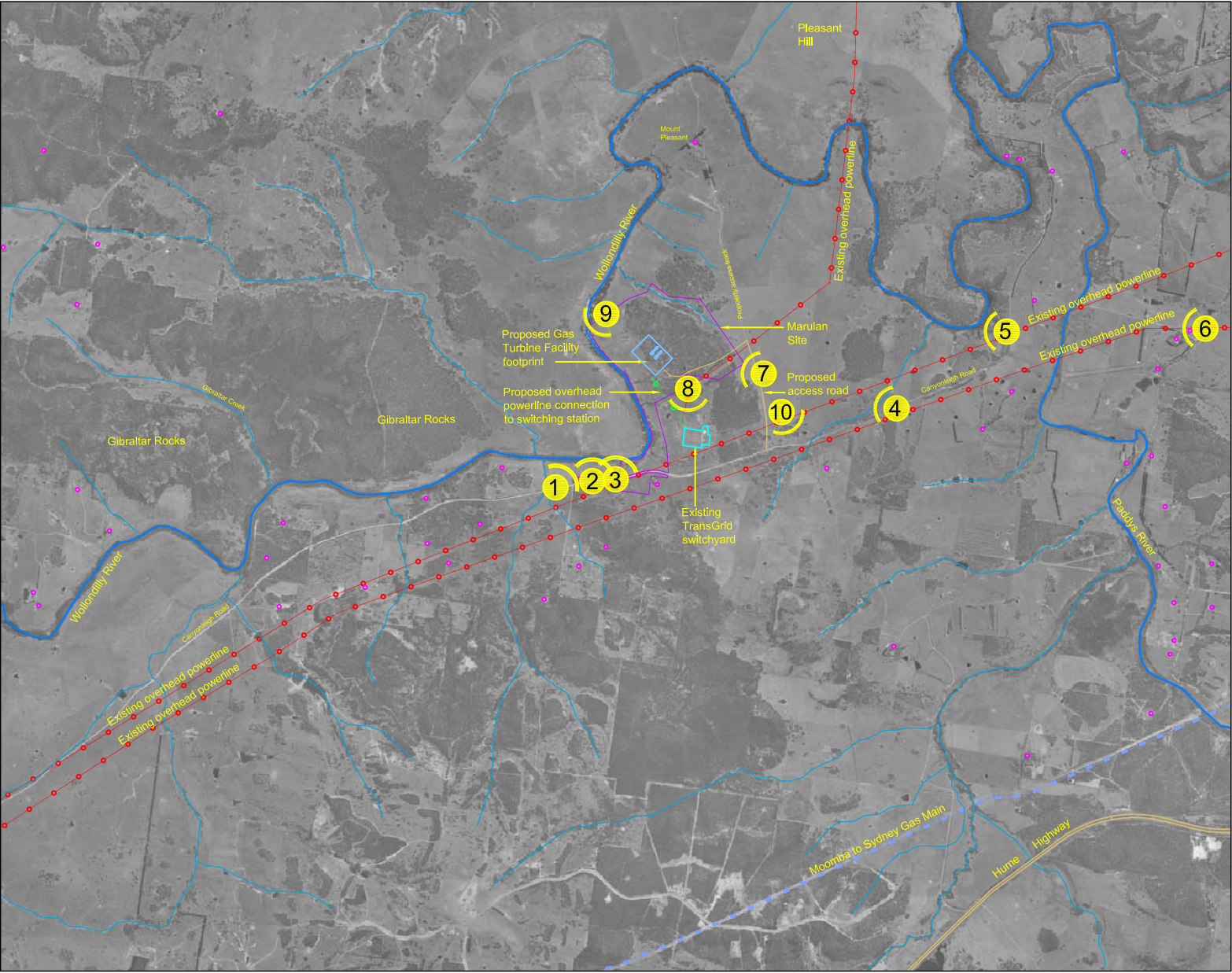
The Marulan site has been partially cleared for grazing with grassland being the predominant vegetation cover. Some woodland cover occurs to the east of the proposed Facility, and along a small number of gullies extending across the Marulan site to the river. Some areas of woodland occur within the Marulan site, and some tree clearing will be necessary to construct the Facility, and to install the proposed transmission line and access road.

Many of the views within the local landscape are generally restricted to short or medium distance (between 1 to 2km) and are influenced by a combination of undulating landform and vegetation. Long distance views across the surrounding landscape are available from elevated locations to the south west of the Marulan site, but are locally influenced by the presence of woodland cover over side slope and hill top areas.

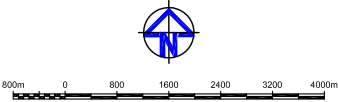
Driving along the Canyonleigh Road from Brayton toward the Facility provides a sequence of visual experiences that alternate from open long distance views where the road crosses ridgelines or crosses open pasture, to visually enclosed areas where the road passes to the south of the Gibraltar rock formation, or is confined by roadside vegetation.

The landscape beyond the Marulan is visually defined by a series of prominent and smaller ridgelines. The Gibraltar rock outcrop forms a distinct and rugged physical feature in the local landscape rising to a height around RL720m above the Wollondilly River to the west of the site.

Forest covered sections of the surrounding landscape form visually strong landscape elements on the skyline when looking to the south through to the west from within the Marulan site.



NOTE:
Roads, boundaries and buildings have not been surveyed. All base information obtained from aerial photography and is not survey accurate.



- LEGEND
- MARULAN SITE AREA
 - NOTED GAS TURBINE FACILITY INDICATIVE FOOTPRINT
 - NOTED PROPOSED OVERHEAD POWERLINE
 - 6 PHOTO LOCATION
 - NOTED EXISTING TRANSGRID SWITCHYARD
 - EXISTING RESIDENTIAL BUILDING OR OTHER BUILT STRUCTURE
 - NOTED EXISTING OVERHEAD POWERLINE
 - NOTED MOOMBA TO SYDNEY GAS MAIN - EXISTING
 - RIVER, CREEK OR GULLY DRAINAGE LINE

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PROJECT
DELTA ELECTRICITY
Marulan Gas Turbine Facility
TITLE
LOCATION PLAN

Figure 1

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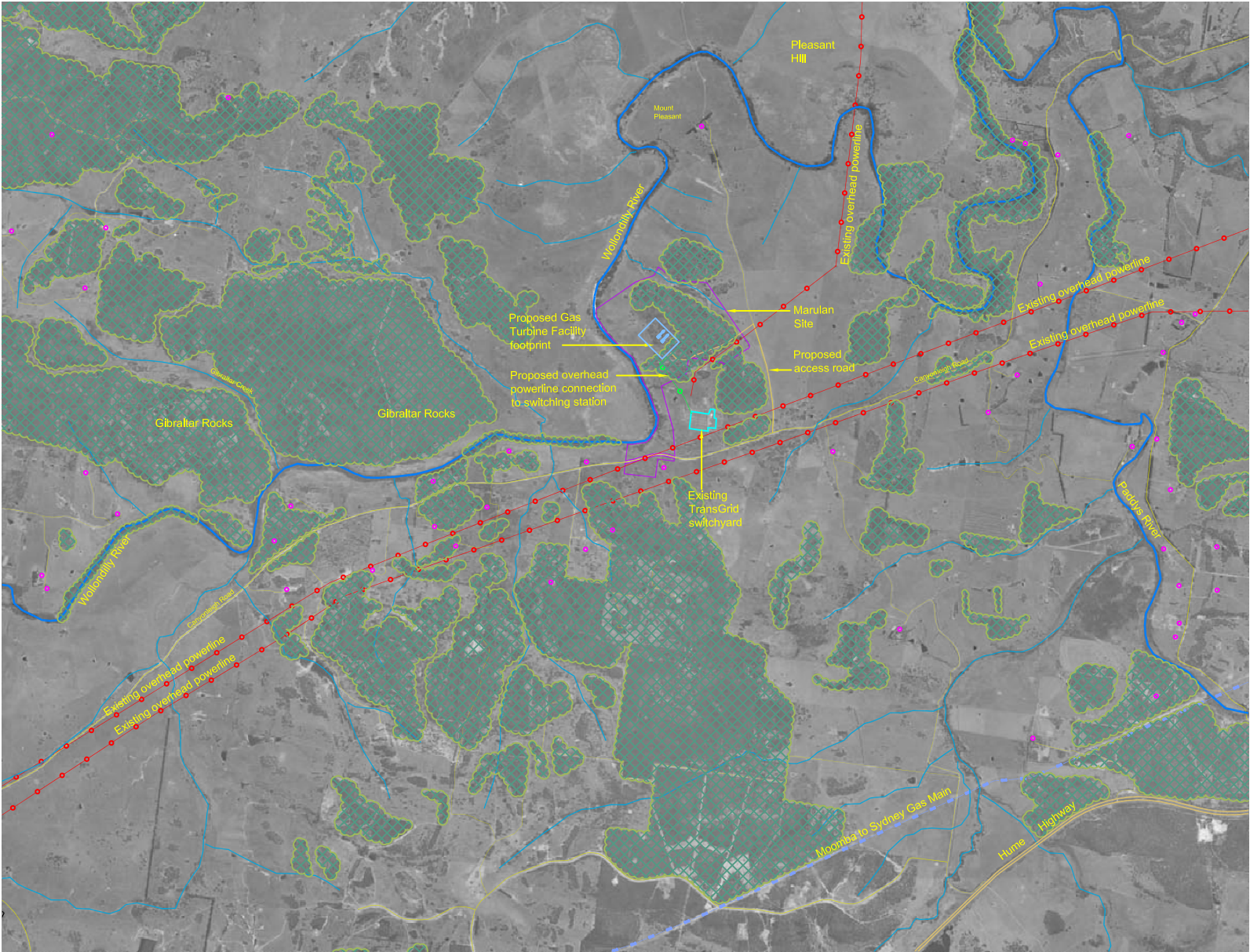
The dark colour of the forested areas contrasts with both the lighter colours of the sky and areas of grassland in the foreground and mid distance views from the Marulan site. Distant views to discrete areas of rock outcrop are also visible in some elevated areas of the landscape to the south west of the Marulan site.

A small number of rural residential properties are located in the landscape surrounding the proposed Facility. Most of the residences are not visually prominent from the Marulan site due to screening by surrounding undulating landform or the presence of trees around them. Visibility from residential properties was determined during the desktop studies and fieldwork carried out as part of the visual assessment process, although private property was not accessed during the fieldwork.

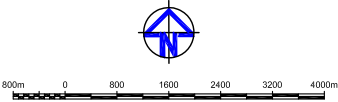
The landscape surrounding the proposed Facility contains a number of built elements that contribute to the local visual character, and includes:

- 330kV and 66kV overhead power lines, running parallel to the Canyonleigh Road corridor;
- TransGrid switchyard;
- A microwave communication tower;
- Local sealed and unsealed roads; and
- Residential dwellings and agricultural structures.

Key elements that combine to create the visual character of the area are illustrated in **Figure 2**, and in the photographs taken from a number of selected viewpoints.



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LEGEND

MARULAN SITE AREA

NOTED

GAS TURBINE FACILITY
INDICATIVE FOOTPRINT

NOTED

PROPOSED OVERHEAD
POWERLINE

NOTED

EXISTING TRANSGRID
SWITCHYARD

EXISTING RESIDENTIAL
BUILDING OR OTHER
BUILT STRUCTURE

NOTED

EXISTING OVERHEAD
POWERLINE

NOTED

MOOMBA TO SYDNEY
GAS MAIN - EXISTING

RIDGELINES AND
SPURS

VEGETATION

RIVER, CREEK OR
GULLY DRAINAGE LINE

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Marulan Gas Turbine Facility

TITLE
VISUAL CHARACTER

Figure 2

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3.2 Site Photographs

The following photographs illustrate existing views from a number of locations within the landscape surrounding the proposed Facility, including views toward the existing TransGrid switchyard. The approximate location and direction of each photograph is illustrated in **Figure 1**.



Photo Location 1 – View northeast from Canyonleigh Road on residential property boundary, with views toward the proposed construction footprint above tree line along river corridor.



Photo Location 2 – View northeast from Canyonleigh Road on residential property boundary with views toward the proposed construction footprint above tree line along river corridor.



Photo Location 3 – View east along Canyonleigh Road toward the existing Marulan switchyard.



Photo Location 4 – View west from Canyonleigh Road in the general direction of the proposed Facility. Views toward the proposed Facility are blocked by a combination of landform and vegetation.



Photo Location 5 – View west from Canyonleigh Road along existing transmission line corridor. Views toward the proposed Facility are blocked by a combination of landform and vegetation.



Photo Location 6 – View west from Canyonleigh Road along existing transmission line corridor. Views toward the proposed Facility are blocked by a combination of landform and vegetation.



Photo Location 7 – View west to north west from Arthursleigh access track. View toward the proposed Facility is generally blocked by a combination of landform and vegetation, although upper portions of taller structures, including the exhaust stacks, may be visible above the tree line.



Photo Location 8 – View south from existing transmission line easement toward TransGrid switchyard.



Photo Location 9 – View south to west from rocky outcrop to the north of the construction footprint within general site area. Tree line in foreground follows Wollondilly River corridor to the west of the Marulan site area.

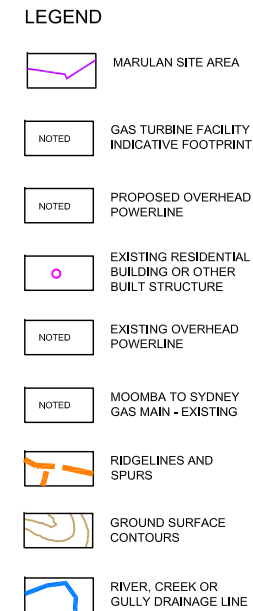
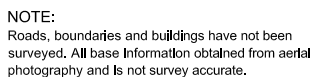


Photo Location 10 – View south to south east from high point to the east of the Arthursleigh access track with existing transmission line crossing east to west in middle distance. Views toward existing rural residences generally screened by surrounding vegetation.

3.3 Landform

Landform patterns are a significant influence on the extent to which the proposed Facility, transmission line and associated infrastructure may be visible from surrounding areas. Landform patterns are illustrated in **Figure 3**, and the key aspects summarised below:

- The proposed Facility will be located to the west of a gently sloping low ridgeline falling north west from around 626m AHD to the Wollondilly River corridor at around 590m AHD.
- Land immediately surrounding the Marulan site is characterised by a series of ridges, gullies and the Wollondilly River corridor. A prominent ridgeline falling from around the RL650m contour runs north south along the access track leading to the Mount Pleasant residence, with a number of smaller ridgelines and spurs branching off to the northeast and northwest of the ridgeline.



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TITLE

LANDFORM AND DRAINAGE

Figure 3

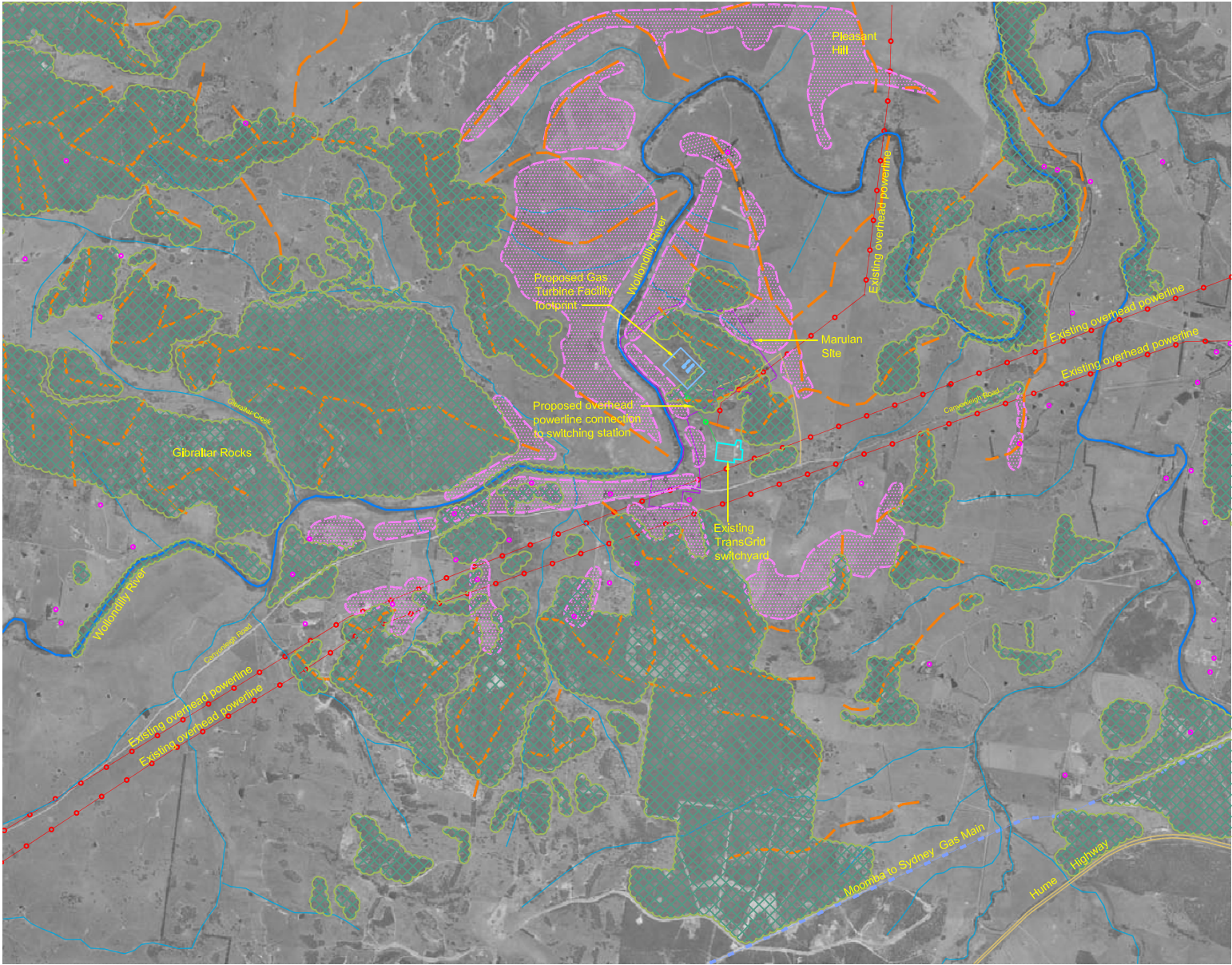
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- Landform between the ridgelines forms a number of gullies that act as tributaries to the Wollondilly River.
- The Wollondilly River follows a meandering route to the west and north of the site. Views from surrounding areas toward the river corridor are generally obscured by mature trees along the river embankments and landform adjacent to the river corridor.
- The proposed transmission line route would generally follow the 598m AHD contour to the south east of the construction footprint. The transmission line would cross a gulley and small spur before connecting to the TransGrid switchyard.

3.4 View Catchment

The potential view catchment is illustrated in **Figure 4** and key visibility aspects summarised by the following points:

- The majority of the potential view catchment is generally restricted to local views within the Arthursleigh property and to areas of land to the south and south west of the Facility located between the Wollondilly River and Canyonleigh Road.
- The view catchment will include potential views toward the exhaust stacks as well as other structures within the Facility, and the proposed transmission line.
- Views toward some of the proposed Facility structures may also occur from a small number of surrounding view locations on elevated ground to the south of Canyonleigh Road, although the majority of these would occur from vacant rural land and in a small number of instances from land surrounding residences.
- The proposed Facility is unlikely to be directly visible to motorists travelling along the Canyonleigh Road. Indirect views toward the Marulan site are partially screened by a combination of landform and vegetation alongside the road corridor, although there will be some potential for indirect views toward the Facility through gaps in roadside vegetation.
- Trees and undulating landform generally block potential views from residential properties to the west of the proposed Facility, although a small area of land on a ridgeline to the west of the site was identified as having a potential view toward the Marulan site. Views from this location would generally be restricted to the upper portions of the Facility structures.
- There were no dedicated public lookouts identified in the immediate area that would have views to the proposed Facility.



LEGEND

-  MARULAN SITE AREA
-  NOTED GAS TURBINE FACILITY INDICATIVE FOOTPRINT
-  NOTED PROPOSED OVERHEAD POWERLINE
-  NOTED EXISTING TRANSGRID SWITCHYARD
-  EXISTING RESIDENTIAL BUILDING OR OTHER BUILT STRUCTURE
-  NOTED EXISTING OVERHEAD POWERLINE
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-  POTENTIAL VIEW CATCHMENT

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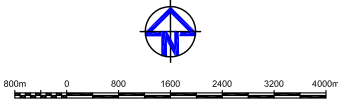
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POTENTIAL VIEW CATCHMENT

Figure 4

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NOTE:
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4.1 Introduction

The potential visual impact of the proposed Facility may result primarily from a combination of the following factors:

- The level of visibility or extent to which proposed structures would be visible from surrounding areas; and
- The degree of visual contrast between the proposed Facility structures and the landscape surrounding the Marulan site that would form a background and would be visible from surrounding view locations.

The potential visual impact from a particular view location is strongly dependent on the level of visibility from that location, which in turn is dependent on a number of criteria that are defined in **Table 1**.

4.2 Assumptions

The key assumptions used in this assessment are summarised below:

- The proposed Facility will be built on a generally level platform formed by cut and fill operations. The platform will be constructed at around the 605m AHD contour; this level will be refined at the detailed design stage.
- The exhaust stacks will be the tallest built elements of the Facility. The physical appearance of the Delta Electricity exhaust stacks may be altered by the construction of additional infrastructure as part of the Stage 2 Combined Cycle Facility.
- The Delta Electricity Stage 2 Combined Cycle Facility will also include the construction of an air cooled condenser which will extend to a height around 637m AHD.
- The proposed transmission line route will generally follow the 598m AHD contour to the south east of the construction footprint. The transmission line will cross a gully and small spur before connecting to the TransGrid switchyard.

4.3 Visibility

Visibility is a measure of the extent to which particular structures of the proposed Facility will be visible from surrounding areas, the relative number of viewers, the period of the view, view distance and context of the view.

The underlying rationale for this component of the visual assessment is that, if any part of the proposed Facility and associated infrastructure is not visible from a particular area then the potential visual impact will be nil. Similarly, if the number of people who would potentially see any part of the proposed Facility and associated infrastructure is low, then the visual impact would be low compared to a situation in which a large number of people have the same view. Distance is a strong influence on potential visibility as the proportion of the total

view occupied by the structure decreases with distance and atmospheric effects reduce the visual contrast between the structure and the surrounding landscape.

The gas turbine structures are generally aligned in an east-west direction. Consequently there would be some degree of mutual screening of structures in views from the west, and some partial mutual screening of views from the south west.

4.4 Visual Contrast

Visual contrast between the proposed Facility and the background against which it is viewed determines the capacity of the existing landscape setting to visually absorb the new structures without creating a significant change in visual character or producing a reduction in visual quality of the landscape. The capacity to absorb new development is dependent on existing structures, vegetation cover and landform.

At a distance, atmospheric effects could reduce the level of visual contrast between the proposed Facility and the landscape setting in which it is viewed. The reduced visual contrast could result in a lower level of visual impact. If the main built elements of the proposed Facility were dark in tone and non-reflective then the visual contrast may be further reduced.

4.5 Visual Assessment Criteria

The potential visual impact of the proposed Facility from key view locations has been assessed against the criteria described in **Table 1**.

Table 1 Visibility Criteria

Criteria	Definition
<i>Number of Viewers</i>	
High	>1000 people per day
Moderate	500-1000people per day
Low	250-500 people per day
Very Low	<250 people per day
<i>View Distance</i>	
Long	>2km
Medium	1km – 2km
Short	500m – 1km
Very short	<500m
<i>Period of View</i>	
Long term	>120 minutes
Moderate term	1-120 minutes
Short term	<1minute

The levels of visibility resulting from various combinations of the above criteria are listed in **Table 2**.

Table 2 Visibility Criteria Matrix

	Long Distance			Medium Distance			Short Distance			Very Short Distance		
Period of View	L	M	S	L	M	S	L	M	S	L	M	S
High No. of Viewers	M	L	L	H	M	M	H	H	M	H	H	H
Medium No. of Viewers	L	L	L	M	M	L	H	M	M	H	H	M
Low No. of Viewers	L	L	L	M	L	L	M	M	L	H	M	L
Very Low No. of Viewers	L	L	L	L	L	L	L	L	L	M	L	L

- **Period of View** L=long, M=moderate, S=short
- **Levels of visibility** L=low, M=medium and H=high (The visibility level from view locations where no view toward the Facility is determined and recorded as Nil).

4.6 Visibility Matrix

Table 3 presents the results of the visibility assessment from the various potential view locations identified during the field inspection. The potential view locations are illustrated in **Figure 5**.

Table 3 Visibility Matrix

VIEW LOCATION	APPROXIMATE DISTANCE TO SITE	CATEGORY OF VIEWER	APPROX. PERIOD OF VIEW	RELATIVE No. OF VIEWERS	LEVEL OF VISIBILITY	VISIBILITY RATING
R 1 to R 10 Rural residences	Long	Residents	Moderate to Long term	Very Low	Views east from residences toward the proposed Facility are blocked by a combination of landform and vegetation.	Nil
R 11 to R 13 Rural residences	Long	Resident	Moderate to Long term	Very Low	Views east and northeast from residences toward the proposed Facility are blocked by a combination of landform and vegetation.	Nil
R 14. Rural residence	Long	Resident	Moderate to Long term	Very Low	Elevated views from residential property on hillside southwest of proposed Facility. Views from residences toward the proposed Facility may be partially screened by vegetation surrounding the residence.	Low
R 15 to R 17	Long	Resident	Moderate to	Very Low	Views northeast from	Nil

VIEW LOCATION	APPROXIMATE DISTANCE TO SITE	CATEGORY OF VIEWER	APPROX. PERIOD OF VIEW	RELATIVE No. OF VIEWERS	LEVEL OF VISIBILITY	VISIBILITY RATING
Rural residences			Long term		residences toward the proposed Facility generally blocked by a combination of landform and vegetation.	
R 18 Rural residence	Long	Resident	Moderate to Long term	Very Low	View northeast from residence toward proposed Facility generally blocked by a combination of landform and vegetation.	Low
R 19 Rural residence	Long	Resident	Moderate to Long term	Very Low	Elevated views from residential property on hillside southwest of proposed Facility. Views from residence toward the proposed Facility may be partially screened by vegetation surrounding the residence.	Medium
R 20 to R21 Rural residence	Medium	Resident	Moderate to Long term	Very Low	Views north from residences toward proposed Facility are blocked by a combination of landform and trees.	Nil
R 22 Rural residence	Medium	Resident	Moderate to Long term	Very Low	Generally short distance views to the north and northeast from rear of residence including views to proposed Facility.	High
R 23 Rural residence	Medium	Resident	Moderate to Long term	Very Low	Generally short distance views north and northeast from residence toward proposed Facility. Views from residence are partially screened by existing trees.	High
R 24 Rural residence	Medium	Resident	Moderate to Long term	Very Low	Views north from residence toward proposed Facility are blocked by a combination of landform and trees.	Low
R 25 Rural residence	Long	Resident	Moderate to Long term	Very Low	View northwest from residence toward proposed Facility is generally blocked by a combination of landform and trees. Potential view to upper portion of exhaust stacks from within limited areas property.	Low

VIEW LOCATION	APPROXIMATE DISTANCE TO SITE	CATEGORY OF VIEWER	APPROX. PERIOD OF VIEW	RELATIVE No. OF VIEWERS	LEVEL OF VISIBILITY	VISIBILITY RATING
R 26 Rural residence	Medium to Long	Resident	Moderate to Long term	Very Low	View southwest from residence toward Facility is partially screened by a combination of landform and trees. Potential view toward proposed Facility from areas of the property south of the residence.	Low
R 27 to R 35 Rural residences	Long	Resident	Moderate to Long term	Very Low	Views southwest to west from residences toward proposed Facility generally blocked by a combination of landform and vegetation.	Nil
R 36 Rural residence	Long	Resident	Moderate to Long term	Very Low	View north west from residence toward proposed Facility is generally blocked by a combination of landform and vegetation. Possible distant view toward upper portions of exhaust stacks.	Low
R 37 to R48 Rural residence	Long	Resident	Moderate to Long term	Very Low	View west to north west from residences toward proposed Facility generally blocked by a combination of landform and vegetation.	Nil
L 49 Canyonleigh Road	Medium to Long	Motorist	Short term	Low	View from road corridor north and northeast toward proposed Facility generally restricted to indirect views through gaps in roadside vegetation.	Low

4.7 Summary of Visibility Assessment

A total of 49 view locations were identified as part of the visual assessment process, and included views from:

- Residential properties;
- Vacant/rural land;
- Public road corridors (motorists); and
- Private access roads.