PROPOSED MERAPI SOLAR PARK

Remainder of the Farm Ceylon No. 311, Remainder of the Farm Moedersgift No. 566, Remainder of the Farm Welgegund No. 1623, Remainder of the Farm Concordia No. 374, and Portion 1 of the Farm De Hoop No. 1547, Excelsior, Free State Province

VISUAL IMPACT ASSESSMENT

Prepared as part of an Environmental Impact Assessment Process undertaken in terms of the National Environmental Management Act, 107 of 1998

11 JULY 2012

PROJECT NO: VIA_010612.2SA

Produced for:

SolaireDirect (Pty) Ltd.

solairedirect
Southern Africa
The solar MWh company

On behalf of:

Savannah Environmental (Pty) Ltd.

Savannah
ENVIRONMENTAL (PTY) LTD

Produced by:

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1 INTRODUCTION

1.1 Background and Purpose of Report

SolaireDirect Southern Africa (Pty) Ltd. proposes to establish a commercial photovoltaic (PV) solar energy facility as well as associated infrastructure on a site approximately 2km southeast of Excelsior in the Free State Province.

This Visual Impact Assessment (VIA) is undertaken as part of the Environmental Impact Assessment (EIA) process being facilitated by Savannah Environmental (Pty) Ltd. in terms of the National Environmental Management Act 107 of 1998 (NEMA). As such, the purpose of this report is to assess the proposed activity for the site(s) in terms of the *Guidelines for Involving Visual and Aesthetic Specialists in the EIA Process* and the *NEMA EIA Regulations of 2010*.

1.2 Components of the Report

The aspects addressed in this report are as follows:

a) Description of the methodology adopted in preparing the report.
b) Description of the receiving environment.
c) Description of the view catchment area, view corridors, viewpoints and receptors.
d) Identification and evaluation of potential visual impacts associated with the proposed activity and the alternatives identified, by using the established criteria, including potential lighting impacts at night.
e) Identification in terms of best practical environmental option in terms of visual impact.
f) Addressing of additional issues such as:
    - Impact on skyline.
    - Negative visual impact.
    - Impact on aesthetic quality and character of place.
g) Assumptions made and uncertainties or gaps in knowledge.
h) Recommendations in respect of mitigation measures that should be considered by the applicant and competent authority.

1.3 Study Methodology

As stated previously, this VIA was undertaken in accordance with the *Guideline for Involving Visual and Aesthetic Specialists in EIA Processes*, as issued by the Western Cape Government's Department of Environmental Affairs and Development Planning during 2005.

The VIA was undertaken in distinct steps, each of which informed the subsequent steps. The figure below summarises the methodology adopted for undertaking the assessment.

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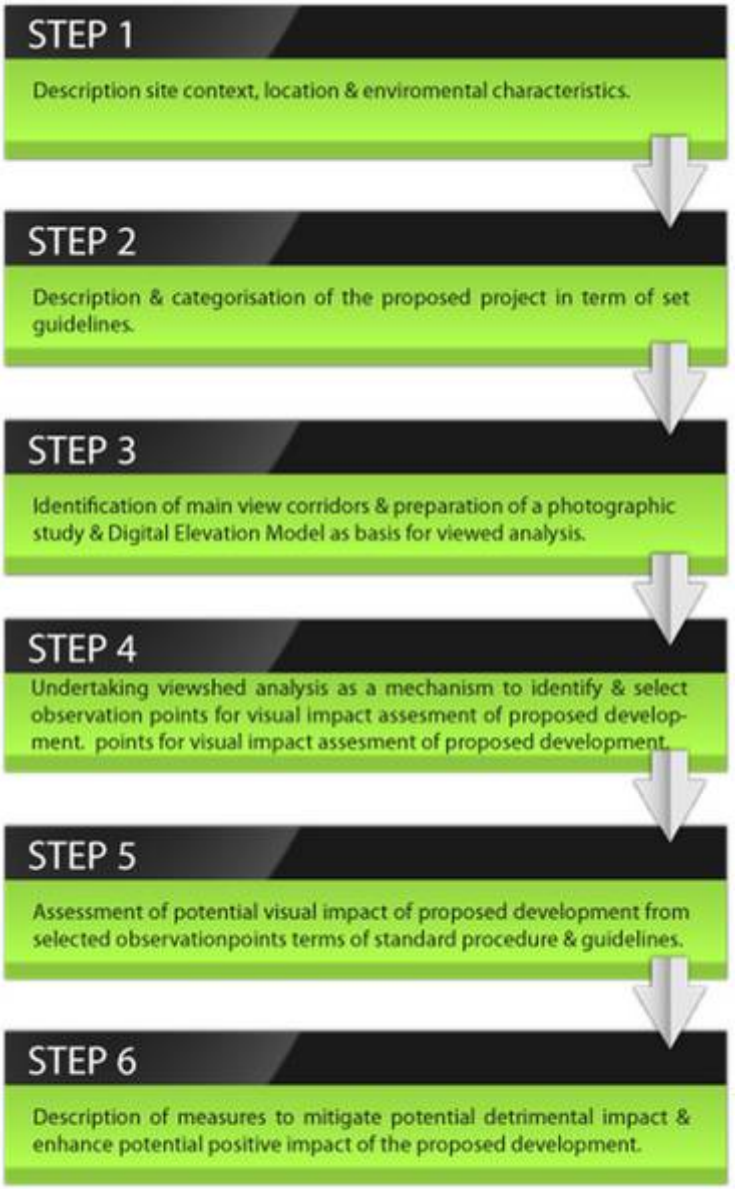

Figure 1: Methodology adopted for the VIA.

1.4 Supplementary Documentation

This report is to be read together with Annexure 2 (Selected observation point viewsheds and assessments), which provides an identification of selected observation points and visual assessment of the proposed activity from each of these points.

1.5 Gaps in Knowledge, Assumptions and Limitations

This assessment was undertaken during the planning stage of the project and is based on the Background Information Document (BID) of June 2012, provided by Savannah Environmental (Pty) Ltd., for the mentioned project.

2 SITE DESCRIPTION

2.1 Locality

The project site is located in the Mantsopa Local Municipality (FS196) in the Free State Province and is some 2km from the town of Excelsior. The town was established in 1910 by farmers who wanted a town which was closer to them than Winburg and Ladybrand.

Excelsior serves as a service centre in support of the predominant agricultural surrounding area. In recent years, however, it has lost its agricultural service centre function due largely to the liberalization of the agricultural marketing system and improved technology.

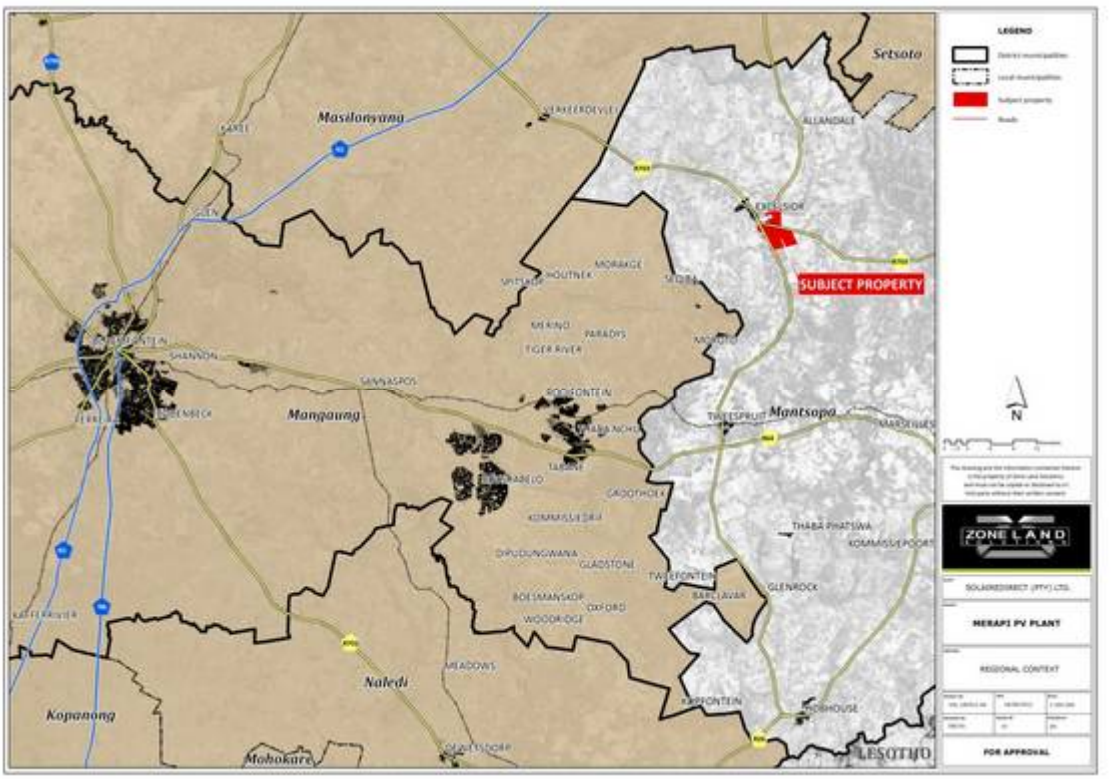

Figure 2: Regional context of the subject property.

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As illustrated by the figure above, the project site is located at the intersection of the R709 and R703, southeast of Excelsior. The R709 links Tweespruit in the south with Winburg in the north. The R703 is a major distributor in the region and connects the town of Clocolan in the east with the N1 in the north. The R709 connects to the N8 in the south which also serves as a primary movement corridor between Bloemfontein and Lesotho.

No national parks of nature reserves exist in close proximity to the project site.

2.1.1 Intrinsic Values of the Area

It is a common principle of planning that each place has a specific intrinsic, instrumental and systemic value and that such values need to be carefully considered when contemplating the current and future use of any particular place.

Broadly spoken, two different philosophical perspectives are possible when considering the value of any place or object, namely **what is it good for?** and **what is its own good?** The first question relates to its instrumental value, while the second deals with intrinsic value. Instrumental value use something as a *'means to an end'* while intrinsic value refers to being *'worthwhile in itself'* (Rolston, 1994).

Systemic value relates to the fact that *'things do not have their separate natures merely in, and for themselves, but they face outward and co-fit into broader natures. Value seeps out into the system and the individual lose its status as sole locus of value'* (Rolston, 1994:174). Systemic value refers to the relations that things have with other things, and to the role they play in larger wholes.

The value system of the eastern Free State was determined in the various collaborative, participative processes undertaken during the drafting of forward planning documentation, policy and guidelines. As such, the intrinsic value of the area is found in the agrarian landscape with strong linkages to the natural landscape.

It is also recognised that tourism is becoming an increasingly important industry in the area. The Provincial Economic Strategy identifies tourism as a sector which has a competitive advantage. It is stated that the Free State's natural and cultural features have different potential for tourism. One of the province's main assets is its large areas, which are relatively well-preserved. Even though not formally recognised as a key tourism area or which forms part of a tourism corridor, the area in the vicinity of Excelsior should also be treated as such.

2.2 Project Site Description

As illustrated by the figure below, the project site consists of 4 individual sites/phases to be established on 5 larger farms. In total the properties on which the phases are to be

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undertaken constitute approximately 1465 ha while the phases total approximately 315ha. The relevant properties are summarised in Table 1 and are illustrated by Figure 3.

Table 1: Properties that collectively constitute the project site.

FARM NO.	EXTENT
Remainder of the Farm Ceylon No. 311	369ha
Remainder of the Farm Moedersgift No. 566	472ha
Remainder of the Farm Welgegund No. 1623	233ha
Remainder of the Farm Concordia No. 374	261ha
Portion 1 of the Farm De Hoop No. 1547	130ha

Figure 3: Extent of subject property and improvements.

In the northern portion of the subject property, the Merapi substation is situated on Portion 12 of the Farm No. 566. A number of electrical transmission lines run into this substation from where electricity is again distributed to the wider region. Currently, a 132kV transmission line, with a servitude width of 15.5m, run in a north-south direction to and from the Merapi substation along the R709. A second transmission line of similar capacity run in an east-west direction over the Remainder of the Farm Moedersgift No. 566.

The planned Merapi Solar Park facility will evacuate the generated power into the Eskom electricity grid at the Merapi substation.

An area of approximately 120ha, 100ha and two portions of 45ha each have provisionally been allocated to establish the planned solar park. The provisional location of the latter sites is indicated by the figure above. It should however be noted that the final position is still be to determined by means of the EIA process to be undertaken.

2.2.1 Landscape Character

Agriculture dominates the landscape character of the Free State with cultivated land covering 32 000km² and natural veld and grazing a further 87 000km². The landscape character of the region in the vicinity of Excelsior and the project site in particular is no different.

Open grass plains characterise the project site. The Korannaberg Mountains exists further to the east. Commercial livestock (cattle) farming is the main form of farming.

The area on average receives approximately 450mm of rain per annum, with most of the rainfall occurring during mid summer. The average midday temperatures range from approximately 16°C in June to 28°C in January. The region is the coldest during June when the mercury drops to 0°C on average during the night.

The project site has a generally flat terrain, which gently increases in height towards the 'koppies' in the north. Along the western boundary, the Lengana River represents the lowest portion of the subject property.

The height variations of the project site vary between 1455m and 1530m above mean sea level over a distance of approximately 3.6km between the individual phases.

The area is dominated by the Eastern Free State Clay Grassland (Gm 3) vegetation type. According to Mucina and Rutherford (2006), Eastern Free State Clay Grassland form part of the Grassland Biome which is found on the high central plateau of South Africa. Although the vegetation type occurs on mainly flat and rolling retain, it generally occurs between 1380m and 1740m above mean sea level.

Eastern Free State Clay Grasslands are dominated by a single layer of grasses. The amount of cover depends on rainfall and the degree of grazing, while trees are generally absent, except in a few localized habitats. Frosts, fire and grazing maintain the grass dominance and prevent the establishment of trees.

The grassland is dominated by *Eragrostis curvula, Themeda triandra, Cymbopogon pospischilii, Eragrostis plana, Setaria sphacelata, Elionurus muticus* and *Aristida congesta*. The specific vegetation type has been classified as endangered with only a small portion being offered formal protection.

3 PROJECT DESCRIPTION AND INSTALLATIONS

The proposed solar power plant will include PV solar panels and associated infrastructure with a total generating capacity of approximately 300MW, which is to be developed in four phases of 75MW each. The facility will be known as the Merapi Solar Park.

Table 1 above indicates the properties upon which the individual phases are to be established. In terms of the above, it is proposed that the PV facility will be established in a phased approach under four separate Special Purpose Vehicles (SPVs).

The overall aim of the design and layout of the facilities is to maximise electricity production through exposure to the solar radiation, while minimising infrastructure, operation and maintenance costs, and social and environmental impacts. The use of solar energy for power generation can be described as a non-consumptive use of natural resources which emits zero greenhouse gas emissions.

3.1 Project Components

The proposed Merapi Solar Park, would typically comprise of the following infrastructure:

- Solar modules of 300Wp each;
- Arrays of PV panels with an installed capacity of up to 75MW per Phase;
- Inverter/transformer enclosures;
- Cabling between the project components, to be lain underground where practical;
- Overhead power lines (132 kV);
- Internal access roads and fencing; and
- A workshop area for maintenance and storage, office, toilets and small water treatment unit.

3.2 Renewable Energy Technology Proposed

Various renewable energy technologies are available for electricity generation. Renewable energy technologies offer an alternative to fossil fuels, thereby reducing the amount of CO2 emissions into the atmosphere.

3.2.1 Photovoltaic Technology

Solar energy facilities, such as those using PV panels use the energy of the sun to generate electricity through a process known as Photovoltaic Effect. This effect refers to photons of light colliding with electrons, and therefore placing the electrons into a higher state of energy to create electricity.

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Photovoltaic systems use solar panels to convert sunlight into electricity. The system is made up of one or more solar panels, usually a controller or power converter, and the interconnections and mounting for the other components.

Individual ground-mounted PV panels (also referred to as free-field or stand-alone arrays) will be connected into a 'string' of panels of up to 3.0m in height. The 'string' will be attached to a steel support structure set at an angle so to receive the maximum amount of solar radiation. The angle of the panel is dependent on the latitude of the proposed facility and the angles may be adjusted to optimise for summer or winter solar radiation characteristics.

The photovoltaic cells to be used consist of a thin film technology or polycrystalline silicone cell which acts as a semiconductor used to produce the photovoltaic effect. Individual PV cells are linked and placed behind a protective glass sheet to form a photovoltaic panel.

The photovoltaic effect produces electricity in direct current. Therefore an inverter must be used to change it to alternating current.

The PV panels are designed to operate continuously for more than 20 years, unattended and with low maintenance.

Figure 4: Illustration of photovoltaic panels (Source: Savannah Environmental [Pty] Ltd.).

3.3 Potential 'triggers' or Key Issues

A 'trigger' is a characteristic of either the receiving environment or the proposed project which indicates that visibility and aesthetics are likely to be key issues and may require further specialist involvement (DEA&DP, 2005).

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The 'triggers', as it relates to the proposed project refer to the following:

Table 2: Potential trigger.

KEY ISSUE	FOCAL POINTS	DESCRIPTION
a) Nature of the receiving environment:	*Areas with a recognised special character or sense of place.*	The area does not have a distinctive sense of place or special character. The proposed activity will however be developed in close proximity to the town of Excelsior which requires special mention.
	Areas lying outside a defined urban edge line.	The proposed activity is situated outside the demarcated urban edge of Excelsior and will be assessed accordingly.
	Areas with sites of cultural or religious significance.	The cultural significance of the project site will be assessed during archaeological and heritage impact assessments.
	Areas of important tourism or recreation value.	The R703 is an important spine route between Clocolan and the N1. Development alongside this route should not reduce the comparative economic advantages of the region. As such, the proposed activity could contribute to an expanded electricity network which would help to ensure a constant and uninterrupted electricity supply to the region.
	Areas with important vistas or scenic corridors.	The project site does not fall within important public vistas or scenic corridors. The site also does not break any ridgelines.
b) Nature of the project:	*A change in land use from the prevailing use.*	The prevailing use will change on approximately 315ha. Should the proposed mitigation measures be implemented, the prevailing use could be retained to a degree.
	A significant change to the townscape or streetscape.	Due to the proximity to Excelsior, the proposed activity might change the manner in which the town is experienced by visitors.
	Possible visual intrusion in the landscape.	The proposed activity will form an integral part of the future landscape character. The extent and significance of a possible visual impact is to be determined through this VIA.

3.4 Development Category

Based upon the 'triggers' and key issues and the environmental context summarised above, the proposed activity is categorised as a **Category 4 Development**.

This categorisation is based upon the *Guidelines for Involving Visual and Aesthetic Specialists in EIA Processes*, which lists the following categories of development:

Box 3: KEY TO CATEGORIES OF DEVELOPMENT

Category 1 Development: e.g. nature reserves, nature-related recreation, camping, picnicking, trails and minimal visitor facilities.

Category 2 Development: e.g. low-key recreation/resort/residential type development, small-scale agriculture/nurseries/narrow roads and small-scale infrastructure.

Category 3 Development: e.g. low density residential/resort type development, golf or polo estates, low to medium-scale infrastructure.

Category 4 Development: e.g. medium density residential development, sport facilities, small-scale commercial faculties/office parks, one-stop petrol stations, light industry, medium-scale infrastructure.

Category 5 Development: e.g. high density township/residential development, retail and office complexes, industrial facilities, refineries, treatment plants, power stations, wind energy farms, power lines, freeways, toll roads, large-scale infrastructure generally. Large-scale development of agriculture land and commercial tree plantations. Quarrying and mining activities with related processing plants.

Based upon the above categorization and the assessment criteria provided in the *Guidelines for Involving Visual and Aesthetic Specialists in EIA Processes* it is expected that the visual impact of the proposed activity would be classified as **'moderate'** (refer to the table on the following page).

The objectives of the VIA described in this report is to:

a) determine whether such broad impact categorisation is appropriate and if not, to determine an appropriate category of impact;
b) formulate and implement measures or interventions that would mitigate any detrimental impacts to the extent that the activity will be acceptable.

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Table 3: Categorization of expected visual impact (DEA&DP, 2005).

Type of environment	Type of development				
	Category 1	**Category 2**	**Category 3**	**Category 4**	**Category 5**
Protected/wild areas of international or regional significance	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected	Very high visual impact expected
Areas or routes of high scenic, cultural, historical significance	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected
Areas or routes of medium scenic, cultural or historical significance	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected
Areas or routes of low scenic, cultural or historical significance/disturbed	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	**Moderate visual impact expected**	High visual impact expected
Disturbed or degraded sites / run-down urban areas / wasteland	Little or no visual impact expected. Possible benefits	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected

4 VIEWSHED ANALYSIS

4.1 Dominant View Corridors

As a first step of this VIA, a survey was undertaken to determine the existence of significant view corridors associated with the project site. A view corridor is defined as '*a linear geographic area, usually along movement routes, that is visible to users of the route'* (DEA&DP, 2005). Accordingly, two dominant *view corridors* were identified, namely:

a) **R709-** A main movement corridor between Clocolan in the east and the N1 in the west.

b) **R703-** A main distributor that link the towns of Thaba Nchu, Tweespruit and Ladybrand in the south with Winburg in the north.

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4.2 Relevant Topographic and Physical Characteristics

A further key aspect affecting the potential visual impact of any proposed activity is the topography of the project site and the surrounding environment and the existence of prominent biophysical features from where the project site is visible. The topography and the major ridgelines of the area were subsequently determined and mapped by using a *Digital Elevation Model*[1].

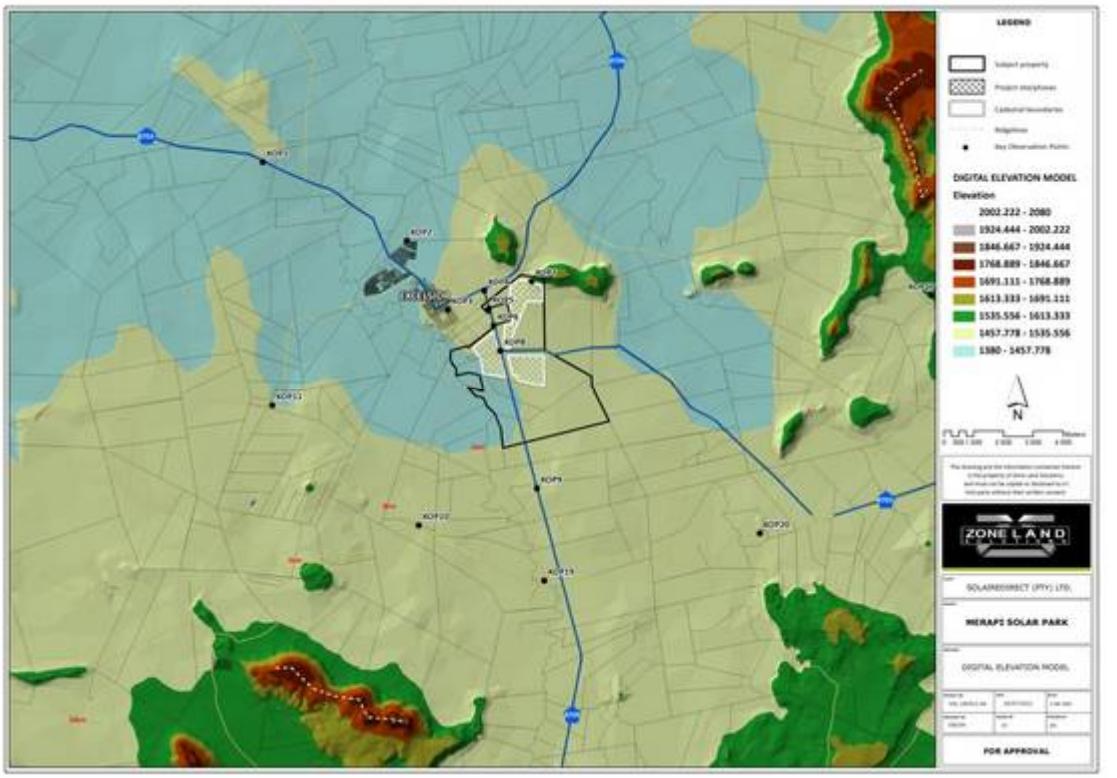

Figure 5: Digital Elevation Model illustrating major ridgelines and dominant view corridors in the sub-region.

As illustrated by the DEM above, the project site is located at a mean elevation of approximately 1480m above sea level on a slight westerly slope. The DEM shows that there are very few prominent topographical manifestations in close proximity to the project site from which the proposed activity is particularly visually exposed. The closest prominent topographical features are the two 'koppies' on either side of the R709. These manifestations do not coincide with any dominant view corridors.

[1] A Digital Elevation Model (DEM) is a geographic information system-based outcome generated from contours for a specific area. In this instance, 20m contour intervals for reference sheet nos. 2826dd, 2827cc, 2827cd, 2926bb, 2927aa and 2927ab were used to calculate the DEM for the region.

Furthermore, as stated previously, the project site is located below any ridgeline. The proposed activity will therefore not impact on the skyline.

4.3 Photographic Study as Supplementary Component

In order to quantify and assess the visibility and potential impact of the proposed activity and to provide a basis for selecting appropriate observation points outside of the project site, a photographic study and analysis was undertaken in the vicinity of the project site. The analysis and ground-truthing identified several observation points with similar characteristics and assessments outcomes. A selection of Key Observation Points is therefore included under Annexure 2. The figure below illustrates the nature of the landscape in the vicinity of the project site.

Figure 6: Photograph illustrating the nature of the environment with the project site in the foreground.

5 DIGITAL VIEWSHED ANALYSIS

The photographic study summarised above was supplemented with a digital viewshed analysis based upon the Digital Elevation Model (refer to Figure 5). As stated previously, the purpose of these two steps was to provide a basis for the identification and selection of appropriate observation points outside the project site for the VIA.

The viewshed[2] analysis was undertaken in accordance with the *Guideline Document for involving Visual Specialists in EIA Processes*. Geographic Information Systems (GIS)

[2] A viewshed is defined as *'the outer boundary defining a view catchment area, usually along crests and ridgelines. Similar to a watershed'*. A Viewshed Analysis is therefore the study into the extent to which a defined area is visible to its surroundings.

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technology was used to analyse and map information in order to understand the relationships that exist between the observer and the observed view. Key aspects of the viewshed are as follows:

- It is based on a *single viewpoint* from the highest point of the project site.
- It is calculated at 3.4m above the natural ground level to reflect the highest point of the PV panels.
- It represents a '*broad-brush' designation*, which implies that the zone of visual influence may include portions that are located in a view of shadow and it is therefore not visible from the project site and *vice versa*. This may be as a result of landscape features such as vegetation, buildings and infrastructure not taken into consideration by the DEM.
- The viewshed generated from each of the selected observation points referred to in Annexure 2 is calculated at 1.7m above the natural ground level to reflect the average height of person either walking or sitting in a vehicle.

As illustrated by the generated viewsheds (refer to Figure 7 below), the primary *zone of visual influence*[3] is located in a western, southern and south-eastern direction up to ±13km from the project site.

The GIS-generated viewshed illustrates a theoretical *zone of visual influence*. This does not mean that the proposed activity would be visible from all observation points in this area. The *zone of visual influence* is closely associated with the most prominent topographical features to the southeast.

5.1 Key Aspects of the Viewshed

The distance between the observer and the observed activity is an important determinant of the magnitude of the visual impact. This is due to the visual impact of an activity diminishing as the distance between the viewer and the activity increases. Viewsheds are categorised into three broad categories of significance, namely:

a) Foreground: The foreground is defined as the area within 1km from the observer within which details such as colour, texture, styles, forms and structure can be recognised. Objects in this zone are highly visible unless obscured by other landscape features, existing structures or vegetation.

b) Middle ground: The middle ground is the area between 1km and 3km from the observer where the type of detail which is clearly visible in the foreground becomes indistinguishable. Objects in the middle ground can be classified as visible to moderately visible, unless obscured by other elements within the landscape.

[3] Zone of visual influence is defined as *'An area subject to the direct visual influence of a particular project'.*

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c) Background: the background stretches from approximately 3km onwards. Background views are only distinguishable by colour and lines, while structures, textures, styles and forms are often not visible (SRK Consulting, 2007).

The distance radii indicating the various viewing distances from the combined phases are illustrated by Figure 7 below. Also illustrated by the figure is the town of Excelsior in the *foreground* to *middle ground* of the project site. Excelsior represents the area where most of the visual receptors would be located. Also located in the *fore-* and *middle ground* are the two main view corridors, namely the R703 and R709.

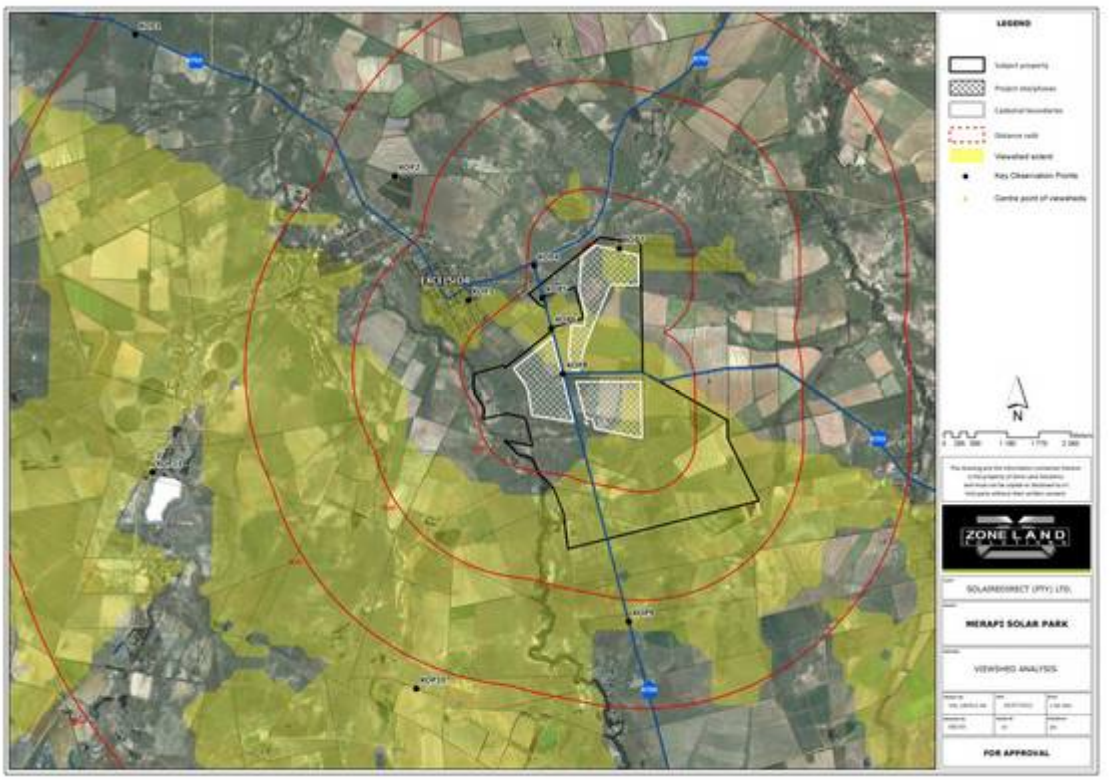

Figure 7: Viewshed generated from the highest point of the project site.

6 VISUAL IMPACT ASSESSMENT

6.1 Selection of Observation Points

A total of 22 Key Observation Points (KOPs) were provisionally identified and selected within the defined viewshed for the visual assessment in accordance with the selection criteria stipulated in the Visual Guidelines. As a result of the similarity in the assessment results of the KOPs, the description and assessment of only five KOPs are included in Annexure 2.

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KOPs selected for the assessment are generally located at the intersection between the zone of visual influence and the defined view corridors (refer to Sections 4.1 and 5 above). The view corridors are those areas that are accessible to the general observer.

6.2 Assessment Process

The identified *observation points* were categorised and assessed as summarised in the table below.

Table 4: VIA methodology and process.

KEY	DESCRIPTION
NUMBER	Each observation point was allocated a reference number.
CO-ORDINATES	The co-ordinates of each of the observation points are provided.
ALTITUDE	The altitude of the observation point was provided in meters above sea level.
DESCRIPTION	A brief description where the observation point is located is provided.
TYPE	Each observation point is categorised according to its location and significance rating. These criteria include the following: • Tourist-related corridors, including linear geographical areas visible to users of a route or vantage points. • Residential areas (including farmsteads).
PHOTOGRAPH	A photograph was taken from each observation point in the direction of the project site to verify the digitally-generated viewshed.
PROPERTY LOCATION	The location of the property was described a *foreground*, *middle ground* or *background*.
PROXIMITY	The distance between the observation point and the project site was provided in kilometres.
VISUAL SENSITIVITY OF RECEPTORS	The visual impact considered acceptable is dependent on the type of receptors. A *high* (i.e. residential areas, nature reserves and scenic routes or trails), *moderate* (e.g. sporting or recreational areas, or places or work), or *low* sensitivity (e.g. industrial, mining or degraded areas) was awarded to each observation point.
VISUAL EXPOSURE	Exposure or visual impact tends to diminish exponentially with distance. A *high* (dominant or clearly visible), *moderate* (recognisable to the viewer) or *low* exposure (not particularly visible to the viewer) rating was allocated to each observation point.
VISUAL ABSORPTION	The potential of the landscape to conceal the proposed activity was

CAPACITY (VAC)	assessed. A rating of *high* (effective screening by topography and vegetation), *moderate* (partial screening) and *low* (little screening) was allocated to each observation point.
VISUAL INTRUSION	The potential of the activity to fit into the surrounding environment was determined. The visual intrusion relates to the context of the proposed activity while maintaining the integrity of the landscape. A rating of *high* (noticeable change), *moderate* (partially fits into the surroundings) or *low* (blends in well with the surroundings) was allocated.
DURATION	With regard to roads, the distance (in kilometres) and duration (in seconds) for which the property will be visible to the road user, were calculated for each observation point.

6.3 Summary of Assessment

Based on the viewshed analysis and the preceding sections, the envisaged visual impact of the proposed activity was assessed in accordance with the criteria for visual impact assessments (DEA&DP, 2005). The findings of the assessment from selected observation points are included under Annexure 2.

6.3.1 Assessment Criteria

It is stated in the DEA&DP's Visual Guidelines that to aid decision-making, the assessment and reporting of possible impacts requires consistency in the interpretation of impact assessment criteria. The criteria that specifically relate to VIAs were therefore described in Table 4 and Annexure 2.

The potential visual impact of the proposed activity was assessed against these criteria, with reference to the summary of criteria in Box 12 of the Visual Guidelines. Table 5 provides a description of the summary criteria used to determine the impact significance.

Table 5: Summary of criteria used to assess the potential impacts of the proposed activity.

CRITERIA	DESCRIPTION
NATURE OF THE IMPACT	The nature of the impact refers to the visual effect the proposed activity would have on the receiving environment. The nature of the development proposals are described in the preceding sections.
EXTENT	This category deals with the spatial or geographic area of influence and refers to the following levels: • *Site-related* (extending only as far as the activity), • *Local* (limited to the immediate surroundings), • *Regional* (affecting a larger metropolitan or regional area), • *National* (affecting large parts of the country),

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	• *International* (affecting areas across international boundaries). A value between 1 and 5 is assigned as appropriate (with 1 being low and 5 being high).
DURATION	Duration refers to the expected life-span of the visual impact. A rating of short term (during the construction phase) (assigned score of 1 or 2), *medium term* (duration for screening vegetation to mature) (assigned score of 3), *long term* (the lifespan of the project) (assigned score of 4), or *permanent* (where time will not mitigate the visual impact) (assigned score of 5) were applied.
MAGNITUDE	Magnitude refers to the magnitude of the impact on views, scenic or cultural resources. The following ratings were allocated to determine the intensity of the impact: • *No effect* (assigned score of 0), • *Low* (visual and scenic resources not affected) (score of 2), • *Minor* (will not result in impact on processes) (score of 4), • *Medium* (affected to a limited scale) (assigned score of 6), • *High* (scenic and cultural resources are significantly affected) (assigned score of 8), • *Very high* (result in complete destruction of patterns) (score of 10).
PROBABILITY	This category refers to the degree of possibility of the visual impact occurring. A rating of *very improbable* (probably will not happen) (assigned score of 1), *improbable* (very low possibility of the impact occurring) (assigned score of 2), *probable* (distinct possibility that the impact will occur) (assigned score of 3), *highly probable* (most likely) (assigned score of 4), or *definite* (impact will occur regardless of any preventative measures) (assigned score of 5) were applied.
STATUS	Status will be described as positive, *negative* or *neutral*.
REVERSIBILITY	Degree to which the activity can be reversed. The following rating were allocated: • Reversible (assigned score of 1), • Recoverable (assigned score of 3), or • Irreversible (assigned score of 5).
SIGNIFICANCE	The significance is calculated by combining the criteria in the following formula: S = (E+D+M)P S = Significance E = Extent D = Duration M = Magnitude P = Probability

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	The significance ratings for each potential impact are as follows: • *Low* (where it will not have an influence on the decision) (<30 points), • *Medium* (where it should have an influence on the decision unless it is mitigated) (30-60 points), or • *High* (where it would influence the decision regardless of any possible mitigation) (>60 points).

6.4 Assessment of Impacts

6.4.1 Assessment of Impact on Sensitive Receptors in Foreground-and Middle Ground

The sensitive receptors in the *fore*-and *middle ground* of the generated viewshed represent mostly users of the road network and the town of Excelsior itself. The R703 and R709 is the major link roads in the region and is the most sensitive receptors in terms of possible impacts as observers using these roads will come into direct view of the proposed activity.

The proposed activity will represent a change in land use and land form to what is currently the status quo. The introduction of foreign structures and forms in the agrarian landscape will have a limited impact on these sensitive receptors as described in the table below.

Table 6: Impact table summarising the significance of visual impact on sensitive receptors in the *foreground* and *middle ground*.

NATURE:	Potential visual impact on the sensitive receptors in the *foreground* and *middle ground*.			
	Without Mitigation	**Score**	**With Mitigation**	**Score**
EXTENT	Regional	**3**	Local	**2**
DURATION	Long term	**4**	Long term	**4**
MAGNITUDE	Minor	**4**	Low	**2**
PROBABILITY	Probable	**3**	Improbable	**2**
SIGNIFICANCE	Medium	**33**	Low	**16**
STATUS	Neutral		Neutral	
REVERSIBILITY	Recoverable	**3**	Recoverable	**3**
IRRIPLACEABLE LOSS OF RESOURCE?	No		No	
CAN IMPACTS BE MITIGATED?	Yes			
MITIGATION:	• Keep disturbed areas to a minimum. • No clearing of land to take place outside the demarcated footprint. • Institute a rigorous planting regime along the outer boundaties of			

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	the individual phases. Only indigenous plant species to be introduced and planted in such a manner and location which would not cast shadows on the PV 'strings'. • Buildings and similar structures must be in keeping with regional planning policy documents, especially the principles of critical regionalism, namely sense of place, sense of history, sense of nature, sense of craft and sense of limits. • Utilise existing roads and tracks to the extent possible. Where new roads are required, they should be two-track gravel roads, maintained to prevent dust plumes and erosion.
CUMULATIVE IMPACTS:	As described above, the existing Merapi substation and its associated industrial-type infrastructure such as electrical transmission lines and pylons already exists in the immediate surroundings. Therefore, the cumulative impact will be increased with the establishment of the PV plant.
RESIDUAL IMPACTS:	The proposed infrastructure is of such a nature that the status quo could be regained after decommissioning of the plant. Providing that the site is rehabilitated to its current state, the visual impact will also be removed.

6.4.2 Assessment of Impact on Sense of Place

Sense of place and intrinsic values are closely related to one another. Sense of place refers to a unique experience of an environment by a user, based on his or her cognitive experience of the place. Visual criteria and specifically visual character of an area (informed by a combination of aspects, such as topography, level of development, vegetation, noteworthy features, cultural/historical features, etc.) play a significant role (MetroGIS, 2012).

A visual impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light (MetroGIS, 2012).

Although very week and not promoted in any way, the sense of place of Excelsior is very much one of an agricultural town in an agrarian landscape, dotted by agricultural farmsteads set against a backdrop of mountains and hills in the distance. The sense of place attributes and intrinsic values has, to a large degree, further been lost with the introduction of the electrical substation and associated infrastructure and the uncontrolled expansion of the town in the direction of Mahlatswetsa.

Table 7: Impact table summarising the significance of visual impact on the sense of place.

NATURE:	Potential visual impact on the intrinsic value and sense of place of the Excelsior region.			
	Without Mitigation	**Score**	**With Mitigation**	**Score**
EXTENT	Local	**2**	Local	**2**
DURATION	Long term	**4**	Long term	**4**
MAGNITUDE	Medium	**6**	Medium	**6**
PROBABILITY	Highly probable	**4**	Probable	**3**
SIGNIFICANCE	Medium	**48**	Medium	**36**
STATUS	Negative		Negative	
REVERSIBILITY	Recoverable	**3**	Recoverable	**3**
IRRIPLACEABLE LOSS OF RESOURCE?	No		No	
CAN IMPACTS BE MITIGATED?	Yes			
MITIGATION:	• Keep disturbed areas to a minimum. • No clearing of land to take place outside the demarcated footprint. • Institute a rigorous planting regime along the outer boundaries of the individual project phases. Only indigenous plant species to be introduced and planted in such a manner and location which would not cast shadows on the PV 'strings'. • Buildings and similar structures must be in keeping with regional planning policy documents, especially the principles of critical regionalism, namely sense of place, sense of history, sense of nature, sense of craft and sense of limits. • Consider raising the PV platforms so that cattle can roam underneath the PV 'string'. • Utilise existing roads and tracks to the extent possible. Where new roads are required, they should be two-track gravel roads, maintained to prevent dust plumes and erosion.			
CUMULATIVE IMPACTS:	It is near impossible to distinguish built forms and structures at distances greater than 5km. However, the introduction of a PV plant with three phases of approximately 315ha in total might have a cumulative effect on the observer.			
RESIDUAL IMPACTS:	The proposed infrastructure is of such a nature that the status quo could be regained after decommissioning of the plant. Providing that the site is rehabilitated to its current state, the visual impact will also be removed.			

6.4.3 Assessment of Impact of Lighting

The project site has a relatively low illumination factor. The occurrence of light sources in the vicinity of the project site is confined to the townscape approximately 2km away. As a result of the proximity of the town, a slight sky glow[4] effect is visible at night.

The proposed PV 'string' will not include lights of any kind, however, the associated ancillary buildings and infrastructure may include some degree of lighting.

It is not expected that the proposed activity will contribute to the effects of sky glow or artificial lighting of the area. In order to ensure this, the proposed mitigation measures will have to be complied with.

Table 8: Impact table summarising the significance of visual impact of lighting.

NATURE:	Potential visual impact of artificial lighting as a result of the activity.			
	Without Mitigation	**Score**	**With Mitigation**	**Score**
EXTENT	Local	**2**	Local	**2**
DURATION	Long term	**4**	Long term	**4**
MAGNITUDE	Minor	**4**	Low	**2**
PROBABILITY	Probable	**3**	Probable	**3**
SIGNIFICANCE	Medium	**30**	Low	**24**
STATUS	Negative		Negative	
REVERSIBILITY	Recoverable	**3**	Recoverable	**3**
IRRIPLACEABLE LOSS OF RESOURCE?	No		No	
CAN IMPACTS BE MITIGATED?	Yes			
MITIGATION:	• Outdoor lighting must be strictly controlled so as to prevent light pollution. • All lighting must be installed at downward angles. • Sources of light must as far as possible be shielded by physical barriers. • Consider the application of motion detectors to allow the application of lighting only where and when it is required. • Only minimum wattage light fixtures must be used.			
CUMULATIVE IMPACTS:	As mentioned above, the area within which the proposed activity is to be undertaken is relatively low lit. The occurrence of ancillary structures of the Solar Plant will contribute to the cumulative lighting effect of the area but it is expected to be negligible in a local context.			
RESIDUAL IMPACTS:	The proposed infrastructure is of such a nature that the status quo could be regained after decommissioning of the plant. Providing that the site is rehabilitated to its current state, the visual impact will also			

[4]Sky glow refers to the illumination of the night sky or parts thereof. The most common cause of sky glow is artificial light that emits light pollution, which accumulates into a fast glow that can be seen from miles away.

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	be removed.

6.4.4 Assessment of Impact of Reflection of PV Panels

Photovoltaic solar panels are designed to absorb sunlight in order to convert it into electricity. The more sunlight that is absorbed, the more energy can be produced.

The polycrystalline silicone cell absorbs two-thirds of the sunlight reaching the panel's surface. This effectively means that only one-third of the sunlight reaching the surface of a solar panel has a chance to be reflected.

In addition, the PV panels have a reflectivity of around 30%, while surface materials such as dry sand has a reflectivity of around 45% and grass-type vegetation at 25%. Moreover, PV panels are installed at a fixed angle of around 30°. The solar panels will therefore not noticeably alter the site's current amount of reflected, indirect sunlight.

Table 9: Impact table summarising the significance of visual impact of reflection of the PV panels.

NATURE:	Potential visual impact of reflection of the PV Panels on the sensitive receptors.			
	Without Mitigation	**Score**	**With Mitigation**	**Score**
EXTENT	Local	**2**	Local	**2**
DURATION	Long term	**4**	Long term	**4**
MAGNITUDE	Low	**2**	Low	**2**
PROBABILITY	Improbable	**2**	Improbable	**2**
SIGNIFICANCE	Low	**16**	Low	**16**
STATUS	Neutral		Neutral	
REVERSIBILITY	Recoverable	**3**	Recoverable	**3**
IRRIPLACEABLE LOSS OF RESOURCE?	No		No	
CAN IMPACTS BE MITIGATED?	Yes			
MITIGATION:	• Consider installing anti-reflective coating or glass to reduce the sunlight that is reflected and increase the amount of sunlight that is absorbed. • Create the shortest possible route for transmission lines between individual phases and substations to reduce its visual appearance. • Consider laying electrical cables underground en-route to the substation.			
CUMULATIVE IMPACTS:	The introduction of the PV plant, coupled with the transmission lines, proposed and existing substations, contribute to an increased cumulative visual impact.			
RESIDUAL IMPACTS:	The proposed infrastructure is of such a nature that the status quo could be regained after decommissioning of the plant. Providing that the site is rehabilitated to its current state, the visual impact will also be removed.			

7 IMPACT STATEMENT

The on-site verification from the selected Key Observation Points and the viewsheds generated from the latter points indicated that the project site is indistinguishable from most observation points in the *middle*- and *background*. The verification and pointed out that the project site is indistinguishable from some of the observation points in the *foreground*.

To this end, the results of the viewshed analysis from defined Key Observation Points, together with a photograph indicating the actual view has been included under Annexure 2. The assessment findings of the KOPs were categorised as follows:

7.1 Impact on the Foreground and Middle Ground

Most of the potential impacts relate to the *foreground* and *middle ground* zone of visual influence. The visual analysis and assessment from all of these observation points found that the proposed activity is potentially visible and recognisable from Key Observation Points along the R703 and R709 as well as from Excelsior itself. The summarised assessment of the KOPs is as follows:

a)	**Visibility:**	Medium to high
b)	**Visual exposure:**	Medium to high
c)	**Visual absorption capacity:**	Medium
d)	**Visual sensitivity of receptors:**	Medium to low
e)	**Visual intrusion:**	Medium
f)	**Significance of impact:**	Medium to low

The results of the Visual Impact Assessment for the proposed Merapi Solar Park therefore found that the proposed activity will have a **medium** impact from KOPs identified in the *foreground* and *middle ground*(<3km).

The development of sustainable energy sources holds huge benefits for the country as a whole, and would have significant multipliers in the local economy. Not only do renewable energy projects contribute to clean development mechanism, but it would also establish an empowering environment in the region within which the facility is established. Sustainable energy projects should therefore be undertaken to provide the necessary infrastructure and associated amenities to accommodate the industry in an efficient manner and which does not negatively impact on the comparative economic advantages of a region.

In order to attain its developmental objectives, the Mantsopa Municipality identified the following key areas:

a) To provide sustainable infrastructure and basic services.
b) To stimulate sustainable economic development and tourism.
c) To sustain financial management excellence.

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d) To improve human resource management excellence.
e) To improve good governance through effective leadership.

With regards to the first key objective, the Municipal IDP Review (2011/2012) identified the provision of sustainable services to communities as its top priority. This is guided by the principle that there is huge potential for economic growth in the municipality. The IDP also stated that *in order to achieve this objective, more resources will once again be channelled towards provision of sustainable services with the intention of expanding and improving the current levels of services.*

7.2 Recommendations

Based on the above and the documentation attached under Annexure 2, it is herewith recommended that the proposed activity be approved subject to the mitigation measures described in section 6.4 above and the Environmental Management Programme described in section 8 below.

It is furthermore recommended that the proposed project phases be relocated to the southeastern portions of the subject property (eastern portions of Farms Concordia and Ceylon). The northern phases of the project on the Farm Moedersgift No. 566 presents the areas most visually prominent. A relocation of this particular phase to an area further away from the receptors in Excelsior would benefit the project from a visual perspective. In addition, it is proposed that the project phases that front onto movement corridors be set back at least 200m from the latter roads in order to establish a proper buffer between the observer and the observed view.

8 ENVIRONMENTAL MANAGEMENT PROGRAMME

The management plan tables aim to summarise the key findings of the visual impact report and to suggest possible management actions in order to mitigate the potential visual impacts.

Table 10 Suitable tree species**:** Environmental Management Programme – Construction Phase

OBJECTIVE: Mitigate the possible visual impact associated with the construction phase.	
Project component/s	Construction site
Potential Impact	Visual impact of general construction activities and associated impacts.
Activity/risk source	Potential impact on sensitive receptors within the *foreground* and *middle ground*.
Mitigation: Target/Objective	Minimal visual intrusion by construction activities and general acceptance and compliance with Environmental Specifications.

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Mitigation: Action/control	Responsibility	Timeframe
An Environmental Control Officer (ECO) must be appointed to oversee the construction process and ensure compliance with conditions of approval.	SolaireDirect	Pre-construction
Contractor to sign and undertake to comply with Environmental Specifications.	Contractor	Pre-construction
Demarcate sensitive areas and no-go areas with danger tape to prevent disturbance during construction.	SolaireDirect / contractor	Pre-construction
Design buildings to reflect the local architecture and sense of place of the Free State.	SolaireDirect / contractor	Pre-construction
Keep disturbed areas to a minimum.	SolaireDirect / contractor	Throughout construction
Identify suitable areas within the construction site for fuel storage, temporary workshops, eating areas, ablution facilities and washing areas.	SolaireDirect / contractor	Throughout construction
Institute a solid waste management programme to minimise waste generated on the construction site, and recycle where possible.	SolaireDirect / contractor	Throughout construction
Reduce and control dust through the use of approved dust suspension techniques as and when required.	SolaireDirect / contractor	Throughout construction
Construction to occur only during daytime. Should the ECO authorize night work, low flux and frequency lighting shall be used.	SolaireDirect / contractor	Throughout construction
Consider raising the PV platforms so that cattle can roam underneath the PV 'string'.	SolaireDirect / contractor	Construction
Rehabilitate all disturbed areas in accordance with the development plan.	SolaireDirect / contractor	Construction
Institute a rigorous planting regime in collaboration with the appointed botanical specialist.	SolaireDirect / contractor	Construction
Performance Indicator	Construction site is confined to the demarcated areas identified on a Development Plan. No transgression of the Environmental Specifications visible and natural processes occurring freely outside boundaries of the construction site.	
Monitoring	Monitoring to be undertaken by an appointed Environmental Control Officer who will enforce compliance with the Environmental Specifications.	

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Table 12: Environmental Management Programme – Operational Phase

OBJECTIVE: Mitigate the possible visual impact associated with the operational phase.		
Project component/s	Photovoltaic 'string' of panels including ancillary infrastructure such as a security building, maintenance workshop, offices, toilets and small water treatment unit.	
Potential Impact	Potential visual intrusion in the area and damage to the natural environment.	
Activity/risk source	Potential impact on sensitive receptors within the *foreground* and *middle ground*.	
Mitigation: Target/Objective	A facility that fits in with the landscape, that is well maintained and managed.	
Mitigation: Action/control	**Responsibility**	**Timeframe**
Maintain the general appearance of the facility as a whole (i.e. the PV panels, buildings and associated infrastructure, roads and natural environment).	SolaireDirect / operator	Throughout operational phase
Monitor land surface below PV 'strings' to prevent loss of vegetation and first signs of desertification.	SolaireDirect / operator	Throughout operational phase
Maintain access roads to prevent scouring and erosion, especially after rains.	SolaireDirect / operator	Throughout operational phase
Performance Indicator	Well maintained facility that has a small footprint on the environment. Natural processes continuing to occur unhindered. All actions to be measured against the Operational Phase Environmental Management Plan.	
Monitoring	ECO to undertake monitoring functions for a year after construction has been completed to ensure compliance with mitigation measures. Management thereafter to be undertaken by operator.	

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Excelsior. 28°57''10.3'S and 27°05''02.2E. Google Earth. 9 July 2012

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11 JULY 2012

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PROPOSED MERAPI SOLAR PARK

Remainder of the Farm Ceylon No. 311, Remainder of the Farm Moedersgift No. 566, Remainder of the Farm Welgegund No. 1623, Remainder of the Farm Concordia No. 374, and Portion 1 of the Farm De Hoop No. 1547, Excelsior, Free State Province

ANNEXURE 1

DECLARATION OF INDEPENDENCE

11 July 2012

PROJECT NO: VIA_010612.2SA

Produced for:

SolaireDirect (Pty) Ltd.

solairedirect
Southern Africa
The solar MWh company

On behalf of:

Savannah Environmental (Pty) Ltd.

Savannah
ENVIRONMENTAL (PTY) LTD

Produced by:

Declaration of Independence

I, Jacques Louis Volschenk, representing Zone Land Solutions (Pty) Ltd., hereby declares that I am an independent consultant appointed to provide specialist input for a VIA assessment. I confirm that I have no personal financial interest in the project other than remuneration for the VIA study itself, and neither I nor Zone Land Solutions (Pty) Ltd. will benefit in any other way from the outcomes of this VIA study. I further declare that opinions expressed in this report have been formulated in an objective manner without interference from any third party.

Jacques Volschen

Print Name

Signature

11 July 2012

Date

PROPOSED MERAPI SOLAR PARK

Remainder of the Farm Ceylon No. 311, Remainder of the Farm Moedersgift No. 566, Remainder of the Farm Welgegund No. 1623, Remainder of the Farm Concordia No. 374, and Portion 1 of the Farm De Hoop No. 1547, Excelsior, Free State Province

ANNEXURE 2

SELECTED OBSERVATION POINT VIEWSHEDS AND ASSESSMENTS

11 July 2012

PROJECT NO: VIA_010612.2SA

Produced for:

SolaireDirect (Pty) Ltd.

solairedirect
Southern Africa
The solar MWh company

On behalf of:

Savannah Environmental (Pty) Ltd.

Savannah
ENVIRONMENTAL (PTY) LTD

Produced by:

ZONE LAND SOLUTIONS

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1 SELECTED OBSERVATION POINT ASSESSMENTS

The selected *observation points* were categorized and assessed in terms of the following assessment criteria.

KEY	DESCRIPTION
NUMBER	Each observation point was allocated a reference number.
CO-ORDINATES	The co-ordinates of each of the observation points are provided.
ALTITUDE	The altitude of the observation point was provided in meters above sea level.
DESCRIPTION	A brief description where the observation point is located is provided.
TYPE	Each observation point is categorized according to its location and significance rating. These criteria include the following: a) Tourist-related corridors, including linear geographical areas visible to users of a route or vantage points. b) Residential Areas.
PHOTOGRAPH	A photograph was taken from each observation point in the direction of the project site to verify the digitally generated view-shed.
PROPERTY LOCATION	The location of the property was described as *foreground*, *middle ground* or *background*.
PROXIMITY	The distance between the observation point and the project site was provided in kilometres.
VISUAL SENSITIVITY OF RECEPTORS	The visual impact considered acceptable is dependent on the type of receptors. A high (e.g. residential areas, nature reserves and scenic routes or trails), moderate (e.g. sporting or recreational areas, or places of work), or low sensitivity (e.g. industrial, mining or degraded areas) was awarded to each observation point.
VISUAL EXPOSURE	Exposure or visual impact tends to diminish exponentially with distance. A high (dominant or clearly visible), moderate (recognizable to the viewer) or low exposure (not particularly visible to the viewer) rating was allocated to each observation point.
VISUAL ABSORPTION CAPACITY (VAC)	The potential of the landscape to conceal the proposed development was assessed. A rating of high (effective screening by topography and vegetation), moderate (partial screening) and low (little screening) was allocated to each observation point.
VISUAL INTRUSION	The potential of the development to fit in with the surrounding environment was determined. The visual intrusion relates to the context of the proposed development while maintaining the integrity of the landscape. A rating of high (noticeable change), moderate (partially fits into the surroundings) or low (blends in well with the surroundings) was allocated.
DURATION	With regard to roads, the distance (in kilometres) and duration (in seconds) for which the property will be visible to the road user, were calculated for each observation point.

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2 KEY OBSERVATION POINT 2

KOP2 is situated on the R703 at the settlement of Mahtlastwetsa, some 4.8km from the project site. The sparse natural veldt result in general good visibility from this particular point. This creates a high visual sensitivity and potential intrusion of the proposed activity in the landscape. A windbreak of dense trees approximately 500m from the observation point, in the direction of the project site, effectively blocks all views towards the site. The combination of these trees and the distance from the project site means that the visual impact of the proposed activity is negligible from this observation point.

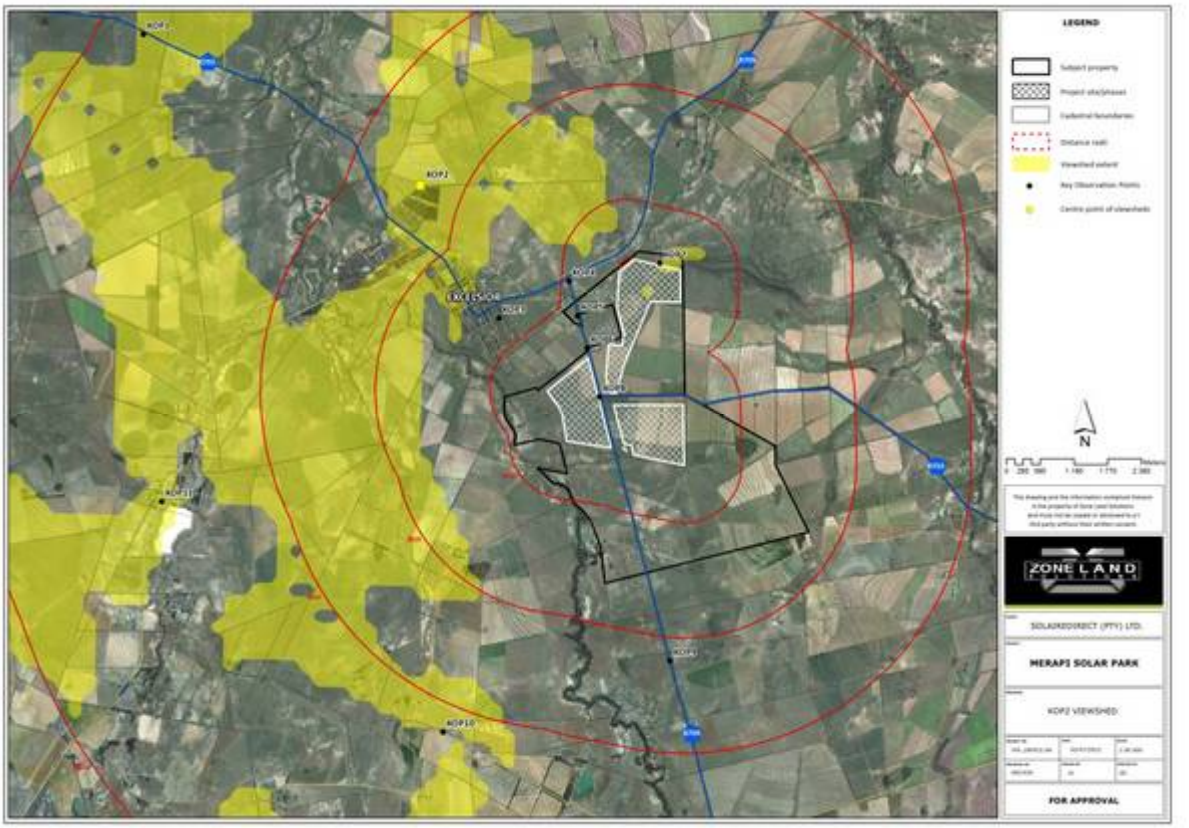

Figure 1: KOP2 Viewshed. Areas shaded yellow is theoretically visible from KOP2.

NUMBER:	KOP2	**CO-ORDINATES:**	**S**	**E**
ALTITUDE:	1453 m		28° 55'16.4"	27° 03'07.1"
DESCRIPTION:	KOP2 is located along the R703 highway approximately 4.8km northwest of the project site.			
TYPE:	Regional distributor	**PHOTO:**	Photograph 1	
PROP. LOCATION:	Background	**PROXIMITY:**	4.8km	
VISUAL SENSITIVITY:	Low			
VISUAL EXPOSURE:	Low	**VAC:**	High	
VISUAL INTRUSION:	Low	**DURATION:**	0min	

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Photograph 1: View from KOP2 approximately 4.8km southwest of the project site along the R703**.**

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3 KEY OBSERVATION POINT 3

KOP3 is situated ±1 km from the project site in the town of Excelsior. The latter town would theoretically have the most visual receptors. Due to its proximity to the project site, the proposed activity is potentially visually prominent to the observer. The GIS-generated viewshed however illustrate that only the northern-most phase of the project would be visible.

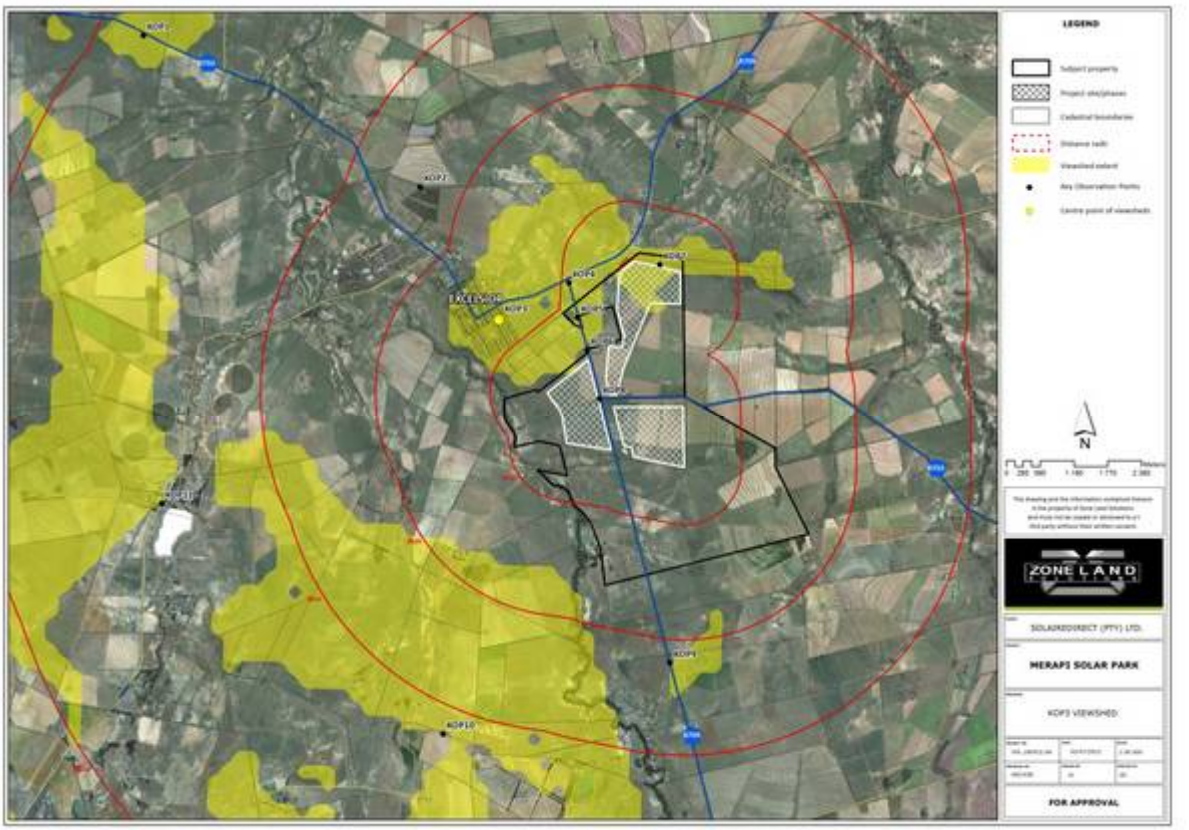

Figure 2: KOP3 Viewshed. Areas shaded yellow is theoretically visible from KOP3.

NUMBER:	KOP3	**CO-ORDINATES:**	**S**	**E**
ALTITUDE:	1471 m		28°56'44.5"	27° 04'5.5"
DESCRIPTION:	KOP3 is located in the town of Excelsior. The photograph is taken towards the Project Site eastwards.			
TYPE:	Residential area	**PHOTO:**	Photograph 2	
PROP. LOCATION:	Foreground	**PROXIMITY:**	±1 km	
VISUAL SENSITIVITY:	High			
VISUAL EXPOSURE:	Medium	**VAC:**	Medium	
VISUAL INTRUSION:	Low	**DURATION:**	N/A	

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Photograph 2: View from KOP3 (Factory Street) towards the project site.

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4 KEY OBSERVATION POINT 4

KOP4 is located at the intersection of the R703 and R709, situated some ±1 km north of the project site. The viewshed from KOP4 suggest that only the northern-most phase of the proposed activity would be visible from this observation point.

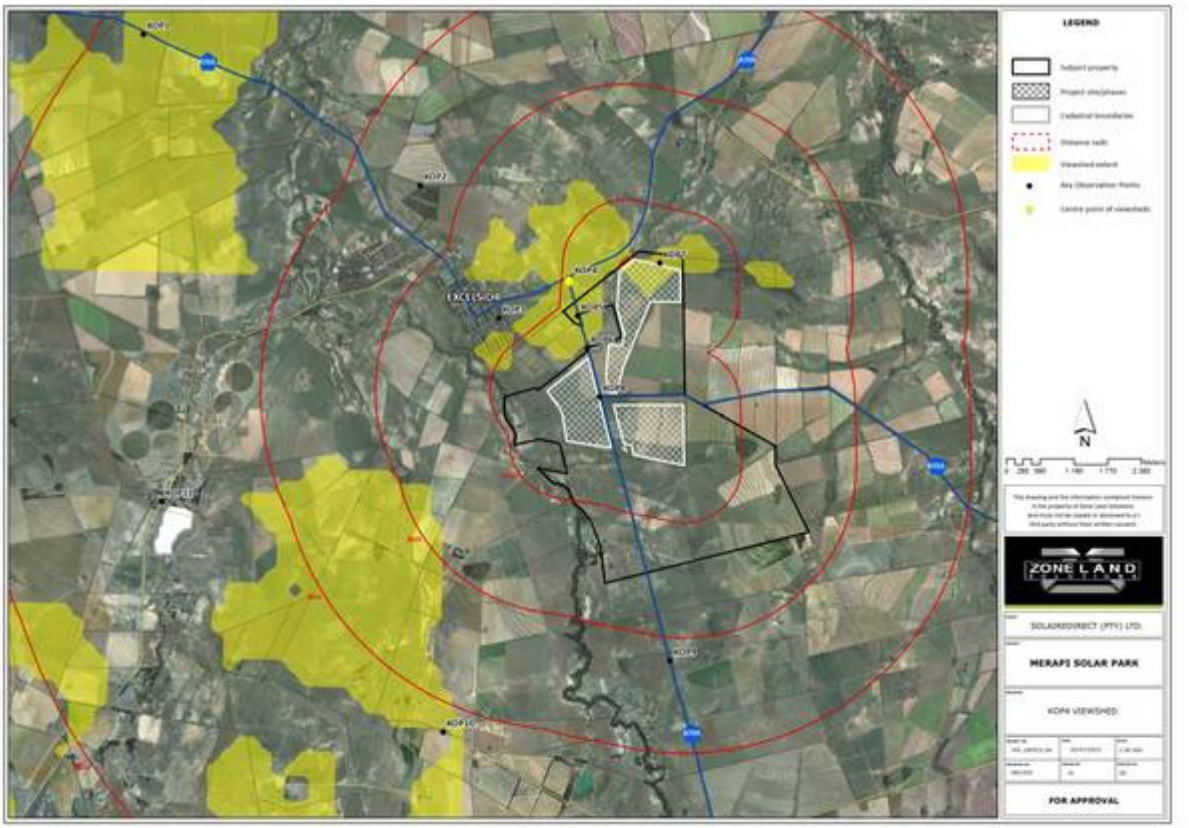

Figure 3: KOP4 Viewshed. Areas shaded yellow is theoretically visible from KOP4.

NUMBER:	KOP4	**CO-ORDINATES:**	**S**	**E**
ALTITUDE:	1465 m		28°56'10.9"	27° 04'41.5"
DESCRIPTION:	KOP4 is located at the intersection of the R703 and R709.			
TYPE:	Regional distributor	**PHOTO:**	Photograph 3	
PROP. LOCATION:	Foreground	**PROXIMITY:**	±1 km	
VISUAL SENSITIVITY:	High			
VISUAL EXPOSURE:	Low	**VAC:**	High	
VISUAL INTRUSION:	Low	**DURATION:**	0min	

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Photograph 3: View towards the project site from the R703 / 709 intersection.

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5 KEY OBSERVATION POINT 8

KOP8 is situated at the R703/R709 intersection in the centre of the project site. The identified observation point would theoretically provide the best visual vantage over the proposed activity. This is confirmed by the GIS-generated viewshed from the latter point and the visual confirmation on the ground, as illustrated by Photograph 4.

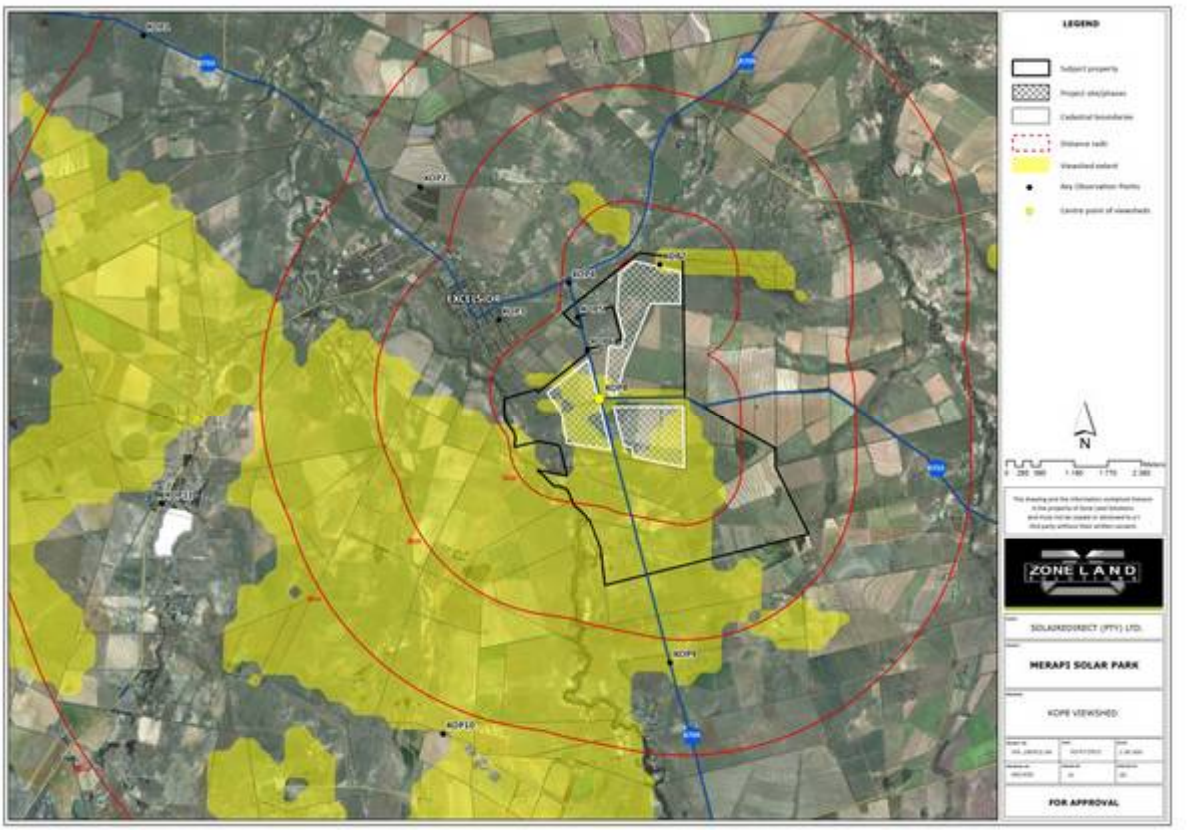

Figure 4: KOP8 Viewshed. Areas shaded yellow is theoretically visible from KOP8.

NUMBER:	KOP8	**CO-ORDINATES:**	**S**	**E**
ALTITUDE:	1475 m		28°57'10.3"	27°05'02.2"
DESCRIPTION:	KOP8 is located at the R703/R709 intersection in the centre of the project site.			
TYPE:	Regional distributor	**PHOTO:**	Photograph 4	
PROP. LOCATION:	Foreground	**PROXIMITY:**	0km	
VISUAL SENSITIVITY:	Low			
VISUAL EXPOSURE:	High	**VAC:**	Low	
VISUAL INTRUSION:	High	**DURATION:**	0min	

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Photograph4: View from KOP8 towards the project site south.

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6 KEY OBSERVATION POINT 9

KOP9 is situated ±3.5km south of the project site. The project site is not visible from this Key Observation Point on the minor road.

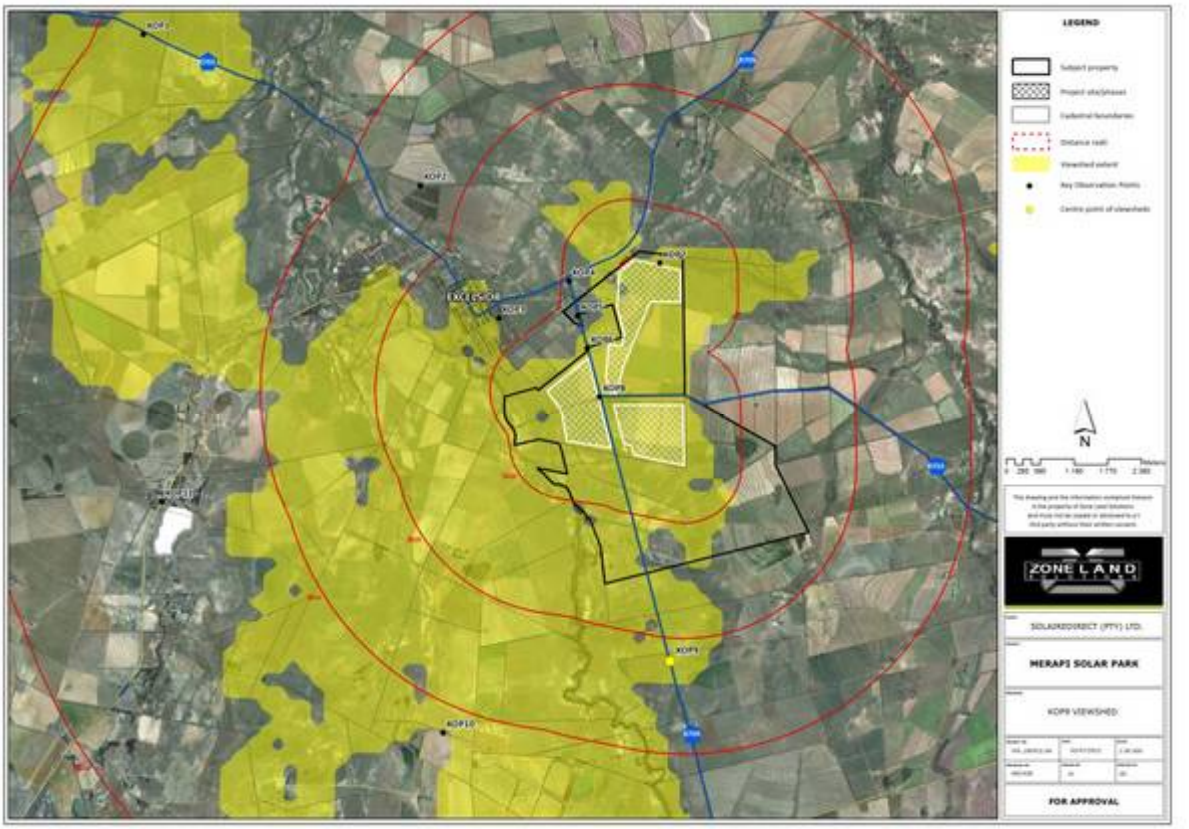

Figure 5: KOP9 Viewshed. Areas shaded yellow is theoretically visible from KOP9.

NUMBER:	KOP9	**CO-ORDINATES:**	**S**	**E**
ALTITUDE:	952 m		28°59'38.68"	27°05'40.59"
DESCRIPTION:	KOP9 is located along the R709 regional road.			
TYPE:	Regional distributor	**PHOTO:**	Photograph 5	
PROP. LOCATION:	Background	**PROXIMITY:**	±3.5 km	
VISUAL SENSITIVITY:	Low			
VISUAL EXPOSURE:	Low	**VAC:**	Moderate	
VISUAL INTRUSION:	Low	**DURATION:**	3.32km southwards 1.992min @ 100km/h	

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Photograph 4: View from KOP9 towards the project site.

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PROPOSED MERAPI SOLAR PARK

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ANNEXURE 3

LIST OF PLANS

11 July 2012

PROJECT NO: VIA_010612.2SA

Produced for:

SolaireDirect (Pty) Ltd.

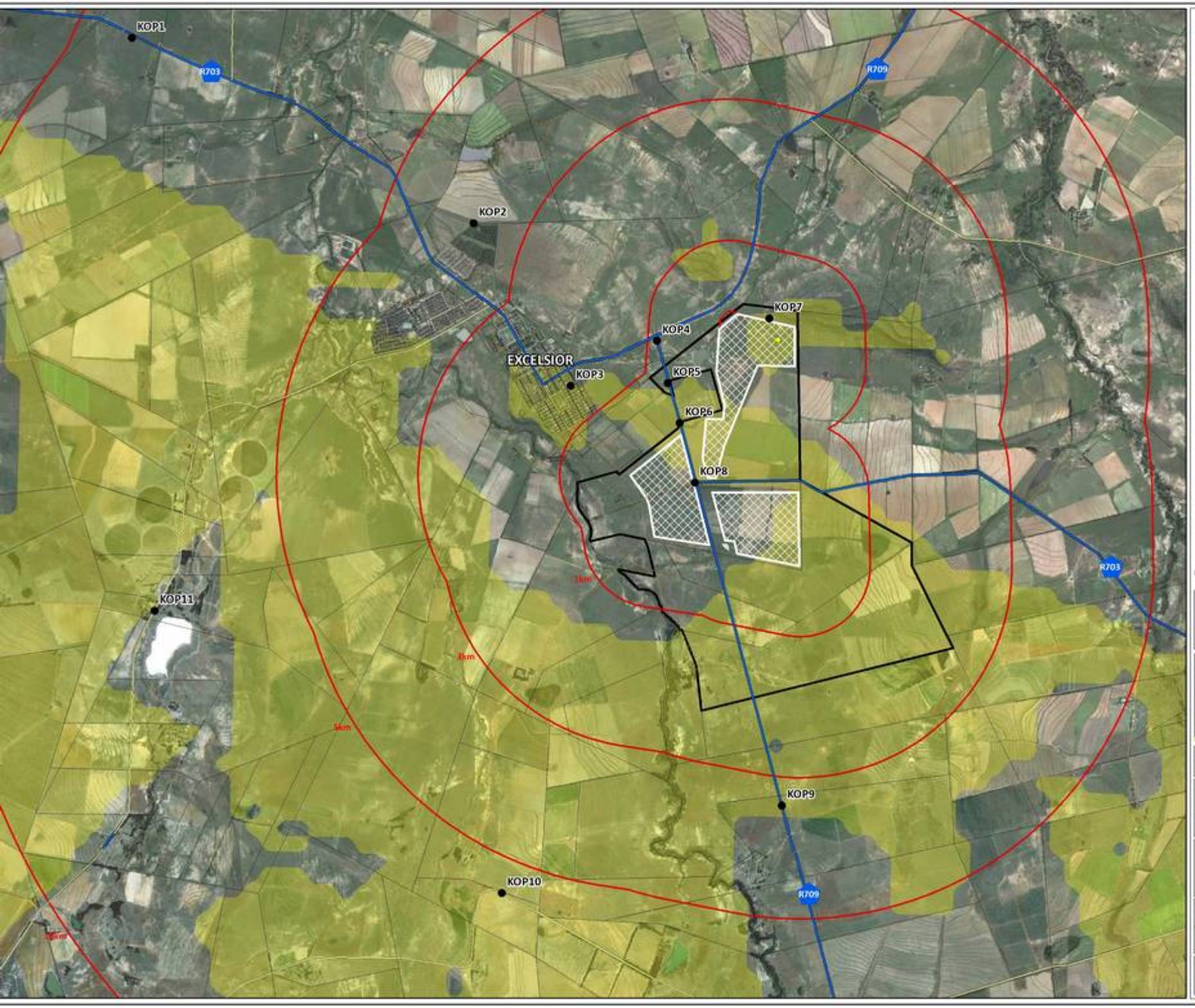
solairedirect
Southern Africa
The solar MWh company

On behalf of:

Savannah Environmental (Pty) Ltd.

Savannah
ENVIRONMENTAL (PTY) LTD

Produced by:



LEGEND

- Subject property
- Project site/phases
- Cadastral boundaries
- Distance radii
- Viewshed extent
- Key Observation Poi
- Centre point of views

N

0 295 590 1 180 1 770 2

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ZONE LAND SOLUTIONS

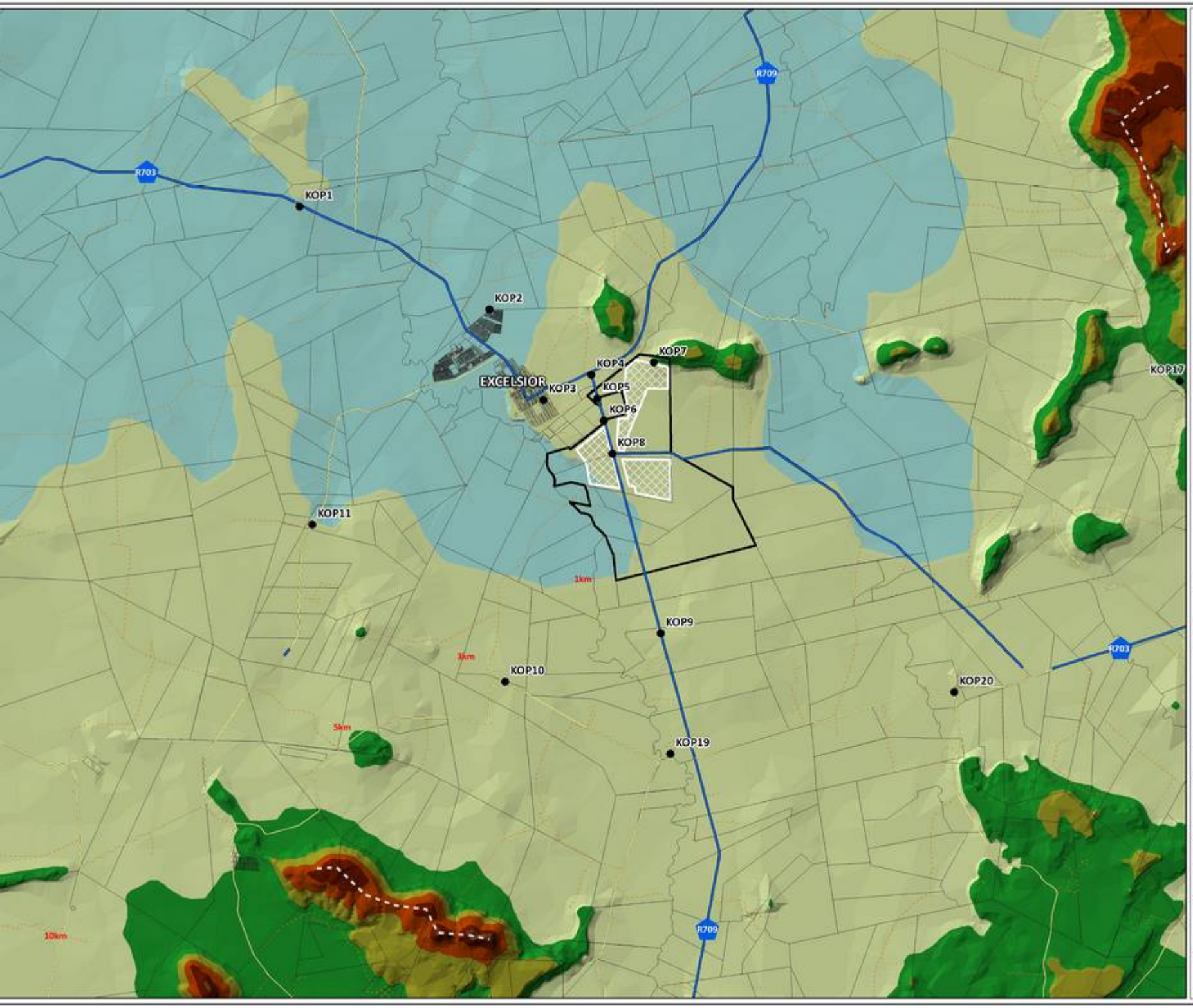
CLIENT: SOLAIREDIRECT (PTY) LTD

PROJECT: **MERAPI SOLAR PARK**

DRAWING: VIEWSHED ANALYSIS

PROJECT NR.	DATE	SCALE
VIA_180512.SA	02/07/2012	1:50 0
DRAWING NR.	DRAWN BY	CHECKED BY
G05/03	JV	DC

FOR APPROVAL



LEGEND

- Subject property
- Project site/phases
- Cadastral boundaries
- Ridgelines
- Key Observation Point

DIGITAL ELEVATION MOD

Elevation

- 2002.222 - 2080
- 1924.444 - 2002.22
- 1846.667 - 1924.44
- 1768.889 - 1846.66
- 1691.111 - 1768.88
- 1613.333 - 1691.11
- 1535.556 - 1613.33
- 1457.778 - 1535.55
- 1380 - 1457.778

N

0 500 1 000 2 000 3 000 4 00

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ZONE LAND SOLUTIONS

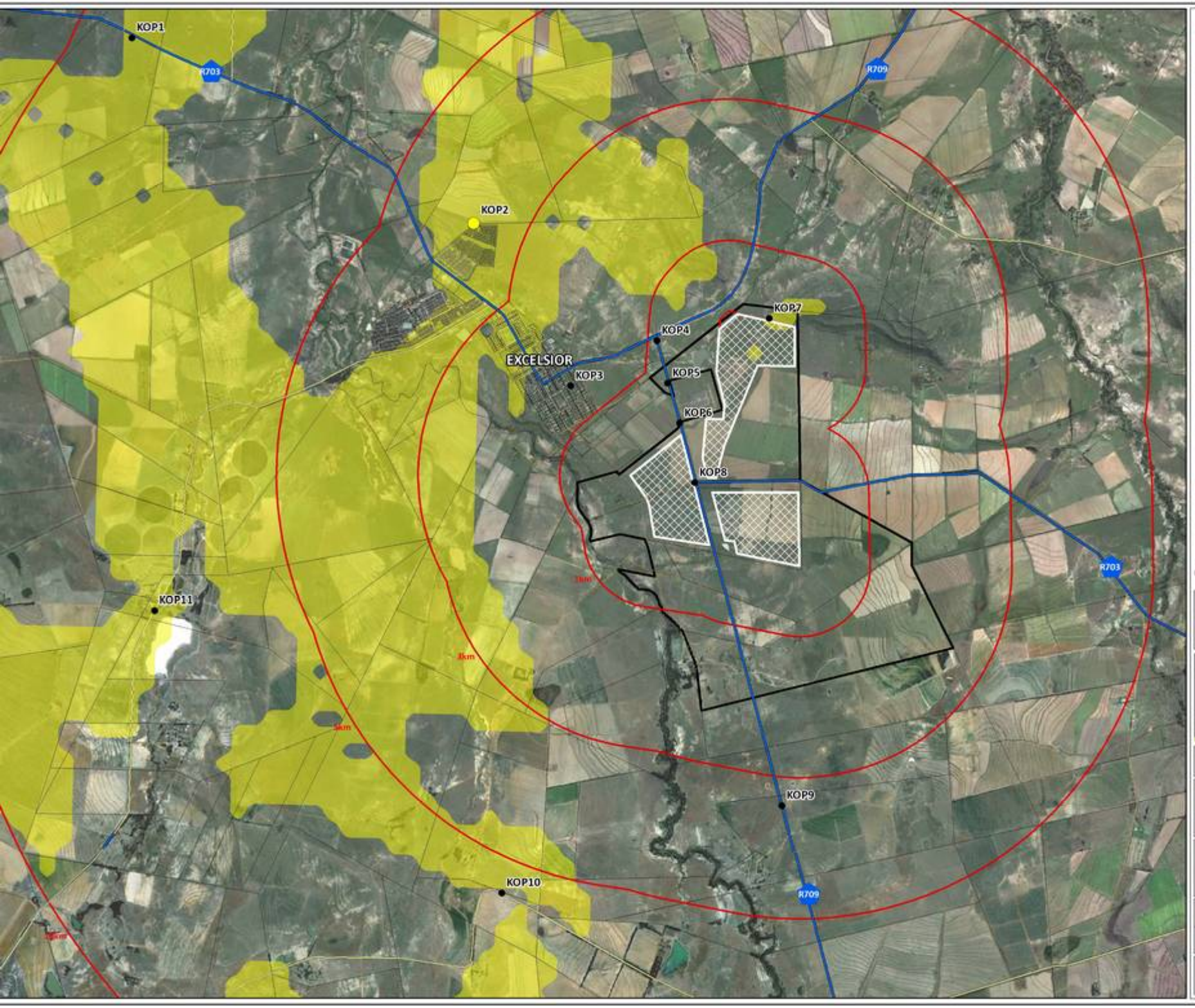
SOLAIREDIRECT (PTY) LTD

MERAPI SOLAR PARK

DIGITAL ELEVATION MODEL

VIA_180512.SA	02/07/2012	1:90 0
G05/04	JV	DC

FOR APPROVAL



LEGEND

- Subject property
- Project site/phases
- Cadastral boundaries
- Distance radii
- Viewshed extent
- Key Observation Point
- Centre point of viewsh

N

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ZONE LAND SOLUTIONS

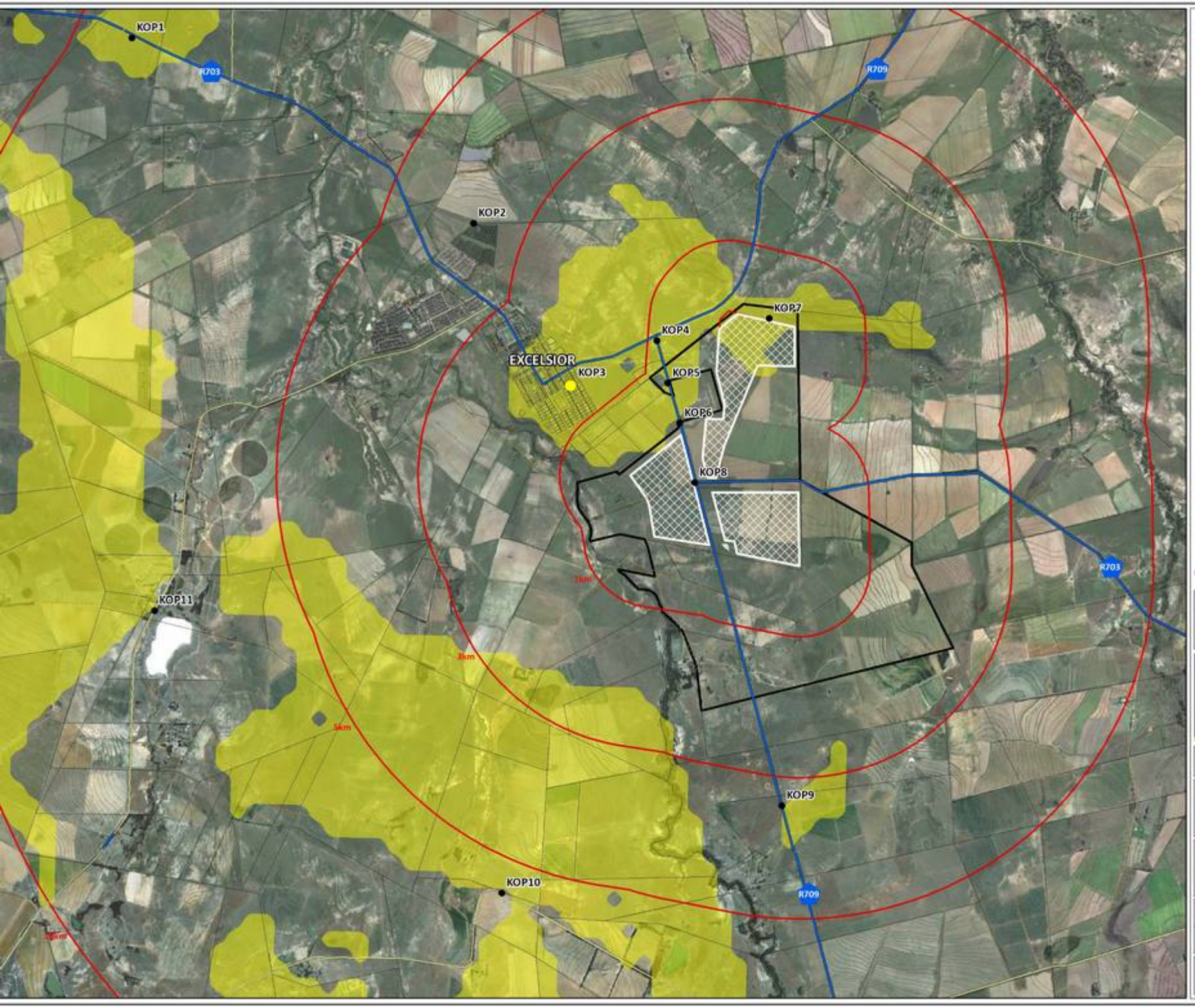
CLIENT: SOLAIREDIRECT (PTY) LTD

PROJECT: **MERAPI SOLAR PARK**

DRAWING: KOP2 VIEWSHED

PROJECT NR.	DATE	SCALE
VIA_180512.SA	02/07/2012	1:50 0
DRAWING NR.	DRAWN BY	CHECKED BY
G05/03A	JV	DC

FOR APPROVAL



LEGEND

- Subject property
- Project site/phases
- Cadastral boundaries
- Distance radii
- Viewshed extent
- Key Observation Point
- Centre point of viewsh

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ZONE LAND SOLUTIONS

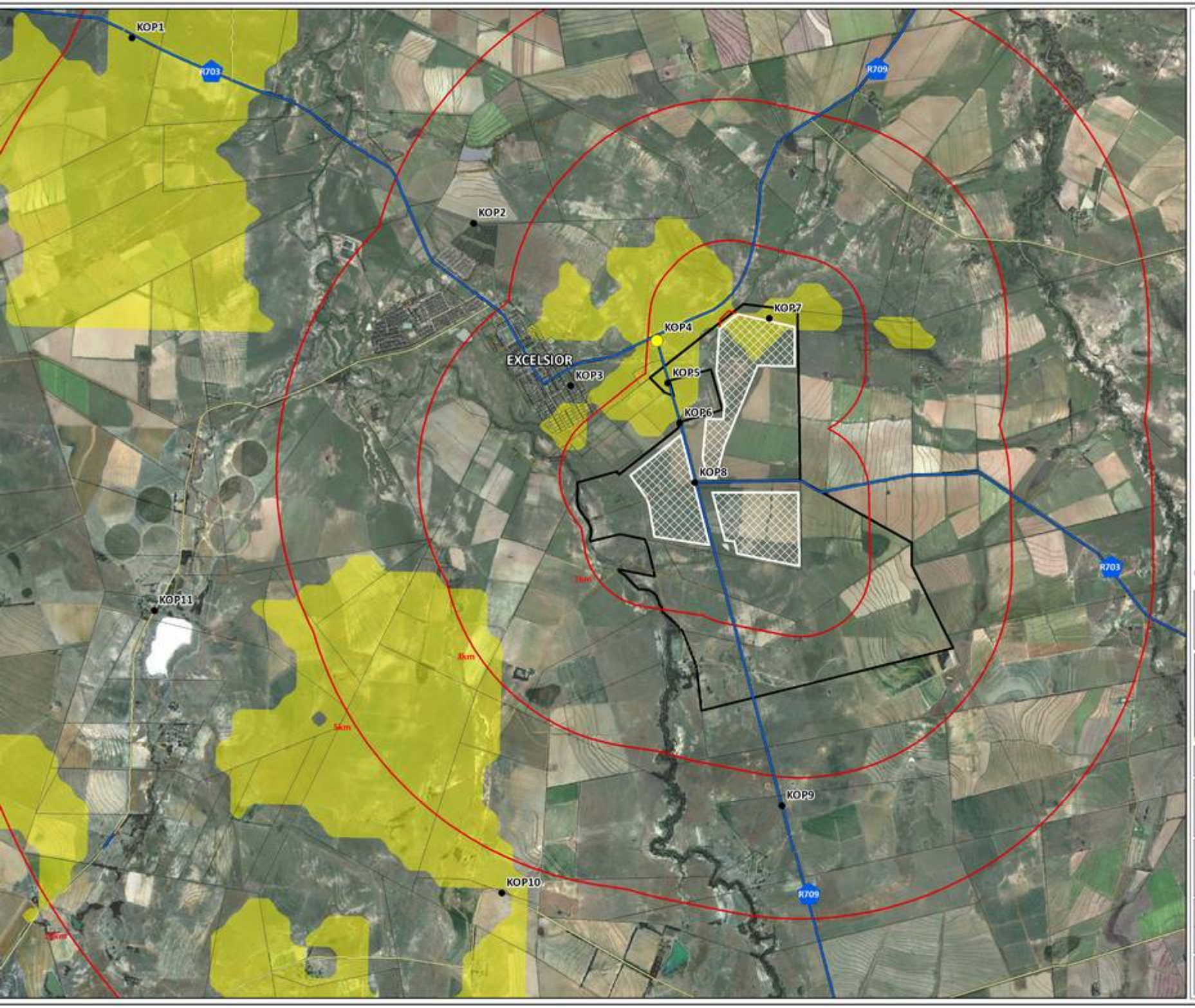
CLIENT: SOLAIREDIRECT (PTY) LTD

PROJECT: **MERAPI SOLAR PARK**

DRAWING: KOP3 VIEWSHED

PROJECT NR.	DATE	SCALE
VIA_180512.SA	02/07/2012	1:50 0
DRAWING NR.	DRAWN BY	CHECKED BY
G05/03B	JV	DC

FOR APPROVAL



LEGEND

- Subject property
- Project site/phases
- Cadastral boundaries
- Distance radii
- Viewshed extent
- Key Observation Point
- Centre point of viewsh

N

0 295 590 1 180 1 770

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ZONE LAND SOLUTIONS

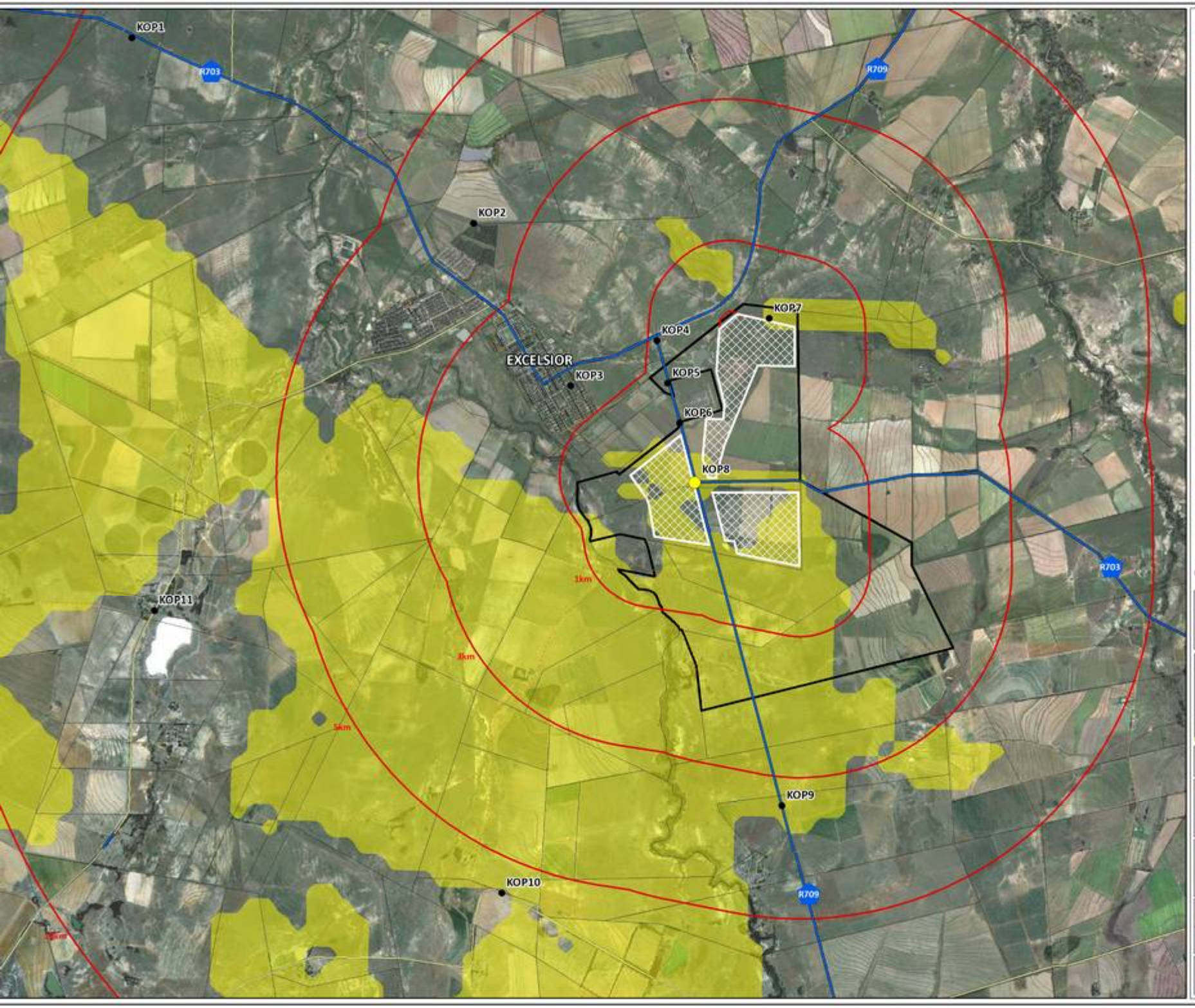
CLIENT: SOLAIREDIRECT (PTY) LTD

PROJECT: **MERAPI SOLAR PARK**

DRAWING: KOP4 VIEWSHED

PROJECT NR.	DATE	SCALE
VIA_180512.SA	02/07/2012	1:50 0
DRAWING NR.	DRAWN BY	CHECKED BY
G05/03C	JV	DC

FOR APPROVAL



LEGEND

- Subject property
- Project site/phases
- Cadastral boundaries
- Distance radii
- Viewshed extent
- Key Observation Point
- Centre point of viewsh

N

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ZONE LAND SOLUTIONS

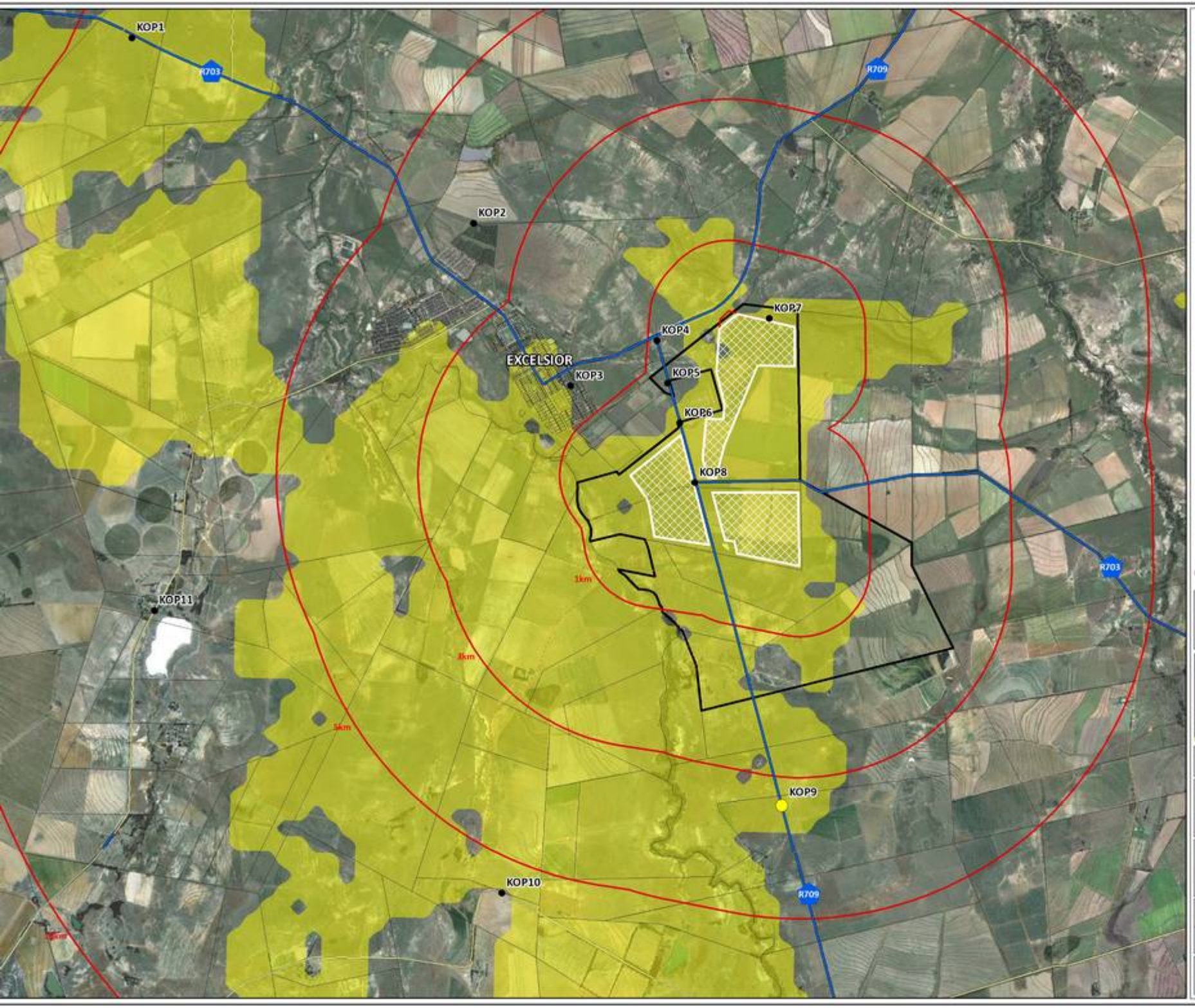
CLIENT: SOLAIREDIRECT (PTY) LTD

PROJECT: **MERAPI SOLAR PARK**

DRAWING: KOP8 VIEWSHED

PROJECT NR.	DATE	SCALE
VIA_180512.SA	02/07/2012	1:50 0
DRAWING NR.	DRAWN BY	CHECKED BY
G05/03D	JV	DC

FOR APPROVAL



LEGEND

- Subject property
- Project site/phases
- Cadastral boundaries
- Distance radii
- Viewshed extent
- Key Observation Point
- Centre point of viewsh

N

0 295 590 1 180 1 770 2

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ZONE LAND SOLUTIONS

CLIENT: SOLAIREDIRECT (PTY) LTD

PROJECT: **MERAPI SOLAR PARK**

DRAWING: KOP9 VIEWSHED

PROJECT NR.	DATE	SCALE
VIA_180512.SA	02/07/2012	1:50 0
DRAWING NR.	DRAWN BY	CHECKED BY
G05/03E	JV	DC

FOR APPROVAL

LEGEND

- Subject property
- Project site/phases
- Cadastral boundaries
- Overhead Electrical Po

N

0 135 270 540 810

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ZONE LAND SOLUTIONS

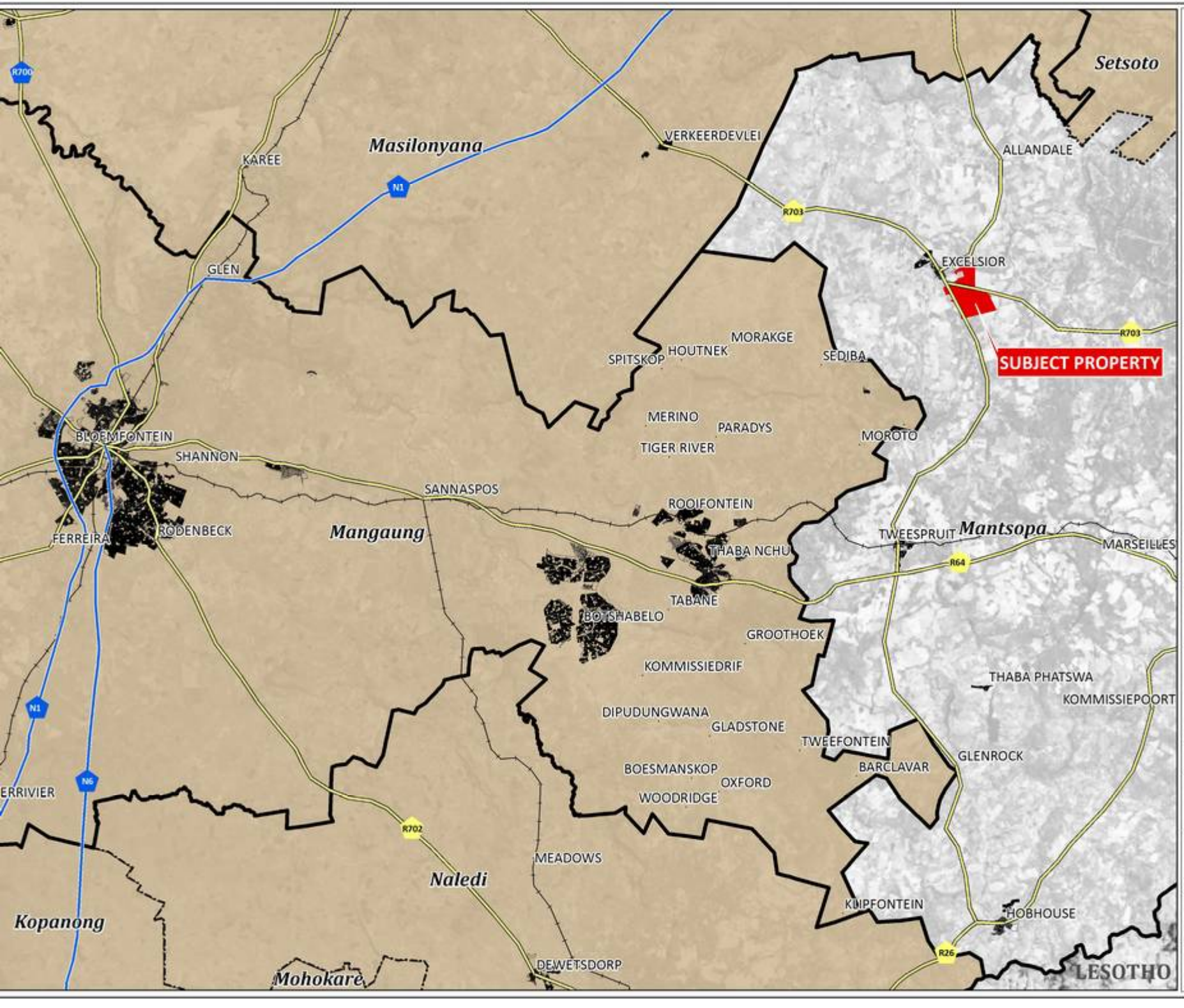
CLIENT: SOLAIREDIRECT (PTY) LTD

PROJECT: **MERAPI SOLAR PARK**

DRAWING: PROJECT SITE CONTEXT

PROJECT NR.	DATE	SCALE
VIA_180512.SA	02/07/2012	1:50 0
DRAWING NR.	DRAWN BY	CHECKED BY
G05/03	JV	DC

FOR APPROVAL



LEGEND

- District municipalities
- Local municipalities
- Subject property
- Roads

N

Kilometers

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ZONE LAND SOLUTIONS

CLIENT: SOLAIREDIRECT (PTY) LTD

PROJECT: **MERAPI PV PLANT**

DRAWING: REGIONAL CONTEXT

PROJECT NR.	DATE	SCALE
VIA_180512.SA	18/06/2012	1:350
DRAWING NR.	DRAWN BY	CHECKED BY
005/01	JV	DC

FOR APPROVAL