

## **APPENDIX H VISUAL IMPACT ASSESSMENT**

MALABAR  COAL

# Visual Impact Assessment

MAXWELL SOLAR FARM

AUGUST 2019

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## EXECUTIVE SUMMARY

NGH Environmental has been commissioned by Maxwell Solar Pty Ltd (Maxwell) to conduct a Visual Impact Assessment (VIA) for inclusion in the submission of an Environmental Impact Statement (EIS) for the proposed Maxwell Solar Farm in Muswellbrook, NSW (the Proposal). The Solar Farm would be located on rehabilitated open cut coal mine land within the Maxwell Infrastructure site and is approximately 10km south-south east of the Muswellbrook town centre and 35km north-west of Singleton, NSW.

The VIA addresses the “visual” element of the Department of Planning and Environment Secretary’s Environmental Assessment Requirements (SEARs) for the Proposal (State Significant Development ID 9820).

The Maxwell Solar Farm Proposal involves the construction, operation and decommissioning of a ground-mounted PV solar array which would generate approximately 25 MW (AC) that would supply electricity to the Maxwell Infrastructure site and/or the Maxwell Underground site and/or the National Energy Market (NEM). The existing Maxwell Infrastructure approval encompasses 1470 ha of land of which approximately 145 ha would be developed as the Maxwell Solar Farm (Proposal site). Approximately 105 ha would contain solar farm infrastructure and an additional area of up to 30 ha is required for transmission line easements to connect to the existing Drayton Mine substation (33 kV option) or proposed switch station (66 kV option).

As visual amenity values and visual impacts can be subjective, this VIA includes a transparent, systematic evaluation with reference to existing guidelines, to address subjectivity as much as possible.

This VIA provides a full assessment of the visual impacts associated with the Proposal. The VIA is used to identify and determine the value, significance and sensitivity of a landscape.

The VIA found the proposed solar farm would have a low visual impact, which can be attributed to the following:

- The selected location of the Proposal site is within an existing established industrial/ mining area
- The Proposal site is set back from the edge of the plateau in which it is situated, thus restricting the view from viewpoints below the plateau
- Existing screening provided by neighbouring industrial facilities, topography and vegetation
- Topography between the viewpoints and the Proposal site obstructs the view of the proposed solar farm.

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## ACRONYMS AND ABBREVIATIONS

AHD	Australian Height Datum
DoPE	Department of Planning and Environment
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (Cwth)</i>
EP&A Act	<i>Environmental Planning and Assessment Act 1979 (NSW)</i>
ESD	Ecologically Sustainable Development
ha	hectares
km	kilometres
kV	Kilovolt
m	Metres
MAC	Mt Arthur Coal
MW	Megawatt
NEM	National Energy Market
NSW	New South Wales
PV	Photovoltaic
SSD	State Significant Development
VIA	Visual Impact Assessment
ZVI	Zones of Visual Influence

# 1 INTRODUCTION

This Visual Impact Assessment (VIA) has been prepared on behalf Maxwell Solar Pty Ltd (Maxwell) for the proposed Maxwell Solar Farm (the proposal). The Solar Farm would be located on rehabilitated open cut coal mine land within the Maxwell Infrastructure site and is approximately 10km south-south east of the Muswellbrook town centre and 35km north-west of Singleton, NSW (

Figure 1-1). This report has been prepared by NGH Environmental on behalf of Maxwell to assess the potential visual impacts of the proposed solar farm infrastructure.

As visual amenity values and visual impacts can be subjective, the assessment includes a transparent, systematic evaluation with reference to existing guidelines, to address subjectivity as much as possible.

## 1.1 PROJECT OVERVIEW

The Maxwell Solar Farm proposal involves the construction, operation and decommissioning of a ground-mounted PV solar array which would generate approximately 25 MW (AC) that would supply electricity to the Maxwell Infrastructure site and/or the Maxwell Underground site and/or the National Energy Market (NEM). The existing Maxwell Infrastructure approval encompasses 1470 ha of land of which approximately 145 ha would be developed as the Maxwell Solar Farm (proposal site). Approximately 105 ha would contain solar farm infrastructure and an additional area of up to 30 ha is required for transmission line easements to connect to the existing Drayton Mine substation (33 kV option) or proposed switch station (66 kV option). The total development footprint for the proposal would be up to 130 ha, which includes development within the solar farm site and the 'worst case' (largest impact area) transmission line option.

The indicative site layout of the solar farm is shown in



Site layout

19-069 Maxwell Solar Farm

-  Project boundary
-  Indicative solar array
-  Future battery storage
-  Proposed 66kV line
-  Proposed 33kV line
-  Existing 33kV line
-  Existing access road
-  Existing substation
-  Proposed Switch Station

0 200 400 800 Meters

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Figure 2-1.

### **1.1.1 Visual characteristics on construction components**

Construction is proposed to commence early 2021 and will take approximately 12 to 18 months. The following construction elements would be temporarily introduced into the visual environment (both are within the proposed solar farm):

- Site compound areas, site office and maintenance buildings, material storage areas and stockpiles located within the proposal site.
- Areas of bare soil created through excavation, grading or trenching.

### **1.1.2 Visual characteristics of operational components**

Key operational infrastructure components would include:

- A combination of single axis tracker photovoltaic (PV) solar panels and / or fixed configuration (PV) solar panels, mounted on steel frames over most of the site (up to approximately 6000 PV solar panels)
  - Panel measurements = 3m by 4m
  - Panel height up to approximately 4m when fully tilted
- Inverter/ transformer units
- Electrical conduits
- On site substation
- Access tracks and perimeter fencing
- Access point via Thomas Mitchel Drive.

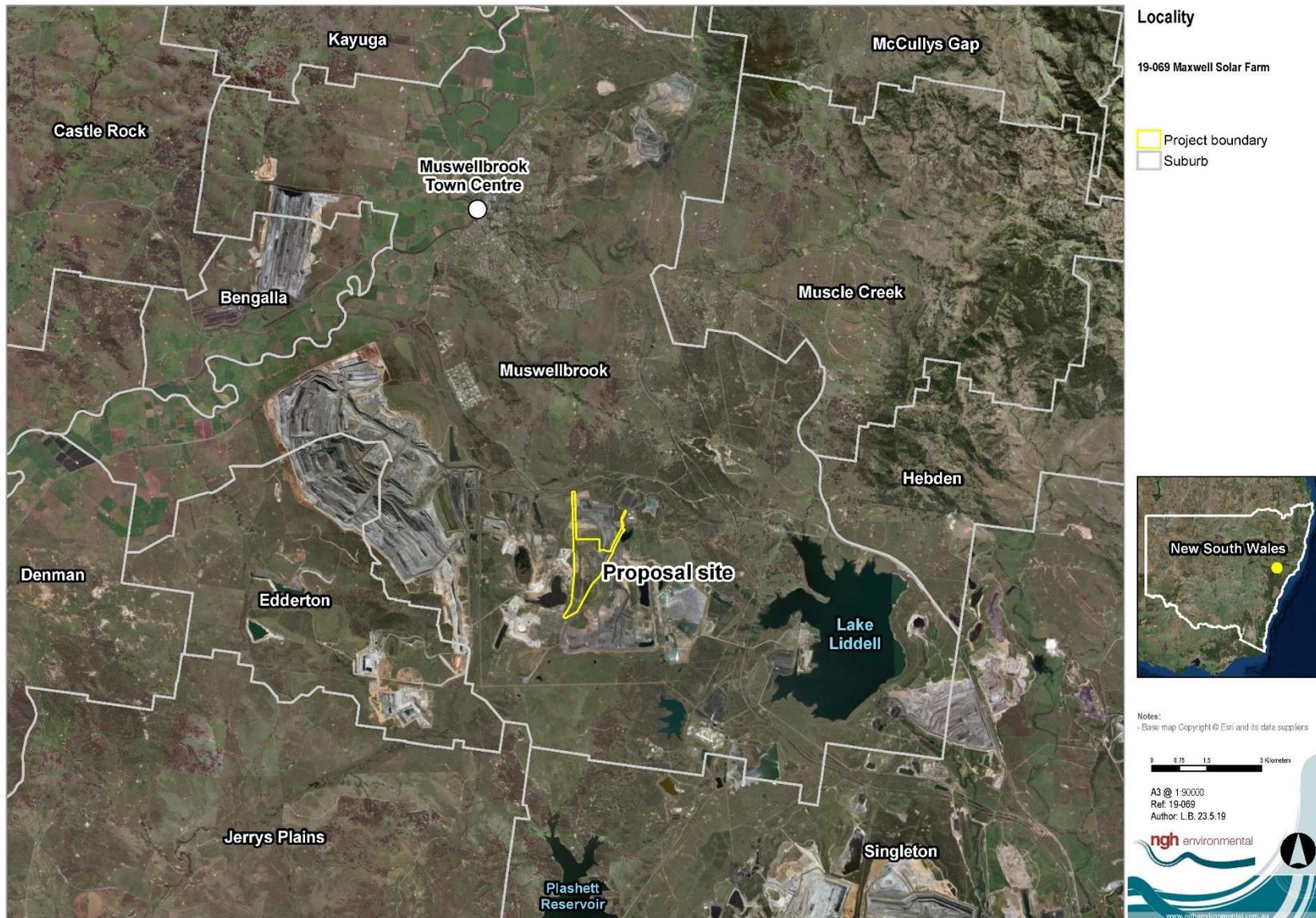


Figure 1-1 Regional location of the proposal site

## 1.2 APPROACH

### 1.2.1 Approach

Maxwell have received the Department of Planning & Environment (DoPE) Secretary's Environmental Assessment Requirements (SEARs) for the preparation of an Environmental Impact Statement (EIS) for the Maxwell Solar project.

The SEARs include a requirement for *'an assessment of the likely visual impacts of the development (including any glare, reflectivity and night lighting) on surrounding residences, scenic or significant vistas, air traffic and road corridors in the public domain, including a draft landscaping plan for on-site perimeter planting, with evidence it has been developed in consultation with affected landowners'*.

This VIA provides a full assessment of the visual impacts associated with the proposal. The VIA is used to identify and determine the value, significance and sensitivity of a landscape.

The assessment was undertaken as follows:

- Description of the existing environment and values of the local community.
- Objective assessment of the relative aesthetic value of the landscape; defined as visual quality and expressed as high, medium or low. This assessment generally relates to variety, uniqueness, prominence and naturalness of the landform, vegetation and water forms within each character type.
- Determination of the landscape sensitivity and its ability to absorb different types of development on the basis of physical and environmental characters.
- An assessment of viewer sensitivity to change. This includes how different groups of people view the landscape (for example, a resident as opposed to a tourist), and how many people are viewing the Proposal and from how far away.
- Viewpoint a to identify areas likely to be affected by development of the site and a photographic survey using a digital camera and a handheld GPS unit to record position and altitude.
- Cross sectional analysis was completed by Zenith Consulting to determine the potential visual impacts of the proposed Maxwell Solar Farm as part of a supplemental visibility analysis. The cross-sectional analysis complements the field assessment and ZVI modelling.
- Assessment of visual impacts. Suggestions are made for suitable development patterns that would maintain the area's visual quality.
- The consideration of reflectivity and glare.

### 1.2.2 Limitations

This assessment is intended to be an objective report based on professional analysis of the proposal design. It seeks to establish the anticipated visual impacts of the proposal on a wide range of receivers. The assessment has been undertaken based on conceptual level information and therefore is generally broad in its approach.

Landscape character and visual impact assessment requires qualitative (subjective) judgements to be made. The assessment process aims to be objective and describe any changes factually. The conclusions of this assessment therefore combine objective measurement and subjective professional interpretation.

The opinions, conclusions and any recommendations in this report are based on assumptions made by NGH Environmental described in this report and, project and cross section data provided by Maxwell.

## 2 EXISTING ENVIRONMENT

### 2.1 SUBJECT LAND AND LOCALITY

The Maxwell Solar Farm proposal site is located in the locality of Muswellbrook and is approximately 10km south-south east of Muswellbrook town centre and 35km north-west of Singleton, within the Muswellbrook Local Government Area (LGA) (

Figure 1-1). The site would be accessed from Thomas Mitchell Drive, which is located on the northern boundary of Maxwell Infrastructure.

The land immediately surrounding the proposal site includes agricultural, mining, power generation and rural residential uses.

The existing Maxwell Infrastructure Approval encompasses 1470 ha of which approximately up to 130 ha would be developed as the Maxwell Solar Farm (the proposal site), identified as within the following properties:

- Lot 6, DP701496.
- Lot 14, DP701496.
- Lot 21, DP545087.
- Lot 64, DP850818.

The proposal site is a rehabilitated portion of an open cut mining operation. The topography of the proposal site has been modified by mining and rehabilitation activities.

The solar array area of the proposal would be constructed on an area known as the 'North Tip', as described in the Rehabilitation and Offset Management Plan (Anglo American, 2013). Rehabilitation of the North Tip was undertaken prior to 2013.

Approximately 22 residences are located within 3 km of the proposed solar farm (including transmission line options). The closest residences are located approximately 1.4 km from the proposed Maxwell Solar Farm site.

Notable features within the region include:

- Hunter Valley Energy Coal (HVEC) located outside the town of Muswellbrook and adjacent to the Proposal site. HVEC includes Mount Arthur North, Bayswater No. 2 and Bayswater No. 3 Mines and is the largest individual coal production site in the NSW Hunter Valley.
- Bengalla open cut mine, located outside the town of Muswellbrook and approximately 9.5km northwest of the Proposal site.
- Bayswater Power Station (BPS) located approximately 5km south southeast. BPS is a coal fuelled thermal power station with four generators.
- Liddell Power Station (LPS) located approximately 5km southeast of the proposal. LPS is a coal fuelled thermal power station with four generators.
- Lake Liddell, which was expanded to accommodate the needs of the Liddell Power Station.
- The Hunter River is a major river which originates in the Liverpool Ranges and flows generally south and then east reaching the Tasman Sea at Newcastle. Muswellbrook is a major town along the Hunter River. The river flows approximately 8km northwest of the proposal site.

## **2.2 VALUES OF THE LOCAL COMMUNITY**

A high percentage (77%) of Australians believe that large-scale solar farms could supply a significant source of Australia's energy requirements (ARENA, 2015). Attitudes in Australia are greatly divided about the visual impacts of large-scale solar farms; 30% agree and 26% disagree that large-scale solar farms have a negative visual impact (ARENA, 2015). While most members of the community are aware of large-scale solar energy, many do not know a great deal about its impacts (ARENA, 2015), including visual impacts.

Three approaches to improving community understanding of the visual impacts of large-scale installations include:

- Provision of images (from many angles) of large-scale solar facilities, particularly in the early stages of a proposal.
- Understanding the similarities between highly supported domestic scale installations and large-scale facilities.
- Understanding the current function of the land proposed to site the solar farm and the additional value the installation allows for (ARENA, 2015).

This VIA endeavours to address these issues.

Maxwell Solar Pty Ltd has conducted an extensive consultation process, leading to an understanding of the priorities of the impacts of the development. Consultation has included direct contact with residential neighbours, consultation with adjacent mines and businesses, consultation with representative bodies, two open days, three newsletters and consultation with Aboriginal groups. Throughout this process, the only time visual impact was raised was by the Maxwell Infrastructure Community Consultative Committee. A full account of consultation activities is given in Section 6 of the EIS.



Site layout

19-069 Maxwell Solar Farm

- Project boundary
- Indicative solar array
- Future battery storage
- Proposed 66kV line
- Proposed 33kV line
- Existing 33kV line
- Existing access road
- Existing substation
- Proposed Switch Station

0 200 400 800 Meters

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Figure 2-1 Indicative site layout

## 2.3 EXISTING LANDSCAPE CHARACTER

The existing landscape character of the proposal site and surrounding area is outlined below.

<p><b>Land use</b></p>	<p>The proposal site is zoned RU1 Primary Production with SP2 Infrastructure 1 km east and E3 Environmental Management 1.5 km north of the site.</p> <p>Land use activities surrounding the proposal site are predominantly mining, agriculture and associated rural dwellings. Other land uses in the locality include</p> <ul style="list-style-type: none"> <li>• Bayswater Power Station and Liddell Power Station to the southeast and east</li> <li>• Mt Arthur Coal to the west, southwest and northwest</li> <li>• The Antiene subdivision and grazing agricultural land to the north of northeast</li> <li>• Drayton Wildlife Refuge to the north</li> <li>• Thomas Mitchell Drive business district to the northwest including maintenance facilities, a takeaway shop and industrial offices</li> <li>• Township of Muswellbrook, approximately 7 km north of site, comprising retail, health services, accommodation, schools and community services.</li> </ul>
<p><b>Topography</b></p>	<p>The proposed site is a rehabilitated portion of an open cut coal mining operation. The proposal would be constructed on a plateau of rehabilitated overburden. The plateau has an elevation of 250 m ADH to 269 m ADH, making it one of the taller landscape features of the area. The topography of the proposal site has been modified by mining and rehabilitation activities.</p> <p>The study area lies within the Upper Hunter Valley; a physiographic region referred to as the Central Hunter Foothills subregion of the broader Sydney Basin Bioregion. It is characterised by undulating lowlands with rounded to steeply-inclined hills and rock outcropping on ridges formed on Permian-era bedrock (Mitchell, 2001) (Morgan, 2001) The original topography of the majority of the study area has been modified through open-cut mining activities, installation of mine infrastructure including buildings, dams, transmission lines and roads, and is generally either rehabilitated or highly disturbed.</p>
<p><b>Roads</b></p>	<p>The proposal site is located approximately 10km south of Muswellbrook, New South Wales. Access to the proposed site would be provided via Thomas Mitchell Drive, a local road which runs in a northwest-southeast alignment between the New England Highway to the east and Denman Road to the west.</p>
<p><b>Vegetation</b></p>	<p>The vegetation within the proposal site occurs on mine overburden rehabilitation. Vegetation establishment in the rehabilitation commenced in 2000 and ceased in approximately 2010. Vegetation primarily consists of rehabilitated pasture including exotic groundcover such as Kikuyu (<i>Pennisetum clandestinum</i>) and Rhodes grass (<i>Chloris gayana</i>) with occasional derived/regenerating native species i.e. <i>Acacia</i> species. Rehabilitated woodland areas have been planted and consist of <i>Eucalypt</i> species, primarily those not native to NSW (i.e. <i>Eucalyptus cladocalyx</i>).</p>
<p><b>Waterbodies</b></p>	<p>The site is within the Hunter Local Land Services area and upper section of the Hunter Catchment. The proposal site is located approximately 8km southeast of the Hunter River. Prior to mining and rehabilitation, the principal water course associated with the</p>

	<p>proposal site was Ramrod Creek, which is a first order ephemeral creek. Connection of the proposal site to the watercourse was completely removed during open cut mining.</p> <p>The proposal site has proximity to four final voids which are used as water storages in the post mine landscape.</p>
<b>Recreational areas</b>	<p>The closest area used for recreation would be the Muswellbrook Pistol Club located on Wire Lane 1.7 km North of the proposed site. Due to the topography of the area and the stands of large trees between the club and the proposed site, the Solar Farm would not be visible from the Pistol Club.</p>
<b>Infrastructure:</b>	<p>There are existing Maxwell-managed internal roads on site that provide access around the mine and rehabilitation areas. Access to the site is via Thomas Michel Drive. Within the proposal site boundary there are existing 33 kV powerlines and a substation, which are maintained as part of the existing site.</p>

## 3 POTENTIAL IMPACTS

### 3.1 CRITERIA

#### 3.1.1 Visual sensitivity

Visual sensitivity is a measure of how critically a change to the existing landscape is viewed by people from different areas. The assessment is based on the number of people affected, land use, and the distance of the viewer from the proposed development (EDAW, 2000). Sensitivity ratings are defined as high, moderate or low and are shown in the table below.

Table 3-1 Visual sensitivity criteria

Land use	Distance zones				
	Foreground		Middle Ground		Background
	0-1km	1-2km	2-4.5km	4.5-7km	>7km
Tourist/Recreation	High	High	High	Moderate	Low
Residential: Rural or Urban	High	High	High	Moderate	Low
Main Travel Corridor	Moderate	Moderate	Low	Low	Low
Minor/Local Roads	Moderate	Moderate	Low	Low	Low
Railway Line (Freight)	Low	Low	Low	Low	Low
Industrial Areas	Low	Low	Low	Low	Low

#### 3.1.2 Visual effect

Visual effect is the interaction between a Proposal and the existing visual environment. It is often expressed as the level of visual contrast of the proposed development against its setting or background in which it is viewed. The visual effects are assessed as:

- **Low visual effect:** occurs when development blends in with its existing viewed landscape due to a high level of integration of one or several of the following: form, shape, pattern, line, texture or colour. It can also result from the use of effective screening often using a combination of landform and landscaping.
- **Moderate visual effect:** occurs where development is visible and contrasts with its viewed landscape, however, there has been some degree of integration (e.g. good siting principles employed, retention of significant existing vegetation, provision of screen landscaping, appropriate colour selection and/or suitably scaled development).
- **High visual effect:** results when development has a high visual contrast to the surrounding landscape with little or no natural screening or integration created by vegetation or topography.

### 3.1.3 Visual impact

Visual impact is the combined effect of visual sensitivity and visual effect. Various combinations of visual sensitivity and visual effect would result in high, moderate and low overall visual impacts as suggested in the below table (URBIS, 2009).

Table 3-2 Visual impact criteria.

Visual sensitivity levels	Visual effect zone		
	High	Moderate	Low
High	High	High	Moderate
Moderate	High	Moderate	Low
Low	Moderate	Low	Low

## 3.2 VIEWPOINT ANALYSIS METHODS

### 3.2.1 Zones of Visual Influence (ZVI) Modelling

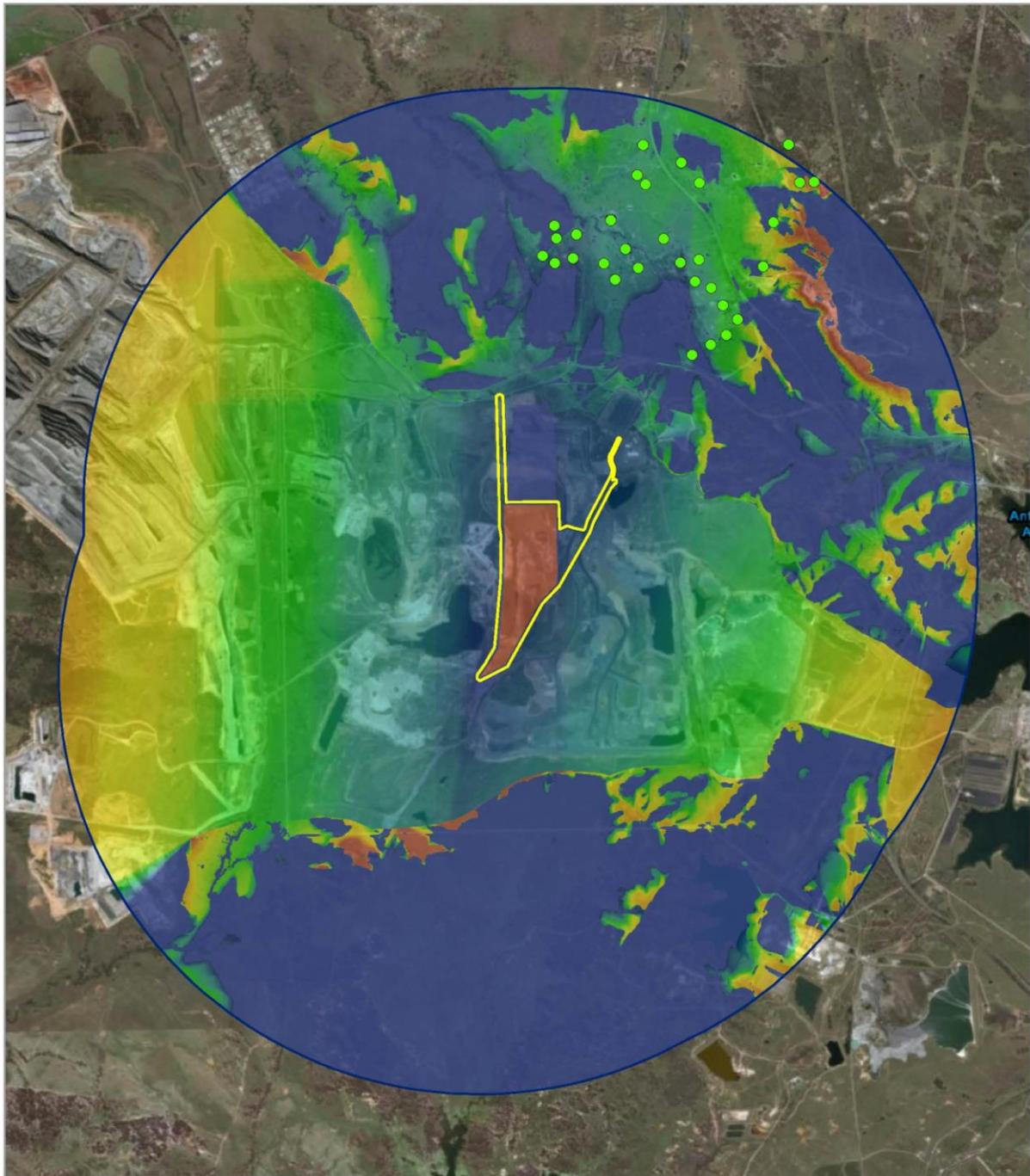
Zones of Visual Influence (ZVI) modelling was undertaken to determine areas in which the solar farm infrastructure may be visible, within 5km of the project. ZVI modelling (provided as Figure 3-1 and Figure 3-2 on the following page) interpreted the Infrastructure as a matrix of evenly spaced points at a height of 4.5 m above ground level with viewers at 1.5m height. This is a conservative approximation of the height of proposed buildings and structures associated with the development, as these are expected to be no greater than 3.5 metres in height. The modelling undertaken is based on the infrastructure layout provided. Two different ground level heights for the proposal site were mapped, i.e. 250 m AHD and 296 AHD, as the site slopes gently from 296m AHD in the north to 250m AHD in the south.

The visibility is then modelled based on the number of points of the infrastructure block that can be seen. 100% visibility means all points can be seen and equates to the highest visibility. The lowest score is 0%; none of the points of the infrastructure block can be seen.

It is noted that the topography was based on a 25m resolution Digital Elevation Model (DEM) derived from 25m contours and that the ZVI does not take into account existing screening from vegetation or infrastructure and, on this basis, is considered a 'worst case' model.

The findings of the ZVI modelling informed the viewpoint analysis. Viewpoints were not selected in areas predicted to be shielded from views of the solar farm.

As a result of the modelling, a total of eight viewpoints were selected and assessed (Figure 3-3). The viewpoints were taken from publicly accessible roads surrounding the site. The viewpoints which have been included represent areas where the development would appear most prominent, either based on the degree of exposure or the number of people likely to be affected, or where sensitive receivers are located.



**Sensitive receivers - 296m AHD**

**19-069 Maxwell Solar Farm**

- Project boundary
- 5km buffer of solar array
- Residences within 5km

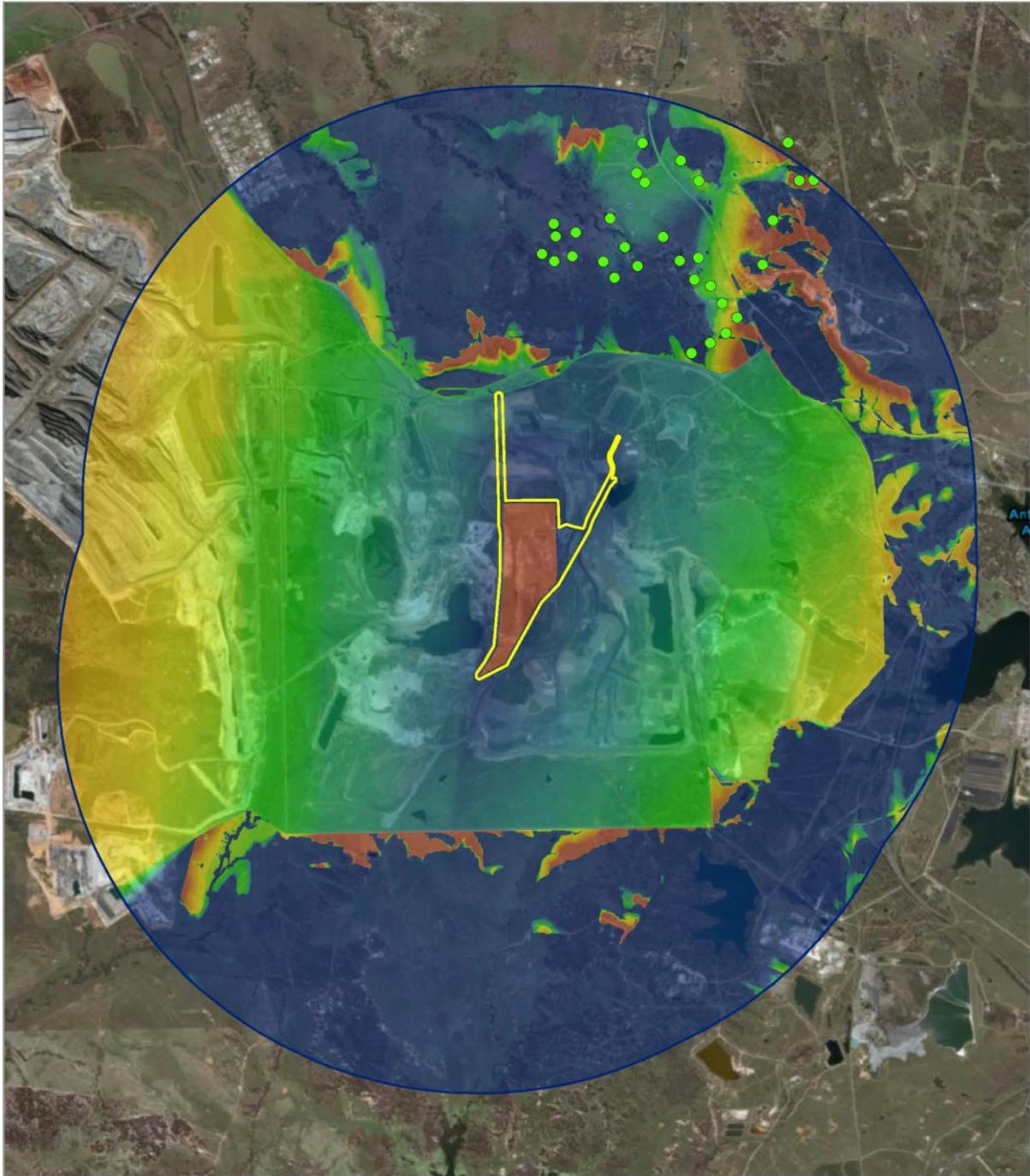
**Relative visibility:**  
 High visibility: 370  
 Low visibility: 1

0 0.625 1.25 2.5 Kilometers

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Figure 3-1 ZVI viewshed model of proposal site – 296m AHD



**Sensitive receivers - 250m AHD**

**19-069 Maxwell Solar Farm**

- Project boundary
- 5km buffer of solar array
- Residences within 5km

**Relative visibility:**  
 High visibility : 370  
 Low visibility : 0

0 0.625 1.25 2.5 Kilometers

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Figure 3-2 ZVI viewshed model of proposal site - 250m AHD



**Viewpoints**

**19-069 Maxwell Solar Farm**

-  Project boundary
-  5km buffer of solar array
-  Viewpoint (VP)
-  Residences within 5km

0 0.625 1.25 2.5 Kilometers

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Author: L.B 23.5.19



Figure 3-3 Viewpoints identified in the Visual Impact Assessment

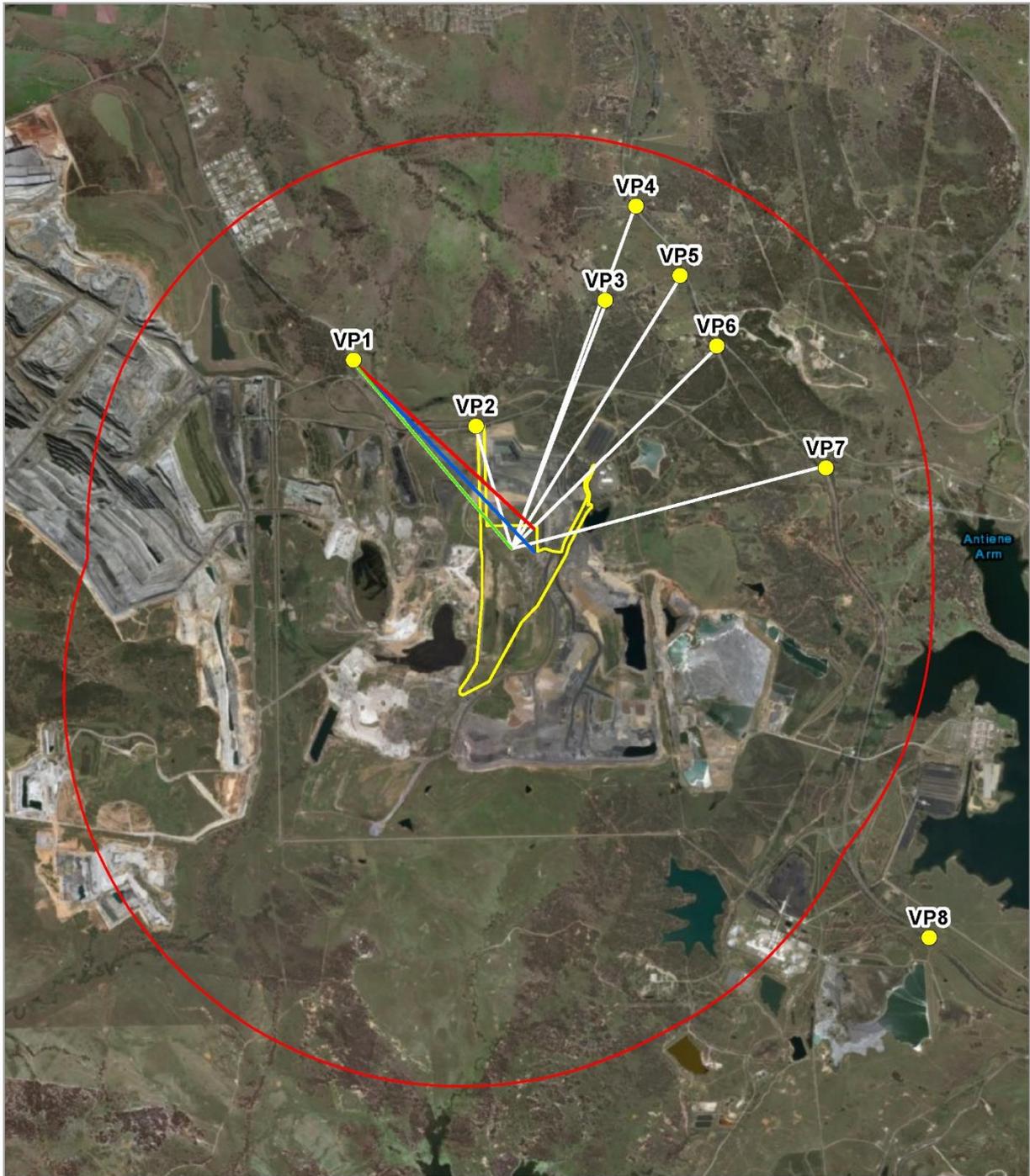
### 3.2.2 Cross sections

In addition to zones of visual influence (ZVI) modelling and photomontage development, cross sectional analysis was completed by Zenith Consulting to determine the potential visual impacts of the proposed Maxwell Solar Farm as part of a supplemental visibility analysis. The cross-sectional analysis complements the field assessment and ZVI modelling.

Cross sectional analysis enables the landscape to be considered across relevant elevated features to determine whether topographic features were able to screen the proposal. The cross sections also gave a relative scale to the proposed Maxwell Solar Farm components in relation to the landscape.

A series of cross sections were completed for seven of the eight viewpoint locations by:

- Importing the terrain model for the locality outside the boundary of Maxwell Infrastructure
  - Terrain data was downloaded from the Spatial Information Exchange (SIX) Maps and ELVIS. SIX Maps is a publicly available data set with 5m contour intervals. ELVIS has limited public availability and utilizes 2m contours
  - Sections were compared between the datasets from both sources.
    - A discrepancy was found for data for Viewpoint 1:
      - It was identified that the SIX Maps data from Viewpoint 1 showed topography that was during the mining of the neighbouring Bayswater #2 mine, which depicts earthworks completed in 2000, and does not represent the current topography.
      - The Viewpoint 1 terrain data sourced from ELVIS shows current topography representing the final rehabilitated surface
      - The ELVIS terrain data was therefore used in preference to the SIX Maps data for Viewpoint 1.
    - All other cross sections were the same for both data sources, so publicly available data from SIX Maps was utilised.
- Utilising aerial photography data for the Maxwell infrastructure site based on a 5m by 5m grid
- 4m height was added to the topography to represent the maximum height of the solar panels, which is depicted on the sections
- Exporting 2D cross sections along each of the eight viewpoints. Four times vertical exaggeration has been applied to the sections to enable the reader to view finer topographical details. Commentary on the cross sections was then added where the line of site would be blocked to the proposal.
- Sections were chosen looking to a “centroid” in the middle of the higher plateau of the proposed Solar farm site (refer to Figure 3-4).
  - This was appropriate for the cross sections for viewpoints 2 to 7 as the solar farm has minimal height variation across the plateau
  - The view from each of these viewpoints is similar across the near flat topography of the plateau
- Three cross sections were produced from Viewpoint 1 as the plateau is partially obscured by topography in the foreground (refer to Figure 3-4)
  - 1A is the most southern alignment and joins the solar centroid as per sections 2 to 7
  - Section 1C was produced to clip the most north eastern corner of the solar farm
  - Section 1B was produced as a final check halfway between 1A and 1C.
- A cross section was not developed for Viewpoint 8 as it is considered too far from the proposal site to experience a notable visual impact by the proposal. Viewpoint 8 is approximately six kilometres from the proposal site and outside of the area considered by the ZVI viewshed analysis.



**Cross sections**

**19-069 Maxwell Solar Farm**

-  Project boundary
-  5km buffer of solar array
-  Viewpoint (VP)
-  Viewpoint cross section 1a
-  Viewpoint cross section 1b
-  Viewpoint cross section 1c

0 0.5 1 2 Kilometers

A4 @ 1:68660  
Ref. 19-069  
Author: L.T 19.8.19



Figure 3-4 Viewpoint cross sections showing line of sight to proposal site

### 3.3 VIEWPOINT ANALYSIS

Section 3.3 analyses the visual impact of the solar farm at each viewpoint using the photomontages and the cross sections of each viewpoint.

#### 3.3.1 Viewpoint 1

<i>Viewpoint ID</i>	<i>Representative receivers</i>	<i>Proximity</i>
<b>1</b>	Traffic along Thomas Mitchell Drive	Middle Ground, 2 to 4.5 km
<i>Land use</i>	<i>Visual sensitivity</i>	<i>Visual effect</i>
Minor local road/ agriculture/ industrial	Low	Low
<i>Visual impact</i>		
<p><b>Low impact</b></p> <p>Viewpoint 1 is situated on Thomas Mitchell Drive, which passes to the north of the Proposal site. The viewpoint is on the north side of the road, which corresponds to the view of traffic travelling East towards the Proposal site. Figure 3-5 shows the view of the Proposal site at Viewpoint 1. From Figure 3-5 it appears that the plateau on which the Proposal site is located is visible from Viewpoint 1. However, Cross sections 1A (Figure 3-6), 1B (Figure 3-7) and 1C (Figure 3-8) show that the area of the proposal site is not actually visible due to land formations between Viewpoint 1 and the proposal site. Therefore, the section of the plateau that is visible in Figure 3-5 is actually only the northern edge of the plateau and not the area of the plateau where the Solar Farm is proposed.</p> <p>The proposed solar farm would be set back from the northern edge of the plateau and hence not visible in the cross sections 1A, 1B, and 1C.</p> <p>Motorists along Thomas Mitchell Drive would not have views of the Solar Farm directly in front as they travel southwest along the road.</p> <p>The solar infrastructure would be a new structure in the area that would be consistent with the existing industrial/mining landscape character, especially the adjacent Mt Arthur mine infrastructure which is highly visible from Thomas Mitchell Drive.</p> <p><b>Mitigation recommended:</b></p> <p>The solar infrastructure would not be visible and therefore no mitigation measures are recommended.</p>		



Figure 3-5 View of Proposal site from viewpoint 1; the Proposal site can partially be seen and is highlighted with a red circle

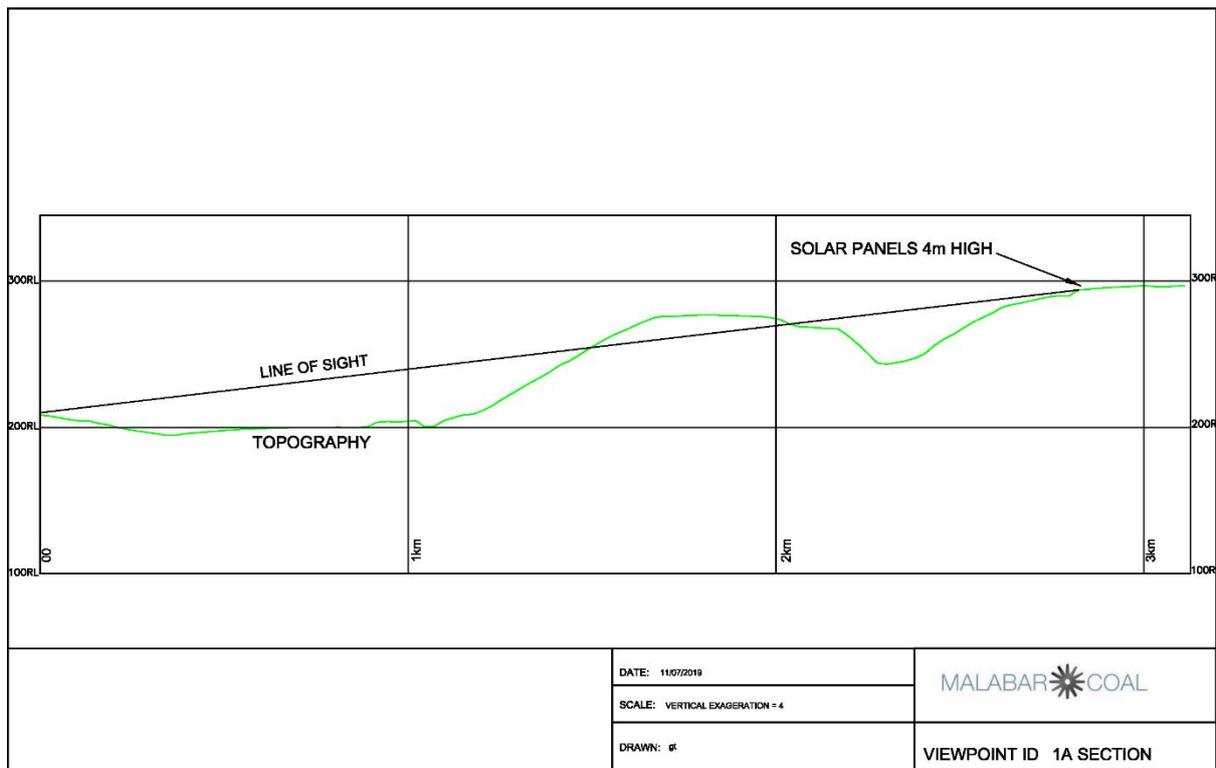


Figure 3-6 Cross section 1A of line of sight from Viewpoint to the Proposal site

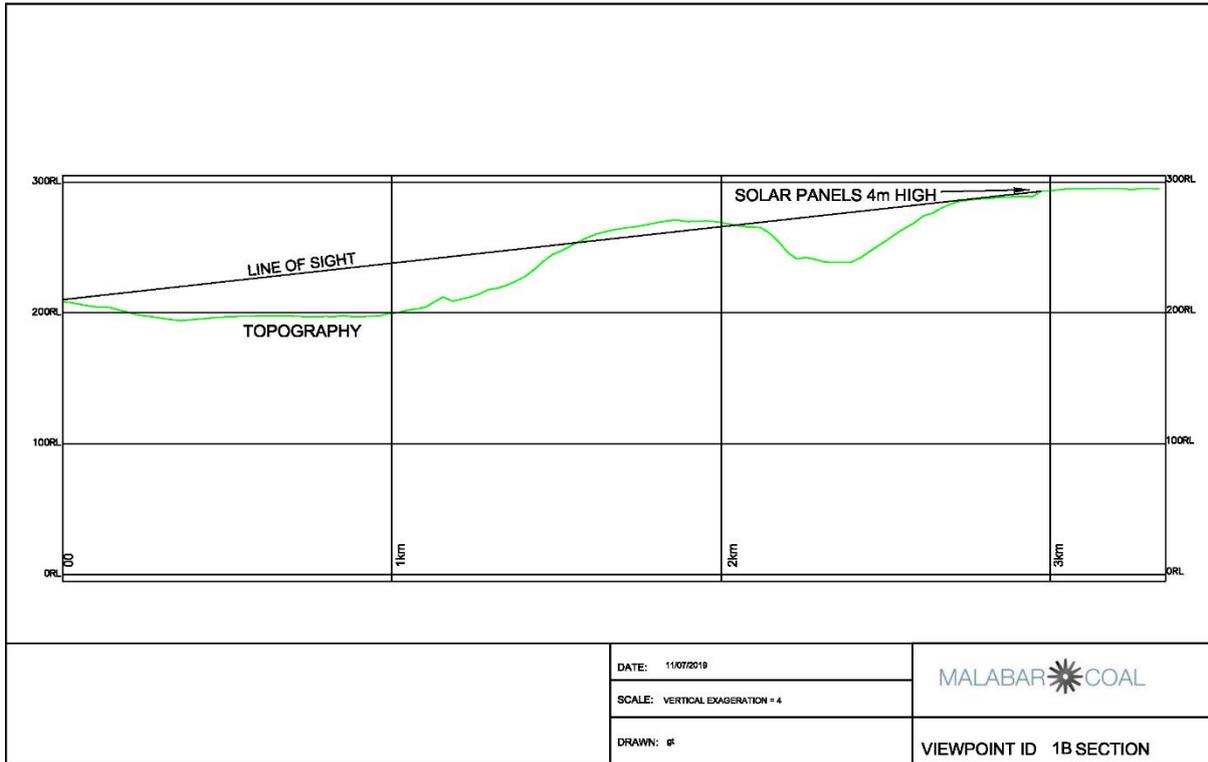


Figure 3-7 Cross section 1B of line of sight from Viewpoint 1 to the Proposal site

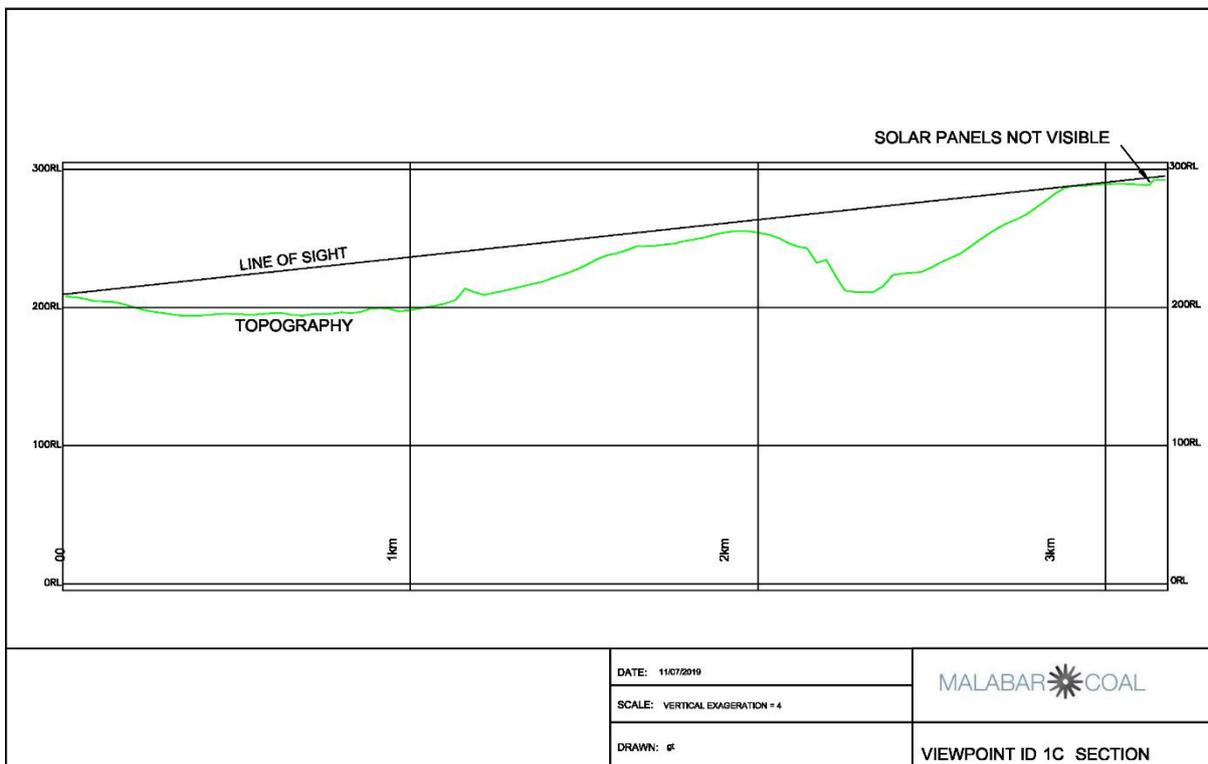


Figure 3-8 Cross section 1C of line of sight from Viewpoint 1 to the Proposal site

### 3.3.2 Viewpoint 2

Viewpoint ID	Representative receivers	Proximity
2	Traffic along Thomas Mitchell Drive	Foreground, 1 to 2 km
Land use	Visual sensitivity	Visual effect
Minor local road/ agriculture/ industrial	Moderate	Low

#### Visual impact

##### Low Impact

Viewpoint 2 is situated on Thomas Mitchell Drive, which passes by to the North of the proposal site. Viewpoint 2 is on the Northern side of the road, with Figure 3-9 looking South towards the Proposal site.

In Figure 3-9 the top of the plateau where the Proposal site would be located is visible. However, Cross section 2 in Figure 3-10 shows that the Proposal site is set back from the edge of the plateau and consequently would not be visible from Viewpoint 2 on Thomas Mitchell Drive. Traffic along Thomas Mitchell Drive would not have views of the Maxwell Solar Farm in either direction.

The solar infrastructure would be a new structure in the area that would be consistent with the existing industrial/mining landscape character.

##### Mitigation recommended:

The Proposal site is not visible from Viewpoint 2 and therefore no mitigation measures are recommended.



Figure 3-9 View of the Proposal site from Viewpoint 2; the Proposal site location is highlighted with a red circle

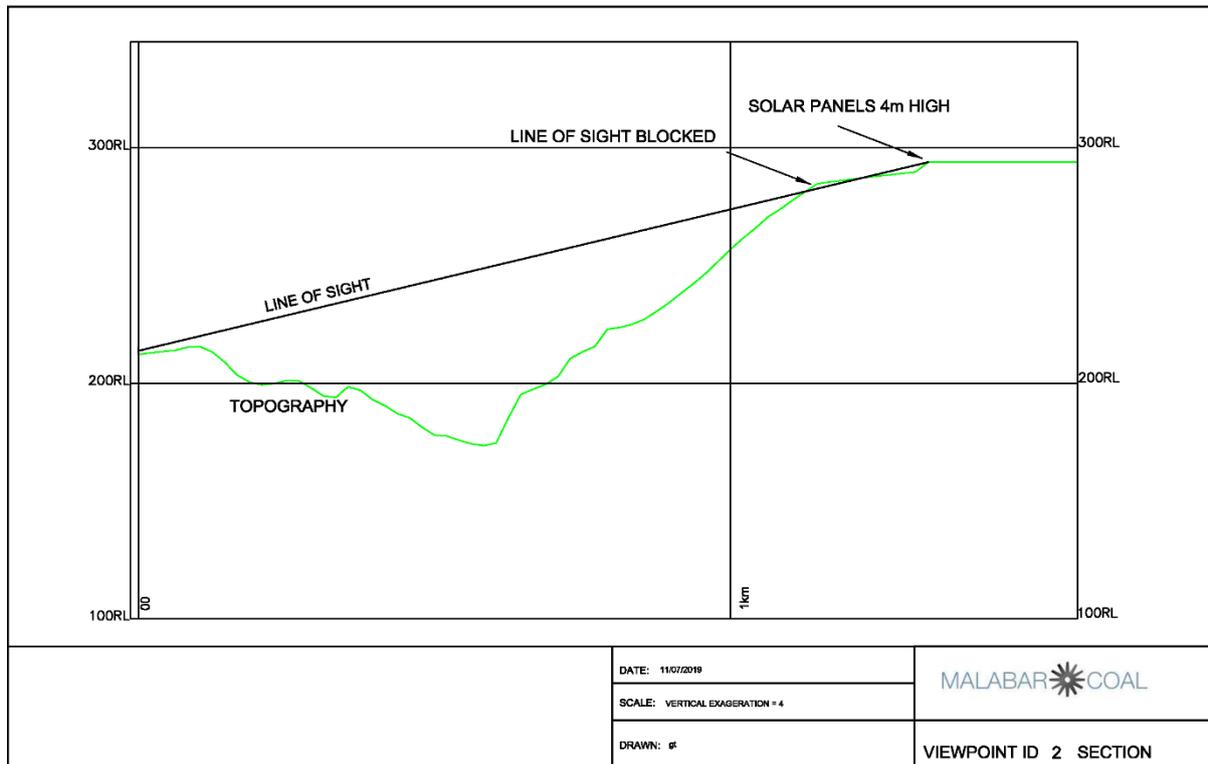


Figure 3-10 Cross section 2 of the line of sight from Viewpoint 2 to the Proposal site

### 3.3.3 Viewpoint 3

Viewpoint ID	Representative receivers	Proximity
<b>3</b>	8 Residents along Pamger Road	Middle Ground, 2 to 4.5 km
Land use	Visual sensitivity	Visual effect
Residential: rural/minor local road/ agriculture	Moderate	Low
Visual impact		
<p><b>Low Impact</b></p> <p>Viewpoint 3 is located on the southern side of Pamger Road and is in proximity to four residents on Pamger Road. The view of the Proposal site from Viewpoint 3 is shown in Figure 3-11. The viewpoint is on the southern side of the road, with the image below looking south towards the Proposal site.</p> <p>Figure 3-12 shows the line of sight from Viewpoint 3 to the Proposal site, which indicates that the proposed solar farm may be partially visible from Viewpoint 3. The solar farm is proposed to be set back from the edge of the plateau, which would reduce its visibility. Vegetation and large trees present between Viewpoint 3 and the Proposal site would also assist in reducing any possible view of the proposed solar farm from Viewpoint 3. As the proposed solar farm would be mostly hidden from view at Viewpoint 3 due to the topography, its location on the plateau and vegetation present, any visual impact at Viewpoint 3 is likely to be negligible.</p> <p>The solar infrastructure would be a new structure in the area that would be consistent with the existing industrial/mining landscape character.</p>		

**Mitigation recommended:**

Due to the likely negligible visual impact of the proposed solar farm no mitigation measures are recommended.



Figure 3-11 View of Proposal site from Viewpoint 3; of the Proposal site is (highlighted by a red ellipse) is located c.3.1km from the trees in the foreground

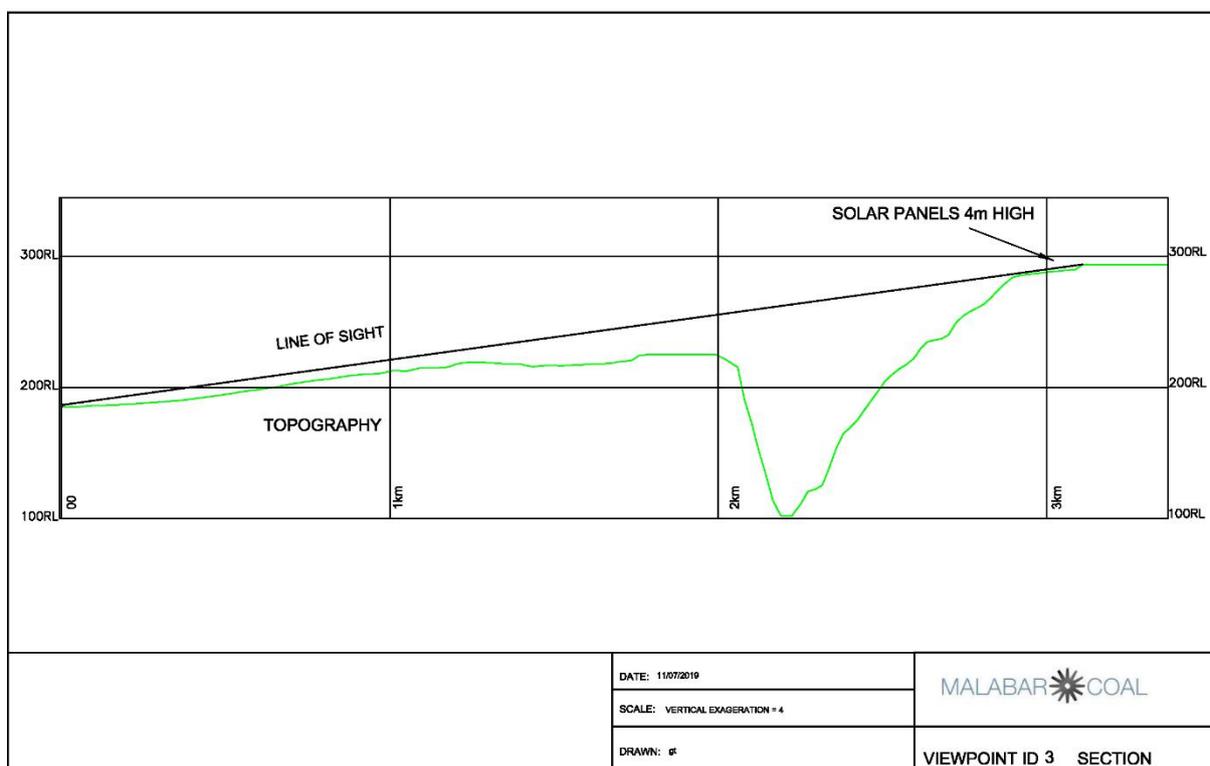


Figure 3-12 Cross section 3 of line of sight from Viewpoint 3 to Proposal site

**3.3.4 Viewpoint 4**

Viewpoint ID	Representative receivers	Proximity
4	5 residents in along the New England Highway in the vicinity of	Middle Ground ,2 to 4.5 km

Viewpoint ID	Representative receivers	Proximity
	VP 4, New England Highway Motorists	
Land use	Visual sensitivity	Visual effect
Residential: rural/ main travel corridor / agriculture	Moderate / Low	Low
Visual impact		
<p><b>Low Impact</b></p> <p>Viewpoint 4 is located on the New England Highway. Viewpoint 4 is located on the north-eastern side of the New England Highway in proximity to three residents. Figure 3-13 shows the view of the Proposal site from Viewpoint 4.</p> <p>The Proposal would be partially visible in between the large trees present between the viewpoint and the Proposal site. Figure 3-14 shows the line of site between Viewpoint 4 and the Proposal site, which also shows that the proposed solar farm would be partially visible from Viewpoint 4.</p> <p>The solar infrastructure would be a new type of structure in the area that would be consistent with the existing industrial/mining landscape character. The area between the viewpoint and the Proposal site is heavily vegetated in parts, which disrupts and shields the New England Highway residents' view of the Proposal site. The Proposal site is also &lt;4km away from Viewpoint 4 and therefore, would have minimal impact on residents' view. The proposed solar farm would have a low to negligible visual impact at Viewpoint 4.</p> <p>Motorists would be unlikely to notice the solar farm from this location due to the distance, disrupted view and temporary nature of their view.</p> <p><b>Mitigation recommended:</b></p> <p>Due to the distance from the Proposal site and vegetation present between the Proposal site and the residents along New England Highway, no mitigations are recommended for this viewpoint.</p>		



Figure 3-13 View of Proposal site from Viewpoint 4; the Proposal site is highlighted by the small red ellipse. It will be c. 4km from this location

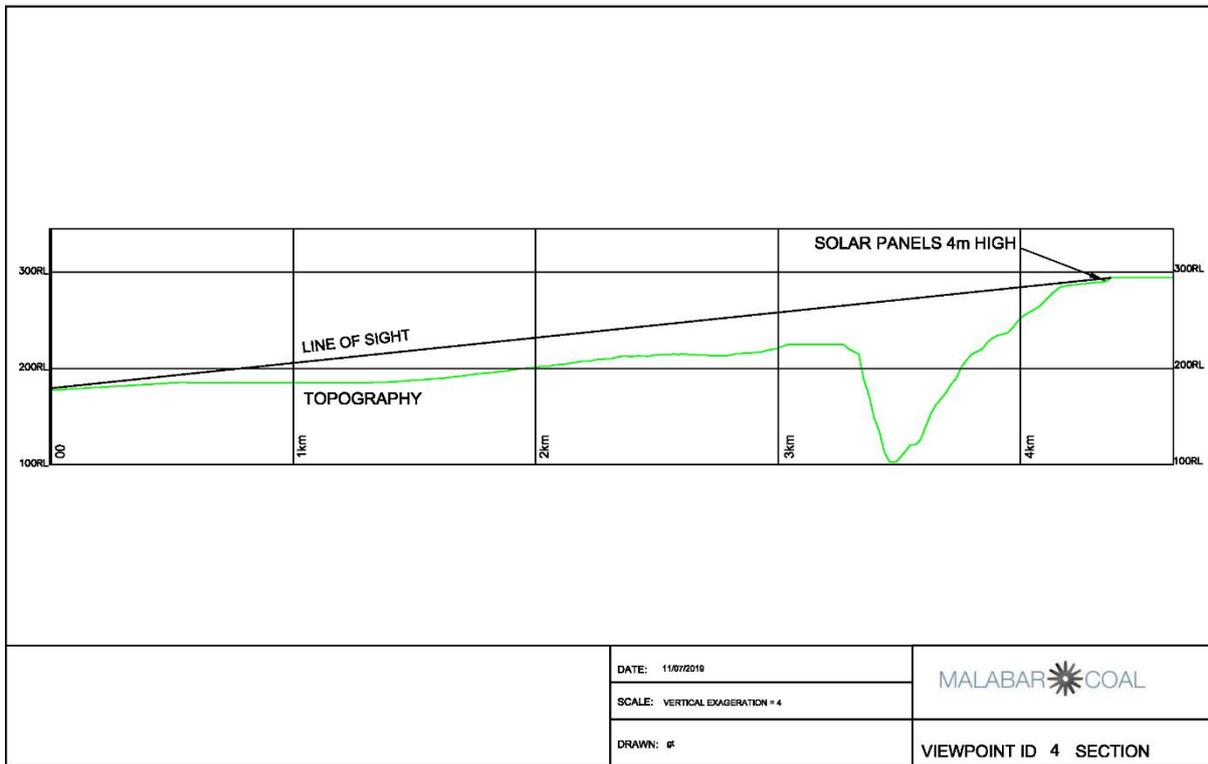


Figure 3-14 Cross section of line of sight from Viewpoint 4 to the Proposal site

### 3.3.5 Viewpoint 5

Viewpoint ID	Representative receivers	Proximity
5	8 Residents along Pamger Road	Middle Ground, 2 to 4.5 km
Land use	Visual sensitivity	Visual effect
Residential: rural/minor local road/ agriculture	Moderate	Low
Visual impact		
<p><b>Low Impact</b></p> <p>Viewpoint 5 is located on Pamger Road where it intersects with the New England Highway. Viewpoint 5 is on the south side of Pamger Road, with Figure 3-15 looking southwest towards the Proposal site. Viewpoint 5 represents approximately five residents to the south and the southwest of Viewpoint 5.</p> <p>Figure 3-16 shows that due to the topography of the land between Viewpoint 5 and the Proposal site, proposed solar farm is not visible from Viewpoint 5.</p> <p><b>Mitigation recommended:</b></p> <p>No mitigation measures are recommended as the proposed solar farm would not be visible from Viewpoint 5.</p>		



Figure 3-15 View of the Proposal site from Viewpoint 5 on the southern side of Pamger Road; the Proposal site location is more than 3.5km from this location and highlighted by the red ellipse

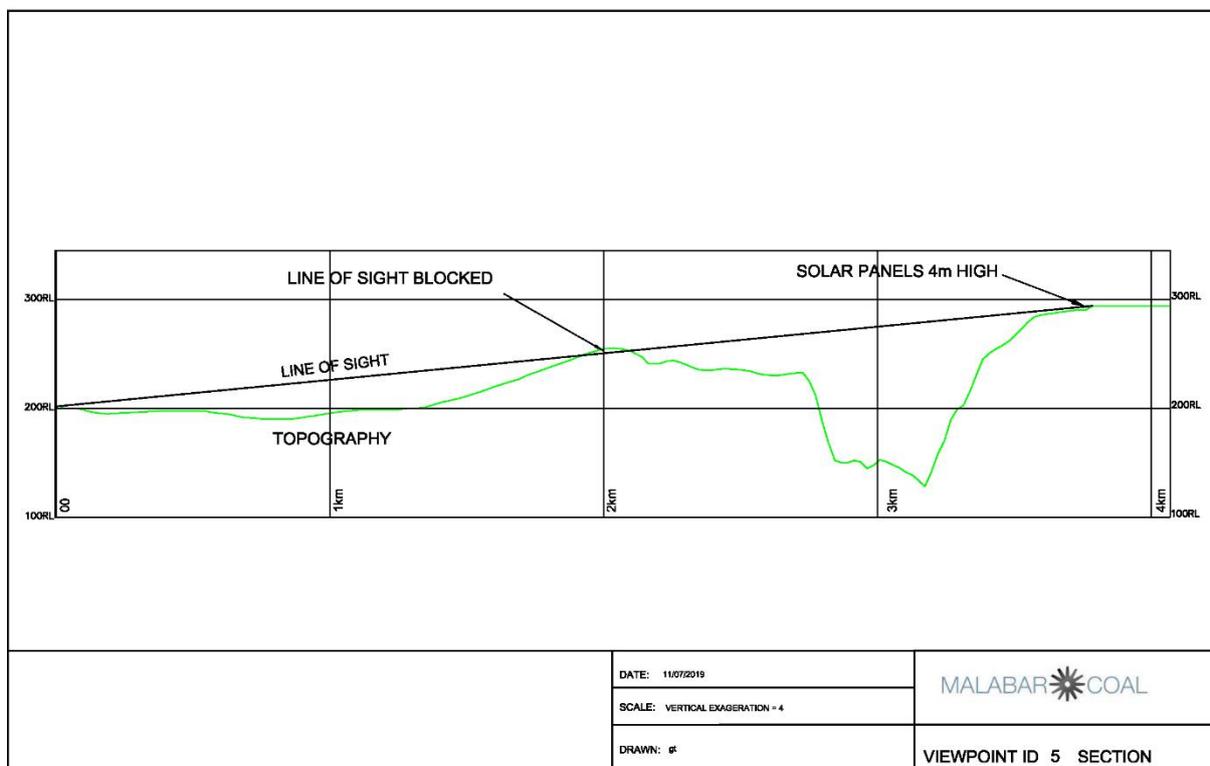


Figure 3-16 Cross section 5 of line of sight from Viewpoint 5 to the Proposal site

### 3.3.6 Viewpoint 6

Viewpoint ID	Representative receivers	Proximity
6	4 to 5 Residents along New England Highway, New England Highway and Thomas Mitchell Drive motorists	Middle Ground, 2 to 4.5 km

<i>Land use</i>	<i>Visual sensitivity</i>	<i>Visual effect</i>
Residential: rural/minor local road/ agriculture	Moderate	Low
<b>Visual impact</b>		
<p><b>Low Impact</b></p> <p>Viewpoint 6 is situated on Hassall Road looking southwest towards the Proposal site. Viewpoint 6 represents approximately six nearby residents and the view of motorists travelling on the New England Highway and Thomas Mitchell Drive.</p> <p>Figure 3-18 shows that when considering only the topography between the Viewpoint 6 and the Proposal site, there would be a line of site from Viewpoint 6 to the Proposal site. However, as shown in Figure 3-17, the proposed solar farm would not be visible due the large trees present between the viewpoint and the Proposal site.</p> <p>The solar infrastructure would be a new type of structure in the area that would be consistent with the existing industrial/mining landscape character.</p> <p><b>Mitigation recommended:</b></p> <p>Due to the heavy vegetation between the Proposal site and Viewpoint 6, no mitigation measures are recommended.</p>		



Figure 3-17 View of Proposal site from Viewpoint 6; the Proposal site location is highlighted by the red circle

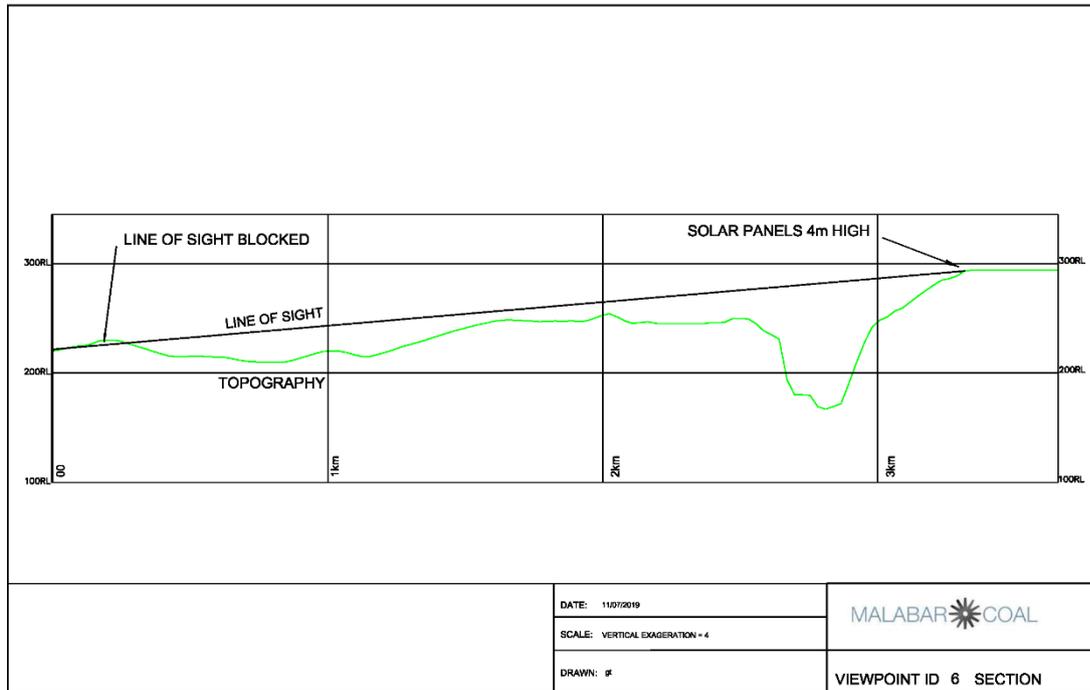


Figure 3-18 Cross section 6 of line of sight from Viewpoint 6 to the Proposal site

### 3.3.7 Viewpoint 7

Viewpoint ID	Representative receivers	Proximity
<b>7</b>	New England Highway and Hebden Road Motorists	Middle Ground, 2 to 4.5 km
Land use	Visual sensitivity	Visual effect
Main travel corridor / minor local road	low	Low
Visual impact		
<p><b>Low Impact</b></p> <p>Viewpoint 7 occurs at the intersection of Hebden Road and the New England Highway. The viewpoint is on the eastern side of the New England Highway, with Figure 3-19 looking west towards the Proposal site. Viewpoint 7 represents the view of motorists travelling on the New England Highway and Hebden Road.</p> <p>Figure 3-20 shows that the topography between the Viewpoint 7 and the Proposal site blocks the view of the proposed solar farm at Viewpoint 7.</p> <p>The solar infrastructure would be a new type of structure in the area that would be consistent with the existing industrial/mining landscape character.</p> <p><b>Mitigation recommended:</b></p> <p>As the view of the proposed solar farm is blocked by the land topography no mitigation measures are recommended.</p>		



Figure 3-19 View of Proposal site more than 3.5km Viewpoint 7; the Proposal site is highlighted by a red ellipse

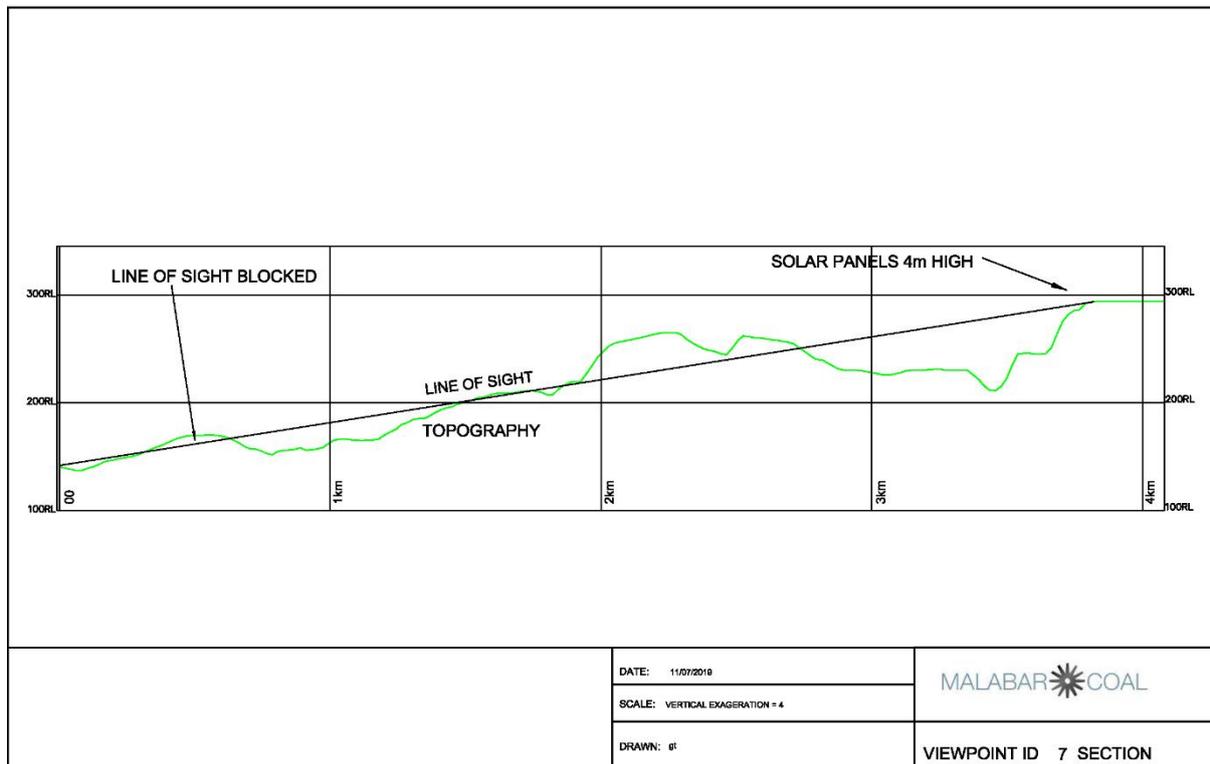


Figure 3-20 Cross section 7 of the line of sight from Viewpoint 7 to the Proposal site

### 3.3.8 Viewpoint 8

Viewpoint ID	Representative receivers	Proximity
<b>8</b>	New England Highway motorist	Background, <7 km
Land use	Visual sensitivity	Visual effect
Main travel corridor	Low	Low
Visual impact		
<b>Low Impact</b>		

Viewpoint 8 is located on the southern side of the New England Highway. Figure 3-21 is the view at Viewpoint 8 looking Northwest towards the Proposal site.

The Proposal would be visible from this viewpoint and is shown clearly in Figure 3-21; however, the Proposal site is approximately 7.5 km away and therefore, is not close enough to have a visual impact on New England Highway motorists.

The solar infrastructure would be a new type of structure in the area that would be consistent with the existing industrial/mining landscape character.

**Mitigation recommended:**

Due to the distance between the viewpoint and the Proposal site mitigation measures are not recommended.



Figure 3-21 View of Proposal site c.7.5km from Viewpoint 8; the Proposal site is highlighted with a red ellipse.

### **3.4 VISUAL IMPACT ASSESSMENT AT REPRESENTATIVE VIEWPOINTS**

#### **3.4.1 Low visual impact**

All eight viewpoints were assessed to have a low visual impact. These viewpoints were assessed as low impact due to the location of the Proposal the top of a plateau, undulating terrain, distance from the Proposal site, and / or existing vegetation between the site and receivers.

No further mitigation measures are recommended.

## 4 GLARE AND GLINT

In the community there is often a perceived issue of glint or glare associated with PV solar panels. Glint is a quick reflection that occurs when the sun is reflected on a smooth surface; glare is a longer reflection. Onsite infrastructure that may cause glint or glare depending on the sun angle, include:

- Solar panels.
- Steel array mounting - array mounting would be steel or aluminium.
- Inverters and transformers.
- Transmission line poles, if steel is used.
- On-site substation.
- Temporary construction site buildings.

Recent studies have suggested that potential for glare from PV solar panels is relatively limited (Spaven Consulting, 2011). PV solar panels are designed to reflect as little sunlight as possible as the PV panels are designed to absorb solar energy in order to generate the maximum amount of electricity. It is documented that PV panels may reflect as little as 2% of the light they receive (FAA, 2010).

The panels would not generally create noticeable glare compared with an existing roof or building surfaces. Figure 4-1 compares the reflectivity of various common surfaces. Seen from above (such as from aircraft) the panels appear dark grey and do not cause a glare or reflectivity hazard. Solar PV plants have been installed on a number of airports around the world and in Australia including Karratha in Western Australia and Darwin in the Northern Territory. Therefore, it is not likely the proposed solar farm will have a visual impact from glint/glare and no mitigation measures are recommended.

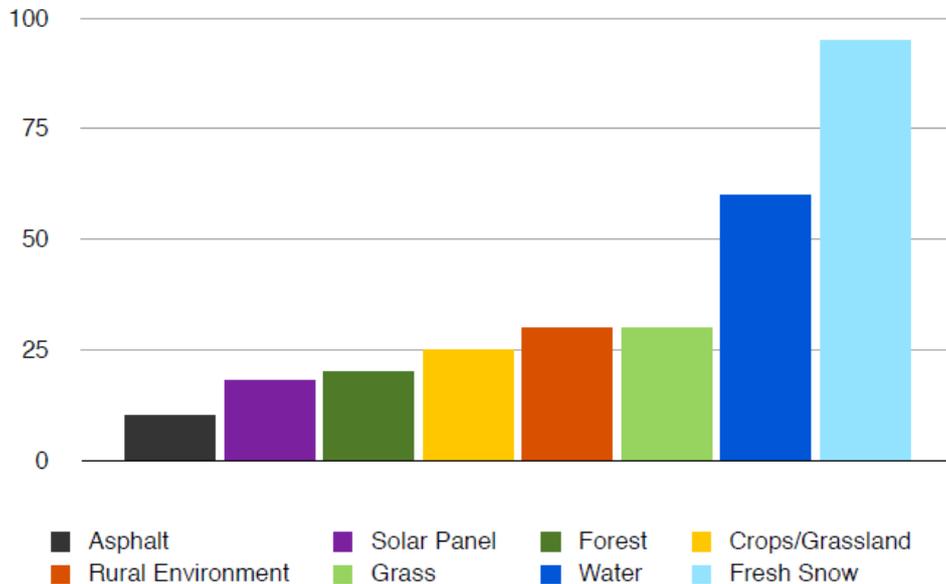


Figure 4-1 Comparative reflection analysis (Spaven Consulting, 2011)

## 5 CONCLUSION

This VIA provides a full assessment of the visual impacts associated with the proposed construction, operation and decommissioning of the Maxwell Solar Farm. The VIA is used to identify and determine the value, significance and sensitivity of a landscape.

The eight viewpoints identified using the DVI modelling were analysed. All eight viewpoints were assessed as having a low visual impact from the proposed solar farm. These viewpoints were assessed as low impact due to the location of the Proposal at the top of a plateau, undulating terrain, distance from the Proposal site, and / or existing vegetation between the site and receivers. There are no glint or glare issues associated with the Proposal.

No mitigation measures are recommended.

## 6 REFERENCES

- Anglo American. (2013). *Drayton Mine Rehabilitation and Offset Management Plan*.
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