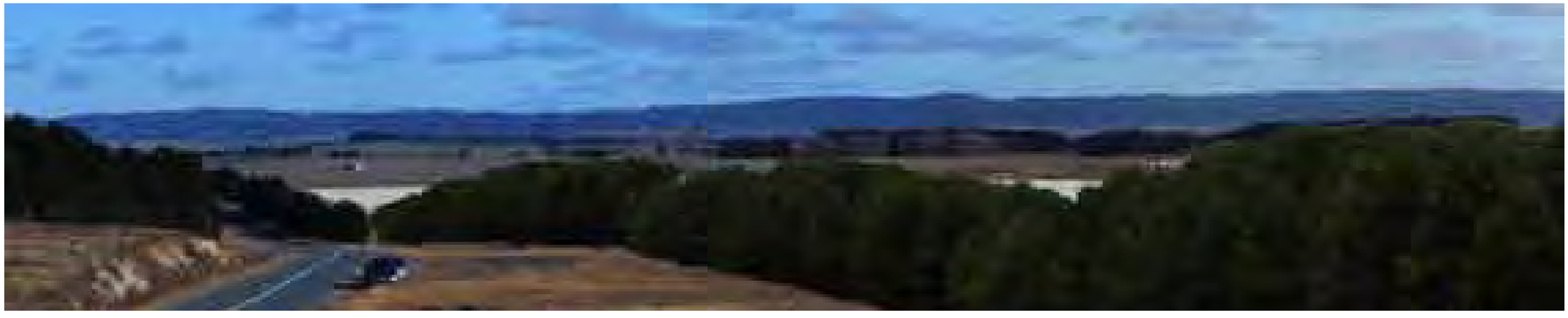
# 5.0 Visual Impact (contd.)

Photomontage 3: Existing view from Tarago Road looking over the Study Site.

Photomontage 3: Photomontage of view to site from Tarago Road.



Photomontage 3: Photomontage of view to site from Tarago Road with site boundary planting.

# 5.0 Visual Impact (contd.)

## 5.3 Visual Impacts

### 5.3.1 OVERVIEW OF VISUAL IMPACTS

The nature and scale of the project will create a new landscape and visual environment. This part of the report will assess the source and magnitude of development effects on the existing landscape elements, character and quality in the context of the site and its environs.

Overall the proposed Lake George Solar Farm would result in impacts on the existing surrounding environment in terms of landscape and scenic values. The visual impacts associated with the proposal will vary depending on the viewing location. The potential visual impacts associated with the proposed development are assessed below.

The Solar Panels are relatively low lying, at a height of approximately 2.3m above the existing ground level. In the context of existing landscape features of the site, including the existing Capital Wind Farm Turbines, and quarry sites, the solar farm has a moderate visual effect.

The solar farm is arranged as an array of panels arranged in an east-west direction, facing north on an angle of 30 degrees. The biggest visual effect of the PV panels is likely to be seen from the north and south, where the most surface area is visible. Visibility of the solar farm from the east and west will be significantly lower. The visual impact is mostly likely to be at its highest during the construction phase.

Existing landscape features of the region which assist in the reduction of the visual impact of the site have been illustrated in the visual analysis (figure 10) on page 39 of this report.

There are a number of rural properties surrounding the proposed solar farm, the closest located approximately 500m to the west of the Site. Generally, due to the high winds typical of the study area, properties in the vicinity are surrounded by a lineal band of mature wind break plantings. The plantings provide a dense visual buffer between homesteads and the Site in most of the circumstances.

The greatest visual impact associated with the proposal is likely to be along Tarago Road. The Solar Farm's southern boundary runs adjacent to Tarago Road for approximately 3km. Approximately 800m of this edge is buffered by existing roadside vegetation. Tarago Road is undulating in character and highpoints along the road become vantage points over the proposed solar farm. Due to the speed at which vehicles travel along Tarago Bungendore Road, the Solar Farm would potentially be visible for approximately 2 minutes.

An overview of the potential visual impact of the solar farm from areas surrounding the site has been included as 5.3.3 of this section of the report.

### 5.3.1 VIEWPOINT VISUAL IMPACT SUMMARY

Due to the undulating topography of the area surrounding the Site, the solar panels are visible from a range of viewpoints around the site.

Of the 14 viewpoints assessed the solar farm would be visible from 11 of these locations. Of these 11 locations, four are assessed as having a high visual impact, one with a moderate visual impact and six with low visual impacts. The Site was not visible from three viewpoints, however these have been retained in the report to demonstrate the effectiveness of existing screening elements from these positions.

The visual impact of each viewpoint has been summarised in table 3 below.

| VIEWPOINT | VISUAL SENSITIVITY | VISUAL EFFECT | VISUAL IMPACT |
|---|---|---|---|
| SF01 | Low | Moderate | Low |
| SF02 | Low | Moderate | Low |
| SF03 | Low | Moderate | Low |
| SF04 | Low | Moderate | Low |
| SF05 | Moderate | Moderate | Moderate |
| SF06 | - | - | - |
| SF07 | Low | Low | Low |
| SF08 | Low | Moderate | Low |
| SF09 | Moderate | High | High |
| SF10 | Moderate | High | High |
| SF11 | Moderate | High | High |
| SF12 | Moderate | High | High |
| SF13 | - | - | - |
| SF14 | - | - | - |

Notes:
1. The visual impact has not been assessed for viewpoints where the proposal would be screened from view.

Table 3: Summary of Viewpoints Visual Impact

# 5.0 Visual Impact (contd.)

## 5.3.3 REVIEW OF VISIBILITY FROM AREAS SURROUNDING THE STUDY SITE

### Views to the Site from the north:

The proposed development would be visible from viewpoints immediately north of the site. The northern perimeter of the study site is bounded by the Bungendore Quarry access road. The site would be visually dominant along this edge. This is due to the close proximity, rise in elevation and lack of vegetation between Currandooley Road and the Study Site. Beyond the northern extent of the site views from homesteads along Currandooley Road would be obstructed by the topography of Hammonds Hill and its associated woodland vegetation. Travelling in a southerly direction down Currandooley Road, glimpses of the proposed solar farm may be briefly visible in clearings, however the impact of these would be minimal due to the low visual sensitivity.

### Views to the Site from the east:

The Study Site is mostly screened from the east due to the height of the ridgeline of the hills of the Great Dividing Range. A combination of the undulating topography and woodland vegegation screens views to the Study Site. The woodland vegetation associated with the Sand Hills extends accross Tarago Road.

### Views to the Site from the south:

The southern extent of the Study Site is defined by Tarago Road. The Study Site is visible from Tarago Road, however views are obscured by intermittent exotic pine and poplar plantings bordering the edge of the Study Site, partially screening potential views to the proposed Solar Farm. The southern edge of Tarago Road is defined by a dense band of exotic planting associated with the small group of rural properties beyond. The proposed Solar Farm may be visible from these properties through breaks in the established pine planting, however for the most part views to the site are concealed.

### Views to the Site from the west:

Traveling in a northern direction along Currandooley Road, off Tarago Road, the Study Site would immediately be visible due to the flat topography and lack of vegetation. Beyond Currandooley Road, views from the edge of Lake George are obstructed by a number of wind break plantings typical of the area.

### Views to the Site from Tarago Road:

Travelling southeast along Tarago Road, the Study Site comes into view at the edge of the extent of woodland vegetation at the eastern edge of the Study Site. The Study Site remains visible for approximately 3km traveling along Tarago Road with roadside embankments creating a degree of visual buffering at points. A lineal band of roadside screen planting along the roadside buffers the visual impact of the Site towards the west, continuing for approximately 800m.

Traveling in a northeasterly direction along Tarago Road, views towards the Study Site are buffered due to a combination of topography and screen planting. The site becomes partially visible at the entry to Bungendore Sands, though vegetation and distance impede views. Plantings of mature poplars border the south eastern edge of the Study Site, partially obscuring views when traveling north east along Tarago Road.

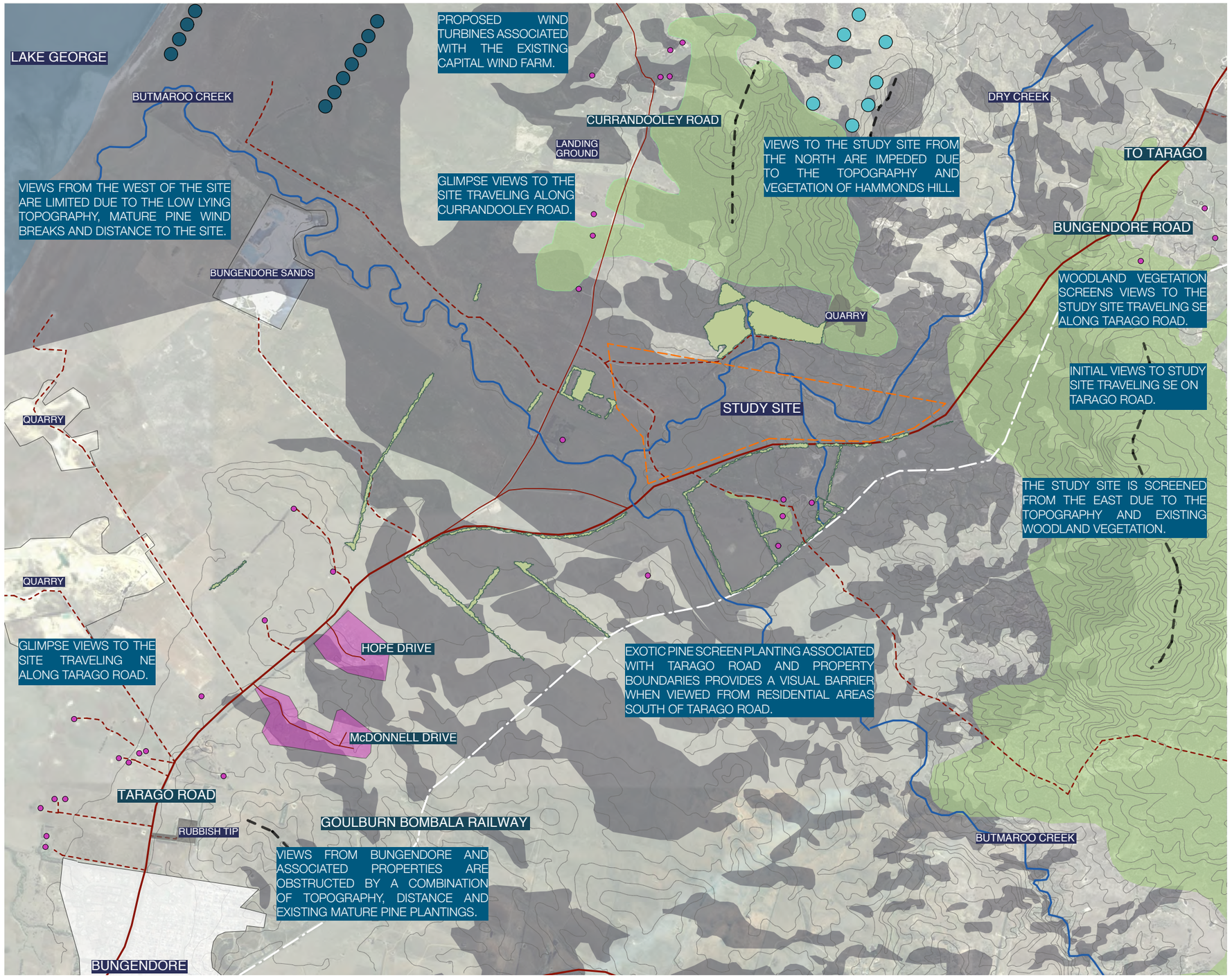
### Views to the Site from Bungendore:

The Study Site is not visible from the Bungendore town centre or surrounding residential housing due to distance, topography and existing vegetation. Views to the site from rural residential estates along Hope Drive and McDonnell Drive to the north east of Bungendore are also buffered by a band of exotic pine screen planting along the southern edge of Tarago Road.

### Views to the Site from the Federal Highway:

Beyond Lake George, to the west of the site the Federal Highway is located along the base of the Lake George Escarpment. A number of rest areas are situated on the western shores of Lake George. These rest areas are all low-lying and the proposed Solar Farm will not be visible. The Weerawa Lookout is located on a high point and has been assessed in viewpoint SF14. The proposed solar farm would  be obscurred by distance from this viewpoint.

# 5.0 Visual Impact (contd.)




## LEGEND

- Minor Access Roads
- Major / Main Roads
- Creeklines
- Existing Pine Windbreak Planting
- Ridge line
- Railway Line
- Existing Contours
- Proposed Solar Panel Layout
- Rural Property
- Rural Estate
- Extent of Bungendore
- Existing Woodland Vegetation
- Location where the Site is wholly or partially visible- based on topography alone.

N

0 1.0 2.0km

Figure 10: Visual Impact Analysis.

VISUAL Impact Assessment

CAPITAL
Solar Farm

September 2010

Moir Landscape Architecture
5 Woodstock Street PO Box 505 Mayfield, NSW 2304
Phone (02)4967 1000 Fax (02)4967 1500
admin@moirlandscapearchitecture.com.au
www.moirlandscapearchitecture.com.au

# 5.0 Visual Impact (contd.)

## 5.5 Reflectivity

There is a perceived issue of glint and glare surrounding the reflectivity of the proposed PV solar panels. As a result of the perceived reflection levels, there is a concern of possible distractions to motorists, aircraft and the hazard of eye damage.

The Poly-Crystalline Solar Panels proposed for the installation are designed to absorb the suns energy and directly convert it to electricity. The PV modules being used in the installation for the Lake George Solar Farm absorb approximately 82-90% of the light received. The SunTech Solar Panels proposed for the Capital Solar Farm have been designed using two anti-reflective coatings which significantly reduces the reflectivity. Thin slivers of metal stripping on the face of the panels further reduce any potential glare issues that may occur.

A number of landing grounds are located within close proximity to the Study Site. PV Solar Panels have been installed at a number of airports in the USA, including Denver and the Oakland FedEx International Airport Hub. These precedents and further studies have found that the reflection created would not cause problems for aircraft, particularly at the critical take off and landing stage.

The level of glare and reflectance from the PV solar panels are considerably lower than the level of glare and reflectance of in common surfaces and those surrounding the proposed Solar Farm. The PV panels would reflect approximately 10-18% of energy which is less than typical rural environments which have a reflectivity of approximately 15-30%. Figure 1.10 and 1.11 and 1.12 compare the percentage of reflected energy from common reflective surfaces to that of a PV Solar Panel.

FXX: Denver International Airport Solar Farm
http://www.oureverydayearth.com

FXXX: Nellis Air Force Base
http://www.seqsoftware.com.au

Figure 12: Suntech VD 280 PV Solar Panel
http://am.suntech-power.com/

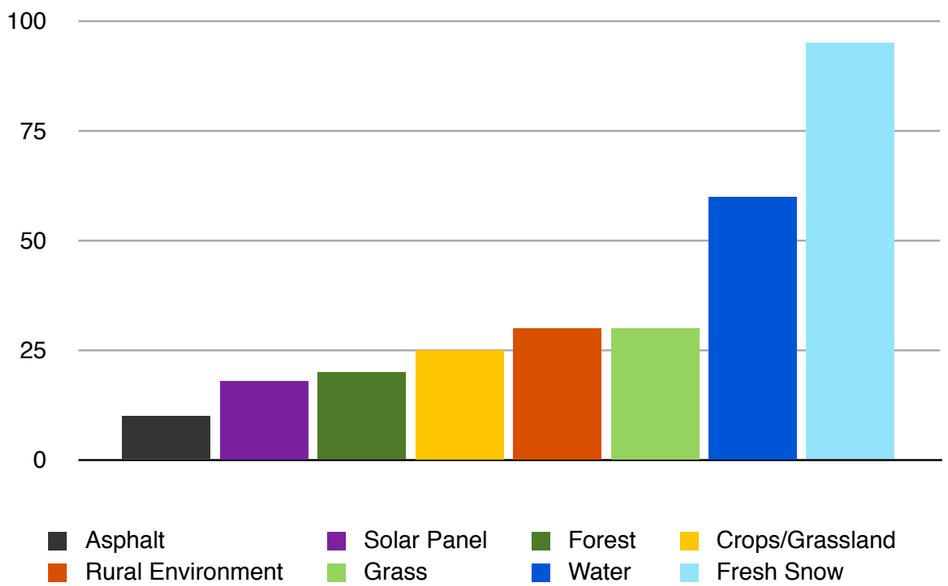



Figure 11: Comparative reflection analysis.

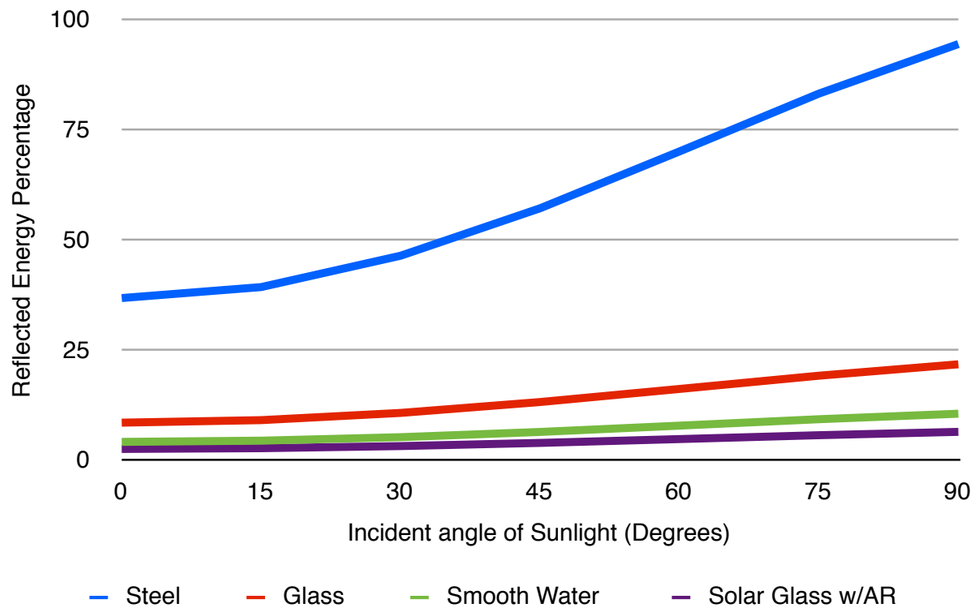



Figure 13: Analysis of typical material reflectivity.

# 6.0 Conclusion

The proposed Lake George Solar Farm is a renewable energy source which involves the installation of solar panels over 60ha of existing rural landscape.

With all visual impact assessments the objective is not to determine whether the proposed impact is visible or not visible, it is to determine how the proposal will impact on the existing visual amenity, landscape character and scenic quality. If there is a potential for a negative impact on these factors it must then be investigated if and how this impact can be mitigated to the extent that the impact is reduced to an acceptable level.

The characteristics which influence the visual impacts associated with the proposal include:

- the sensitivity of the viewing location;
- the visibility of the development for residence and general public;
- the layout of the solar farm and size of the panels;
- the visual appearance of solar panels and associated ancillary works.

Overall the proposed Lake George Solar Farm would result in impacts on the existing surrounding environment in terms of landscape and scenic values. The proposed solar farm contrasts with the existing landscape character of the region which is typically rural, pastoral land. The Site is situated upon currently uninhabited, slightly undulating, grazing land.

The undulating topography of the region in conjunction with the proximity of the proposed solar farm to public roads and residential properties inevitably results in the visibility of the solar farm from a range of viewpoints.

The closest residents to the site are loacted approximately 500m from the site. As is the characteristic of the landscape in this area, these houses are generally surrounded by dense wind break plantings. These dense bands of exotic pine plantings also function as visual buffers and will assist in obscurring views of the solar farm from many residence close to the site.

To assist in quantifying the visual impact of the solar farm, 14 viewpoints were selected from a range of distances and elevations. Of the 14 viewpoints assessed, the solar farm would have a high impact on 4, a moderate impact on 1, a low visual impact on 6 and 3 were not visible.

All four of the viewpoints assessed as having a high visual impact were located along the Tarago-Bungendore Road. The proposed solar farm is bounded on to the south by Tarago Road for approximately 3km.  This has been identified as the area with the highest visual impact, and the area which is likely to cause the most concern.

Currandooley Road is also of concern due to the close proximity to the Site, however the visual impact was assessed as low-moderate due to the visual sensitivity of the area and landuse.

Overall, the proposed solar farm is relatively low lying, with the panels spanning to a height of approximately 2.3m. The panels are north facing on an angle of approximately 30 degrees. Resultantly the biggest visual impact of the solar panels is expected to occur from the north and south. Looking at the panels from a side elevation, the visibility would be limited on a flat surface.

Proposed methods of mitigation for these areas form apart section 7 of this report, focusing on the areas with the highest visual impact. These suggested reccommendations have the ability to significantly reduce the visual impact of the Lake George Solar Farm to achieve a better visual integration at both a local and regional scale.

It is undeniable that the proposed development of a Solar Farm on land identified as the ‘Study Site’ would have impacts on the landscape character of the area. However, in the context of land currently being utilised (wind farm, mining, quarry) visual impact associated with the development of a renewable energy source on the site is considerably low.

# 7.0 Recommendations

## 7.1 Impact Mitigation Strategies

### 7.1.1 OVERVIEW OF IMPACT MITIGATION

A range of methods for mitigating the visual impact of the proposed development have been identified and are outlined in this section of the VIA. The recommendations seek to achieve a better visual integration of the proposed Lake George Solar Farm and the retention of existing landscape character at both local, and regional scales. The mitigation measures attempt to lessen the visual impact of the proposed development whilst enhancing the visual character of the surrounding environment. They are made notwithstanding  issues raised by other consultants (eg. engineering, ecology, geology etc).

When site planning the Solar Farm the design should consider some or all of the following mitigation strategies to lessen the visual impact of the proposal. This is by no meansan exhaustive list, however the adoption of these recommendations will assist considerably in ensuring the proposal contributes positively to the visual quality and character of the area.

In addition to the impact mitigation strategies outlined in the following sections, a visual impact mitigation plan has been prepared and is included as figure 14 on the following page of this report.

### 7.1.2 CONSTRUCTION MITIGATION

It is likely the greatest visual impact will occur through the construction stage. Though the construction phase would be temporary practical methods should be employed to reduce the impact of this stage. These include but are not limited to the following:
- Dust reduction throughout the construction process
- Restoration of any earthworks required for the construction
- Clearing of existing vegetation is to be kept to a minimum

### 7.1.3 SOLAR PANELS & ASSOCIATED INFRASTRUCTURE

Once construction has been completed, the solar farm will be a relatively low lying development, with panels having a vertical height of approximately 2.3m above ground level. Due to the low height, visibility of the solar panels can be potentially be significantly reduced through a variety of mitigation methods.

Although the PV Solar Panels are the most visible feature of the landscape, a considerable amount of associated infrastructure is to be included in the proposal. This infrastructure associated with the solar panels is outlines in the project proposal section of this report. Methods of mitigation which will be incorporated into the project include:
- Colour of above ground infrastructure to be sympathetic to the landscape character
- Underground cabling to be utilised where possible
- The design and location of ancillary works are to incorporate measures which will reduce thie visual impact

### 7.1.4 LANDSCAPING & VISUAL SCREENING

Visual screen planting is a beneficial mitigation method used to assist in the reduction of the Solar Farm's visual impact. Dense wind break and screen planting along Tarago Road and rural homesteads form apart of the existing visual character of the Bungendore/Lake George area. The selection of species typical of the area would enhance the existing landscape character, and would be seen as a continuation of the existing screen planting along Tarago Road.

Visual screen planting is to be undertaken in the form of boundary planting around the solar farm, foreground planting at affected viewpoints and residential tree planting.

The southern boundary adjoining Tarago Road has been identified as the greatest visual impact of the proposed site (Refer figure 7). Visual screen planting along this southern boundary would be the most effective method to reduce the visual impact. As this is the southern edge of the site, shadows cast from screen planting trees would not effect the operation of the solar panels.

Viewpoints located on higher points may require off site foreground planting to assist in the reduction of visibility. Tree planting in consultation with relevant landowners to achieve screening for homesteads with a high visual impact to strategically block parts of the development.

Proposed visual impact mitigation in the form of visual screen planting has been suggested in figure 14.

### 7.1.5 VISUAL OPPORTUNITIES

The proposed Lake George Solar Farm is a flagship development for renewable energy which, due to the relatively large scale and new technology, is bound to be of interest to viewers. There is opportunities for the provision of educational viewing areas at various locations around the site. The integration of a viewing area where visitors would be able to safely view the solar farm and surrounding landscape would be a positive attribute to the development. Combined with interpretive signage these viewing areas would provide an into the function, output and benefits of large scale solar farms.

An area on the eastern corner of the Site has been identified as a potential location for the public viewpoint such an area due to the high vantage position and expansive views over the proposed solar farm and the existing Capital Wind Farm.

# 7.0 Recommendations (contd.)

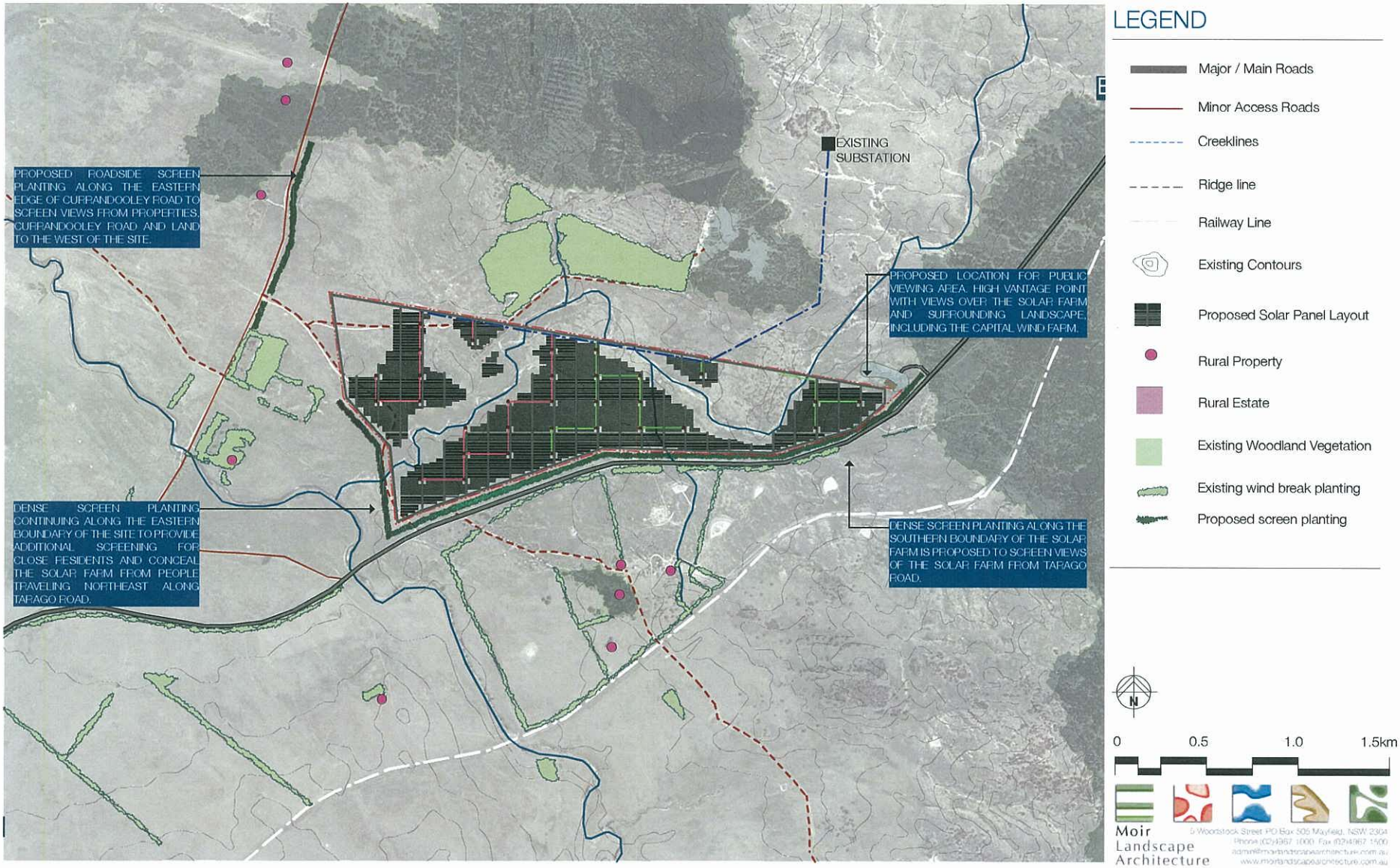



Figure 14: Visual impact mitigation principles.

# 7.0 Recommendations (contd.)

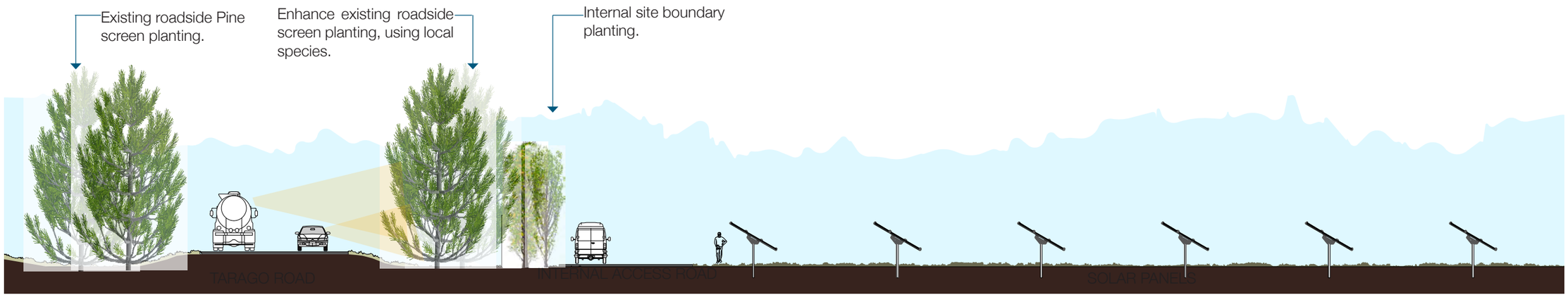
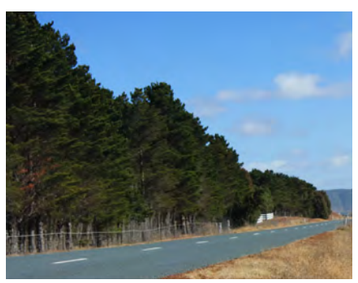
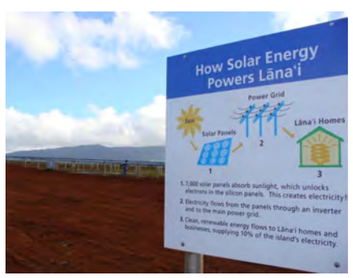



Figure 15: Section through Tarago Road.



1. Dense boundary planting.




2. Educational signage.

3. Public viewing area.

# References

## Publications

Colleran, JR. & Gearing D., (1980) A Visual Assessment Method for Botany Bay, Landscape Australia, 3 August,

DOP (1988) Rural Land Evaluation, Government Printer, Department of Planning.

EDAW (Australia) Pty Ltd., (2000) 'Section 12- Visual Assessment', The Mount Arthur North Coal Project: Environmental Impact Statement, URS Australia Pty Ltd, Prepared for Voal Operations Limited.

State Pollution Control Commission, (1981) Guidelines for Visual Assessment and Management of Coastal Landscapes.

Wright G., (1973)Landscape Quality: A Method of Appraisal, Royal Australian Planning Institute Journal, October

## Maps

Land and Property Information, 1:25000

http://map.google.com.au
2010 Google- Map Data Sciences Pty Ltd, PSMA