POFADDER SOLAR THERMAL PLANT AND ASSOCIATED INFRASTRUCTURE NORTHERN CAPE

(DEA REF No: 12/12/20/1832)

MOTIVATION FOR AMENDMENT OF ENVIRONMENTAL AUTHORISATION

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1. BACKGROUND AND INTRODUCTION

KaXu CSP obtained environmental authorisation for the Proposed Pofadder Solar Thermal Plant and associated infrastructure on a site near Pofadder, Northern Cape (EIA Ref No: 12/12/20/1832) in April 2011. The site is proposed on Portion 4 of the Farm Scuit-Klip 92, which lies approximately 30 km north-east of the town of Pofadder in the Northern Cape. The environmental authorisation authorises all three phases of the proposed Solar Thermal Plant, with an overall capacity of 310MW comprised of a combination of Concentrated Solar Power (CSP) and Photovoltaic technology.

Subsequent to the issuing of a positive environmental authorisation by DEA, in order to comply with the 75 MW cap set by the Department of Energy (DoE), the authorised facility will be split into ***three phases***, the details of which are presented below:

Phase name	***Capacity***	***Authorised Solar Technology***	***Project Development Status***
Pofadder Solar Thermal Plant – Phase 1	100 MW (trough plant)	**Parabolic troughs** (CSP system consisting of several loops of parabolic troughs)	**Construction underway**
Pofadder Solar Thermal Plant – Phase 2	200 MW (tower plant)	**Power tower plant** and **heliostats** (CSP system consisting of a field of heliostats positioned around the power tower)	**Change in technology proposed to parabolic troughs**
Pofadder Solar Thermal Plant – Phase 3	10 MW (PV plant)	Photovoltaic panels (PV) system consisting of several rows of PV panels	Planning Stage

It should be noted that the Phase 1 100 MW trough plant was awarded preferred bidder status by the Department of Energy in December 2011 and construction of the Phase 1 has been underway since mid-2012.

In order to accommodate the planned change in technology for the phase 2 plant, an application for amendment to the Environmental Authorisation will be lodged with the Department of Environmental Affairs (DEA). The change in CSP technology **for the next phase of development of the project** (Phase 2) from

a power tower plant and heliostats to a parabolic trough plant is a substantive amendment to the Environmental Authorisation. In terms of Condition 1.4 of the Environmental Authorisation, an applicant can apply to the competent authority for a change or deviation from the project description. A request for amendment to the environmental authorisation has been prepared, and includes the motivation for the amendment. In terms of Regulation 56 of the EIA Regulations of June 2010[1], Savannah Environmental has prepared this motivation in support of a request/application on behalf of the applicant to National DEA, in order to inform interested and affected parties on the changes to the proposed project, allow an opportunity for the public to comment on these changes and in order for the competent authority to be able to reach a decision on the proposed amendments to the environmental authorisation.

2. MOTIVATION FOR AMENDMENT

The change in technology from a power tower plant and heliostats/mirrors to a parabolic trough plants for Phase 2 of development of the Pofadder Solar Thermal Plant is based on the following reasons:

» The first phase of the project is a parabolic trough plant, and this facility is currently under construction. By Phase 1 and Phase 2 utilising the same CSP technology (parabolic troughs), sharing of common infrastructure and streamlining of operations and maintenance of both Phases will be technically and financially preferred by the Developer. This will translate into cheaper energy production and lower energy tariffs benefiting the country and its energy market as a whole, hence resulting in a lower impact on the electricity consumer and support during the peak demand periods.
» Parabolic trough technology is a mature and advanced technology and accounts for ~90% of the globally installed CSP base. A key reason for this is that a parabolic trough plant has better energy storage capability than power tower plants and heliostats/mirrors, by providing more storage hours. This is the main technical reason for the desired change in the technology to parabolic troughs.
» The local community who are already involved in the first phase of development of the Pofadder Solar Thermal Plant (a parabolic trough plant), can also benefit from a second phase installing the same technology through employment and provision of ancillary services to the development of next phase of the project.

[1] Note that the project was authorised under the EIA Regulations of April 2006, which were current at the time, and these Regulations have now been replaced by the EIA Regulations of June 2010.

Therefore, the Developer's preference is to utilise parabolic trough technology for the next phase of development of the Pofadder Solar Thermal Plant.

3. DESCRIPTION OF POWER TOWER AND PARABOLIC TROUGH TECHNOLOGIES

Solar energy facilities operate by converting solar energy into a useful form (i.e. electricity). The power tower (using mirrors/heliostats) and parabolic trough technologies are discussed below:

4.1 Heliostats and Power Tower technology (authorised technology and to be changed)

A power tower system is comprised of a heat collection system and a conventional generating plant portion. The heat collection system consists of **heliostats** (movable, flat reflective mirrors roughly 120 m^2 which are oriented according to the sun's position in order to capture and reflect the solar radiation) onto a **receiver** (consisting of metal tubes which transfer the heat from the solar radiation to water with the purpose of generating steam). The receiver is mounted on a 200 m high **power tower** that provides elevation and structurally supports the receiver. The collected energy is used to generate steam through a conventional heat exchanger system that is in turn used for electricity generation in a conventional steam turbine and generator (power island) (refer to Figures 1 and 2).

Power tower plants must be large to be economical. The heliostat field and the receiver are sized depending on the needs of the utility, for example, a 50 MW facility will require approximately 300 ha.

Figure 1: CSP power tower (photographs courtesy of Abengoa Solar S.A.)

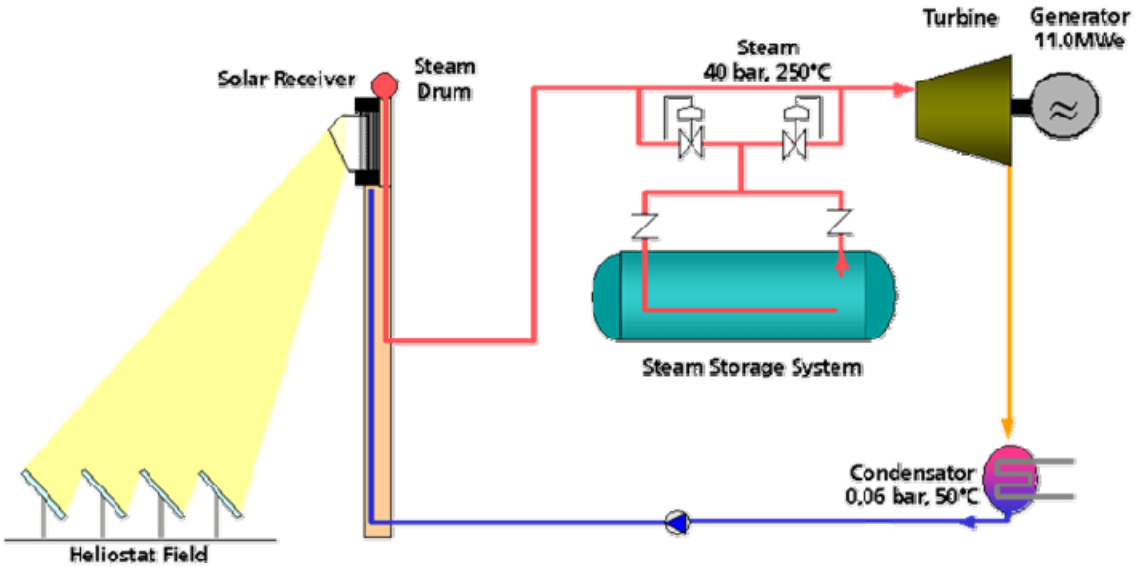

Figure 2: Illustration of the power tower operating system (picture courtesy of Abengoa Solar S.A.)

4.2 Parabolic Troughs (Proposed technology for the next phase of development of the project)

A trough system is comprised of a heat collection system and a conventional generating plant portion. The heat collection system is comprised of **parabolic collectors** (i.e. trough-shaped reflectors which focus the solar radiation onto a receiver at its focal point), a **receiver tube / heat collection element** (i.e. a metal absorber containing the heat transfer fluid surrounded by a glass envelope (maintaining a vacuum), which absorbs the solar energy received from the parabolic trough), a **sun-tracking system** (i.e. an electronic control system and associated mechanical drive system used to focus the reflector into the sun), and support structure (i.e. holds the parabolic trough in accurate alignment with incoming solar radiation while resisting the effects of the wind). The collected energy in the heat transfer fluid is used to generate steam through a conventional heat exchanger system that is in turn used for electricity generation in a conventional steam turbine and generator.

Figure 3: CSP parabolic troughs (photographs courtesy of Abengoa Solar S.A.)

4.3 Summary of Differences and Similarities between Heliostats And Parabolic Troughs CSP Technologies

Technological similarities between heliostats and parabolic troughs include:

» After trapping thermal energy (heat from the sun) in different ways (as described under Section 4.1 and 4.2), both technologies operate on the same system of generating electricity by the use of a steam generator system.

» Both technologies operate on a steam turbine system for steam generation to generate electricity.
» The energy can be stored from both heliostats and parabolic troughs (however parabolic troughs can store energy for longer periods).

Technological differences between heliostats and parabolic troughs include:
» **Parabolic troughs** are up to 5m in height and a heat transfer fluid is heated within the troughs.
» **Heliostats** are mirrors which reflect the sunlight onto one central receiver – the **power tower** which is up to 200m in height.
» **Parabolic trough technology** can store energy for longer periods.

As parabolic troughs have proven to have higher energy storage capability than power tower plants, this technology is technically more preferred than the power tower plant and heliostats.

4. ACTIVITY DESCRIPTION

An amendment to the Environmental Authorisation is required in order to allow for the change in CSP technology to be utilised for the next phase of development of the project (Phase 2). **The technology change is from a power tower and heliostats plant to a parabolic trough plant.**

The lifespan of the facility will remain the same – i.e. between 30 - 50 years. The infrastructure to be shared between the phases included the water abstraction, pipeline and storage infrastructure from the Gariep River to the facility site. The infrastructure to be shared between Phases includes external access roads, power line to Paulputs Substation, workshop, office and storage areas.

5. ENVIRONMENTAL IMPACTS

The change in technology will not change the development footprint area for Phase 2. **Figure 4** presents the **original layout** and Figure 5 presents the development footprint to be occupied by the **new layout** (which has been super-imposed on the original layout for Phase 2 of the development). The primary components of the project (i.e. areas of activity) remain unchanged, and include the following:

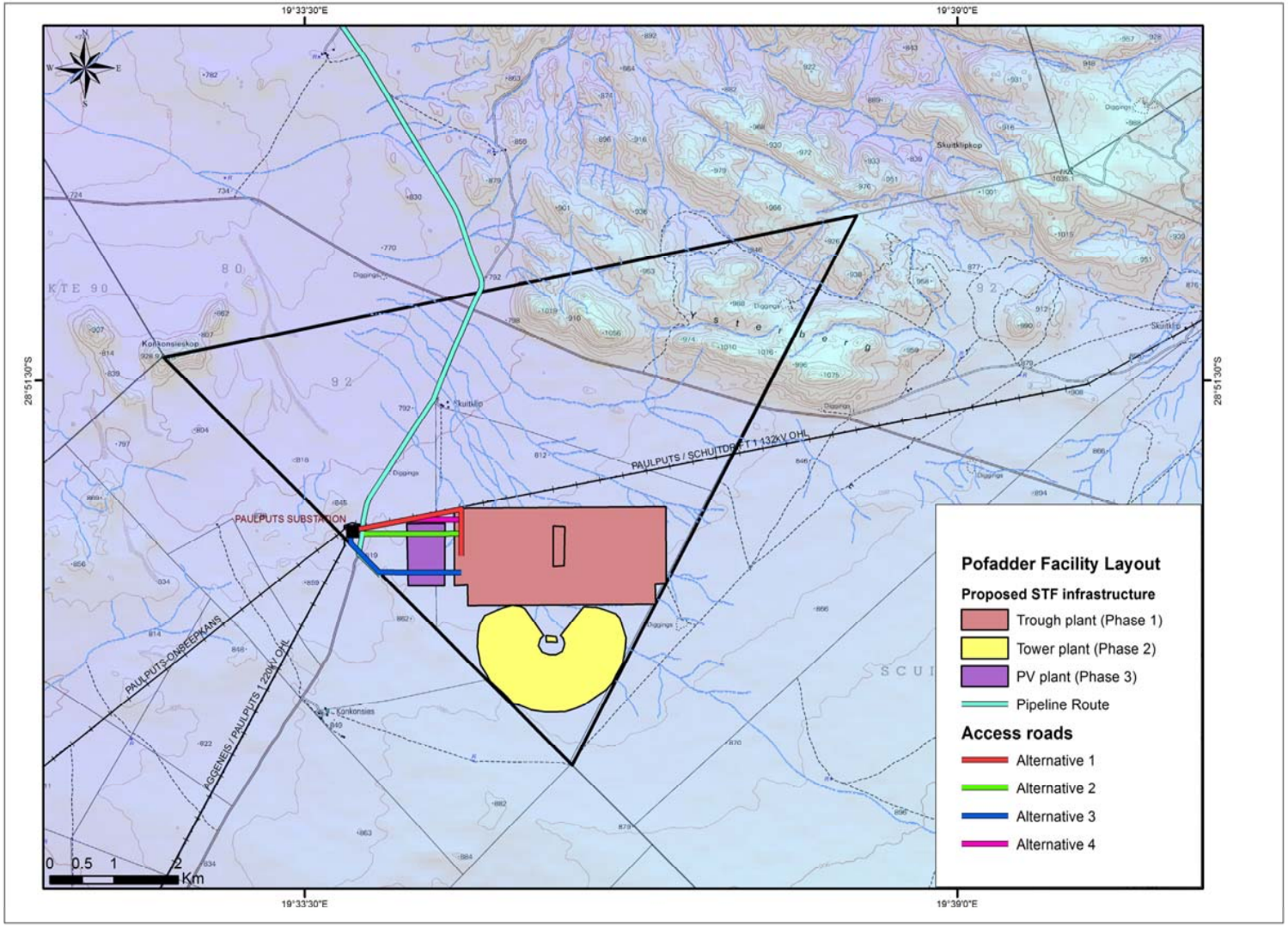

Figure 4: Original Approved Layout for the Pofadder Solar Thermal Plant (showing the various development phases and footprints)

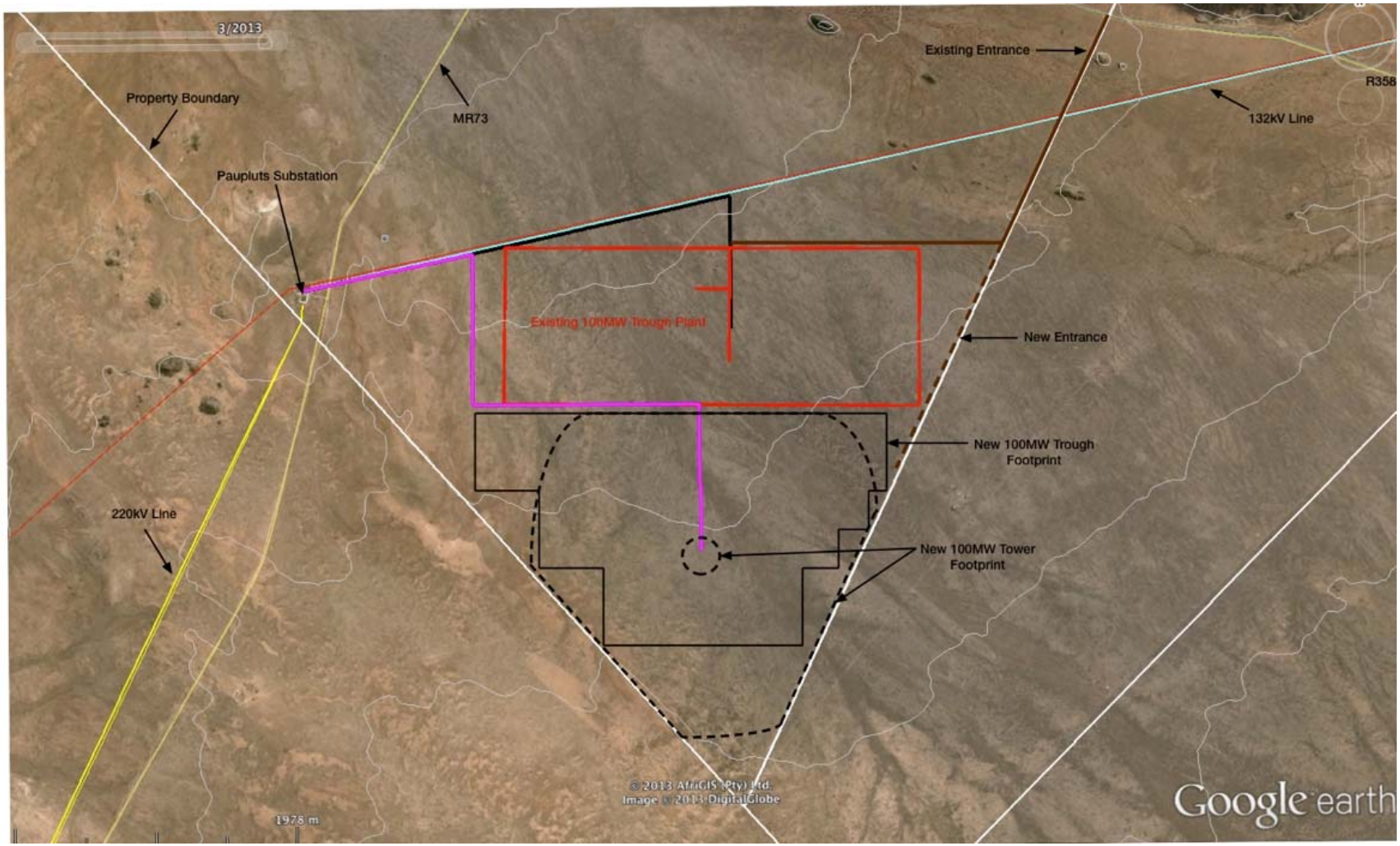

Figure 5: Development footprint of the Phase 2 development of the Pofadder Solar Thermal Plant shown in black. The new 100MW trough footprint is shown where the heliostats and power tower plant was originally planned (ie on the same project development footprint). The 100MW trough plant currently undr construction is shown in red.

» The development footprint **within** the Phase 2 area remains the same, and includes: the solar collector fields; water storage reservoirs; evaporation ponds; overhead power line; the power island; internal access roads; workshops; offices; and storage areas.
» The development footprint **outside** of Phase 2 area still includes an abstraction point at the Gariep (Orange) River; a suspension reservoir; and the underground water supply pipeline to the facility.

The change in technology will not result in a significant change in environmental impacts as assessed in the Final EIA report, as the area to be occupied by the Phase 2 development will remain the same.

5.1 Environmental Sensitivity

From the specialist investigations undertaken within the EIA process for the proposed Pofadder Solar Thermal Plant site, no absolute environmental 'no go' areas were identified. Through the assessment of impacts associated with the solar energy facility, both potentially positive and negative impacts were identified. Due to the nature of the site and the surrounding land use, the majority of environmental impacts will still be of **low to moderate** significance.

5.2 Impacts on Ecology

The impacts on ecology identified in the final EIA report **re*main the same*** due to the fact that the same development footprint will be utilised and similar construction process will be employed for parabolic trough technology as proposed for the heliostats and power tower technology. The overall impact on the **ecology** is likely to be of a **low - moderate significance** prior to mitigation. This could be reduced to **low significance** following the implementation of mitigation measures. Higher ecological sensitivity within the greater site can be attributed to the drainage lines, steep slopes, mountains and ridges, and floristic elements from the Gariep Centre of Floristic Endemism consisting of the low mountains and hills. Therefore, the impacts on ecology (irrespective of choice of CSP technology) remain the same as assessed in the final EIA report.

5.3 Impacts on Geology, soils, and agricultural potential

The impacts on soils and agricultural potential identified in the final EIA report ***remain the same*** due to the fact that the same development footprint will be utilised and similar construction process will be employed for parabolic trough technology as proposed for the heliostats and power tower technology. The overall impact on the **geology, soils, and erosion potential** is likely to be of **moderate - low** significance in terms of direct impacts. The possible presence of

shallow, dense residual soil, calcrete, or basement rock may help to reduce the erosion potential, but this is difficult to quantify without detailed geotechnical information. The cumulative significance of all the potential impacts on the geological environment is considered **low** due to the limited scale of the development and the dearth of development in the immediate surrounding area. With effective implementation of mitigating measures the impacts identified above can be reduced to a low level. Therefore, the impact on soils (irrespective of choice of CSP technology) remains the same as assessed in the final EIA report.

5.4 Impact on Water Resources

The impacts on water resources as identified in the final EIA report **r*emain the same*** due to the both technologies operate on a steam turbine system which requires water for steam generation to generate electricity. The overall impact on the **water resources** is likely to be of a **moderate** significance. The impacts on water resources (irrespective of choice of CSP technology) remain the same as assessed in the final EIA report.

5.5 Impacts on Heritage Resources

The impacts on heritage impacts in the final EIA report ***remain the same*** due to the fact that the same development footprint will be utilised and similar construction process will be employed for parabolic trough technology as proposed for the heliostats and power tower technology. The overall heritage impact is likely to be of **low** significance with the implementation of mitigation measures. Very sparse heritage traces were found during a field survey. From an archaeological perspective the observed heritage resources either fall well outside of the proposed development footprint or are of low significance. The proposed site for the construction of the solar energy facility and associated infrastructure is of a low cultural sensitivity. Therefore, the impact on heritage resources (irrespective of choice of CSP technology) remains the same as assessed in the final EIA report.

5.6 Socio-Economic Environment

The positive and negative social impacts identified in the final EIA report **r*emain the same*** due to the fact that a similar construction process will be employed for parabolic trough technology as proposed for the heliostats and power tower technology. The overall **social** impact is likely to be of a **moderate significance** in terms of positive impacts, and a **low – high significance** in terms of the negative impacts. The development will create employment and business opportunities for locals during both the construction and operational phase of the project and represents an investment in clean, renewable energy infrastructure.

Therefore, the socio-economic impacts Phase 2 of development of the Pofadder Solar Thermal Plant (irrespective of choice of CSP technology) remains the same as assessed in the final EIA report.

5.7 Visual Impacts associated with the PV facility

Parabolic troughs are of a lower height (5m) than the power tower infrastructure (200m tower; and 12m heliostats) i.e. a height difference of 195m between the infrastructure components. Therefore, the visual impact associated with parabolic troughs will be lower than that of power tower and heliostats. The use of parabolic troughs instead of the power tower plant and heliostats CSP technology will reduce the area of potential visual exposure, and subsequently the extent of the visual impact. The comparative viewshed analysis which is contained in the Final EIA Report showed this reduced visual impact, undertaken for parabolic troughs (up to 16m in height) compared to the visual impact of the power tower (refer to **Figure 6**). The proposed parabolic troughs CSP technology will generally also be less intrusive than the 200m high power tower due to its constrained vertical dimensions, further mitigating the potential visual impacts.

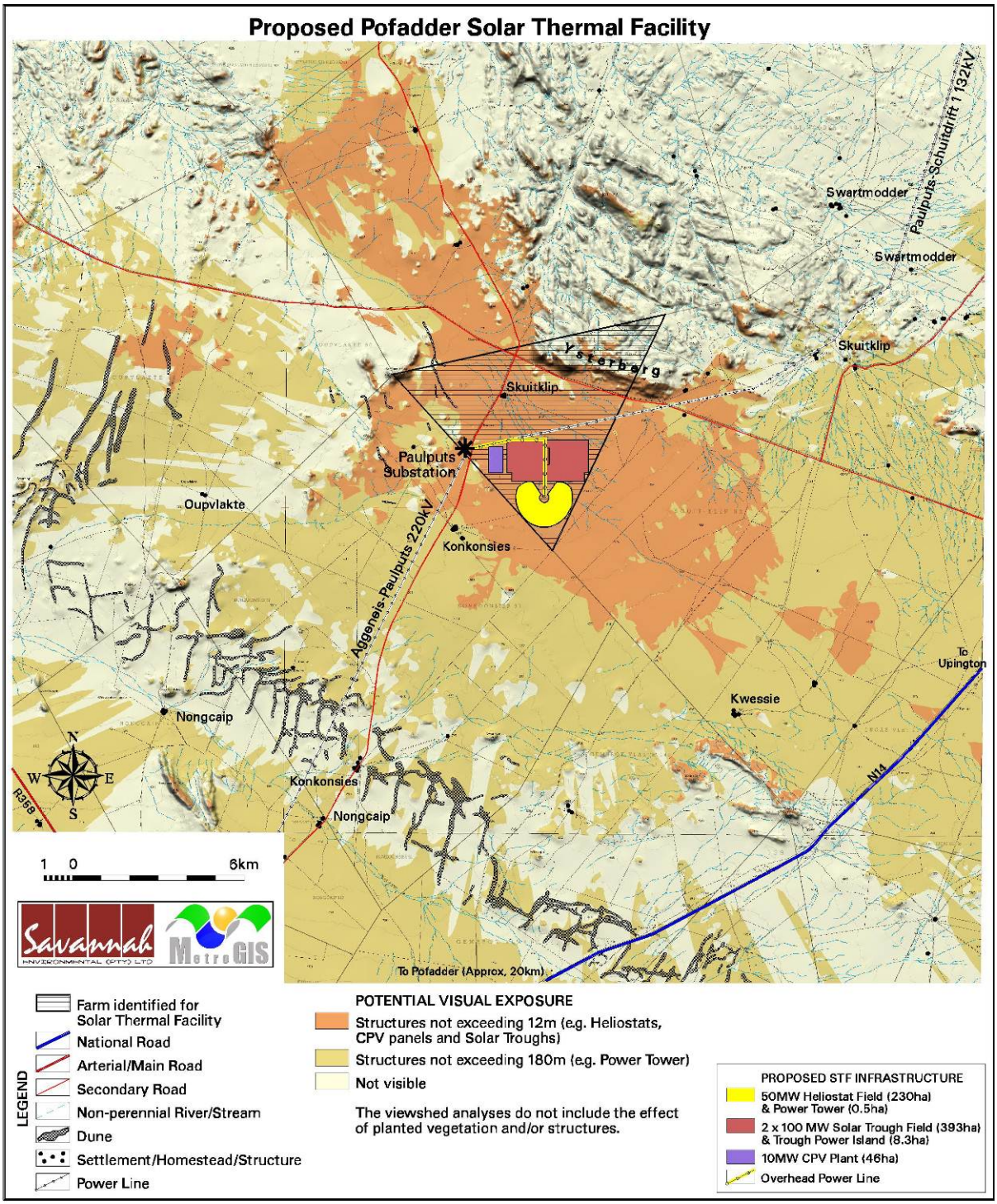

Figure 6: Comparative Viewshed for Troughs and Power Tower technologies for the Pofadder Solar Thermal Plant as taken from the Final EIA Report

6. Final recommendations From EAP in Support of Amendment to EA

In conclusion, it is the opinion of the EAP that the environmental impacts associated with the utilisation of CSP parabolic trough technology within the site development footprint will not be significantly different to that of a CSP Power tower plant technology due to the following reasons:

- The change in technology will not change the development footprint area for Phase 2, which will remain as 300 hectares.
- The primary components and infrastructure associated with the project (i.e. areas of activity) remain unchanged.
- The development footprint **within** the Phase 2 area remains the same, and includes: the solar collector fields; water storage reservoirs; evaporation ponds; overhead power line; the power island; internal access roads; workshops; offices; and storage areas.
- Socio-economic, ecological (soils, vegetation, water resources) and heritage impacts will remain the same as assessed in the Final EIA report as the area to be occupied by the Phase 2 development will remain the same.

The change in technology will not result in a significant change in environmental impacts as assessed in the Final EIA report. However, the use of parabolic troughs instead of a power tower and heliostats will reduce the area of potential visual exposure, and subsequently the extent and significance of the visual impact.

The draft Environmental Management Plan (EMP) developed for the project still applies and will be implemented during the construction; operation and decommissioning of the next phase of development of the project (and updated and submitted to DEA in necessary).

On the basis of the above motivation and in terms of the provision made in terms of Condition 1.4 of the Environmental Authorisation, KaXu CSP South Africa will request that the wording of the project description in the authorisation be amended to accommodate the above-mentioned CSP technology change, for the next development phase of the Pofadder Solar Thermal Plant.

7. PUBLIC CONSULTATION PROCESS

In terms of the Regulation 54 of the EIA regulations of June 2010[2], the following public participation process is being undertaken to allow I&APs the opportunity to comment on the proposed amendment to the EA for the Pofadder Solar Thermal Plant: Giving written notice to —

(i) The owner or person in control of that land if the applicant is not the owner or person in control of the land;

(ii) The occupiers of the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;

(iii) Owners and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;

(iv) The municipal councillor of the ward in which the site or alternative site is situated and any organisation of ratepayers that represent the community in the area;

(v) The municipality which has jurisdiction in the area;

(vi) Any organ of state having jurisdiction in respect of any aspect of the activity; and

(vii) Any other party as required by the competent authority;

A public consultation process is being undertaken to inform and seek any comments on the change in CSP technology to include the following:

» Circulation of a letter to the key stakeholders.
» Placing an advertisement in local newspapers.
» Affording I&APs a 30-day public review period to provide input and comments on the proposed amendment to the EA.

The public review period for this EA amendment is from 24 May 2013 – 24 June 2013. This motivation for amendment and relevant information has been made available electronically on www.savannahSA.com/projects. Please submit your written comment by 24 June 2013. To obtain further information/ a copy of the amendment documentation, please contact:

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[2] Note that the project was authorised under the EIA Regulations of April 2006, which were current at the time, and these Regulations have now been replaced by the EIA Regulations of June 2010.