REPORT N° 21102.LETSOAI.ENAMANDLA

LETSOAI & ENAMANDLA SOLAR POWER FACILITIES

TRANSPORT IMPACT ASSESSMENT

JANUARY 2017

LETSOAI & ENAMANDLA SOLAR POWER FACILITIES

TRANSPORT IMPACT ASSESSMENT

WSP Environment & Energy

Version 1.3

Project no: 21102
Date: January 2017

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PRODUCTION TEAM

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SUBCONSULTANTS

None

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1 INTRODUCTION

1.1 BACKGROUND

WSP Group Africa (Pty) Ltd (WSP) has been appointed by WSP Environment & Energy to undertake a Transport Impact Assessment (TIA) of the proposed Letsoai 1 and 2 Concentrated Solar Power (CSP) and Enamandla 1 to 5 Photovoltaic (PV) Facilities, to be located near Aggeneys in the Northern Cape Province.

It is the intention of the developer, BioTherm Energy (Pty) Ltd (BioTherm), to apply for approval to construct all 7 projects, however it is possible that not all 7 of the projects will be awarded as Preferred Bidders under the Department of Energy's REIPPP.

This report assesses the expected transport related impacts of all 7 facilities during the construction, operation and subsequent decommissioning phases. The purpose of this report is to consider the transport impact that the 7 facilities will have on the surrounding road network and environment, and to propose mitigating measures to address these impacts, where required.

1.2 SCOPE OF STUDY

The Scope of the TIA is as per the requirements of the South Africa Committee of Transport Officials, South African Traffic Impact and Site Traffic Assessment Manual, TMH16, Vol. 1, Version 1, August 2012. The scope covers the following:

- Previous traffic related studies, submissions and approvals (if relevant).
- Description of the extent of the development, including location and land-use/s.
- Description of the phased development of the facility (if applicable).
- Record of liaison with authorities.
- Record of site visits.
- Description of the local and potentially affected road network, including planning and comment on the road condition, where information is available.
- Description of latent development in the vicinity of the facility that may also have an impact on the local road network
- Assessment of the required site access, parking and internal circulation.
- Assessment of expected trip generation (construction & operational phases).
- Capacity analysis (construction & operational phases), including an assessment of the expected total E80's (heavy axle loading) for the life cycle of the facility.
- Assessment of public transport and non-motorised transport.
- Recommendations and conclusions with regards to the transport impact/s and proposed mitigating measures.

Due to the location of the facilities on the same farm portion, and the shared access onto the surrounding road network, a single TIA was undertaken. A separate TIA for each facility will not reflect the combined transport impact satisfactorily.

1.3 PREVIOUS SUBMISSIONS

No prior TIA's has been undertaken or submitted for the facilities.

1.4 PEER REVIEW

The TIA was subjected to a peer review by an independent engineer, as requested by the DEA, detailed below:

Urban EQ Consulting Engineers
Andrew Bulman Pr. Eng
Transportation Engineer
Cell: 072 293 8079
Email: andrew@urbaneq.co.za
Web: www.urbaneq.co.za

The review is included in Appendix A. The issues raised has been addressed, where relevant, in this latest version of the TIA.

1.5 TYPE & EXTENT OF THE FACILITIES

LETSOAI CSP 1 AND 2

These facilities will be 2 separate power generation installations of 150 MW each, consisting of a Central Receiver Tower and heliostat field.

CENTRAL RECEIVER/TOWER TECHNOLOGY

In central receiver technology, sun-tracking mirrors called heliostats (glass mirrors) (Figure 1-1) are mounted on a dual-tracking axis which reflects the sunlight to the central receiver (Figure 1-2). Heliostats are typically arranged in an elliptical formation around the focal point with the majority of the reflective area focussed to the more effective side of the heliostat field (Figure 1-3). Other arrangements are also possible, with rectangular groups of mirrors focused on to a number of smaller central receivers in a modular formation.

In central receiver technology the central receiver is situated on the top of the central tower. This receiver is a heat exchanger which absorbs the concentrated beam radiation, converts it to heat and transfers the heat typically to a heat transfer fluid HTF which may be thermal oil or molten salt. This is in turn used to generate steam for conventional power generation. Figure 1-4 provides a flow diagram of the central receiver CSP power generation process (with storage) as an example.

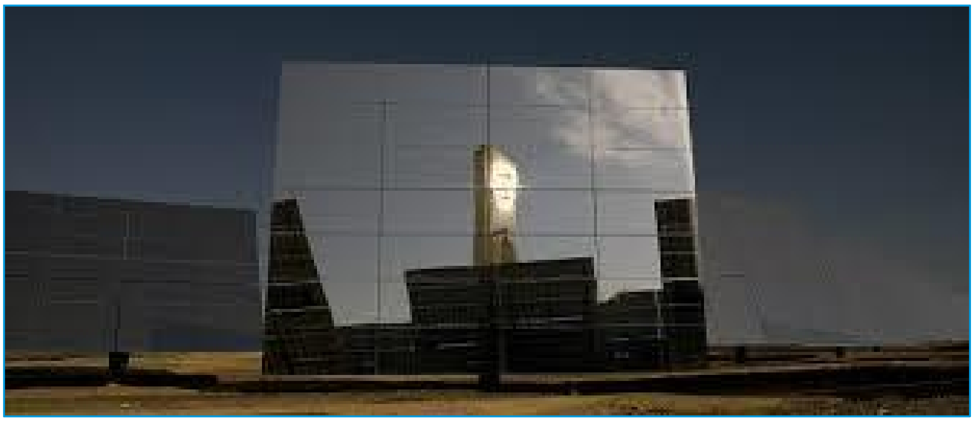

Figure 1-1: Example of a heliostat

Figure 1-2: Central Tower Receiver

(Source: www.torresolarenergy.com)

Figure 1-3: Elliptical formation of the Central Tower Solar Field

Source: www.finetubes.co.uk

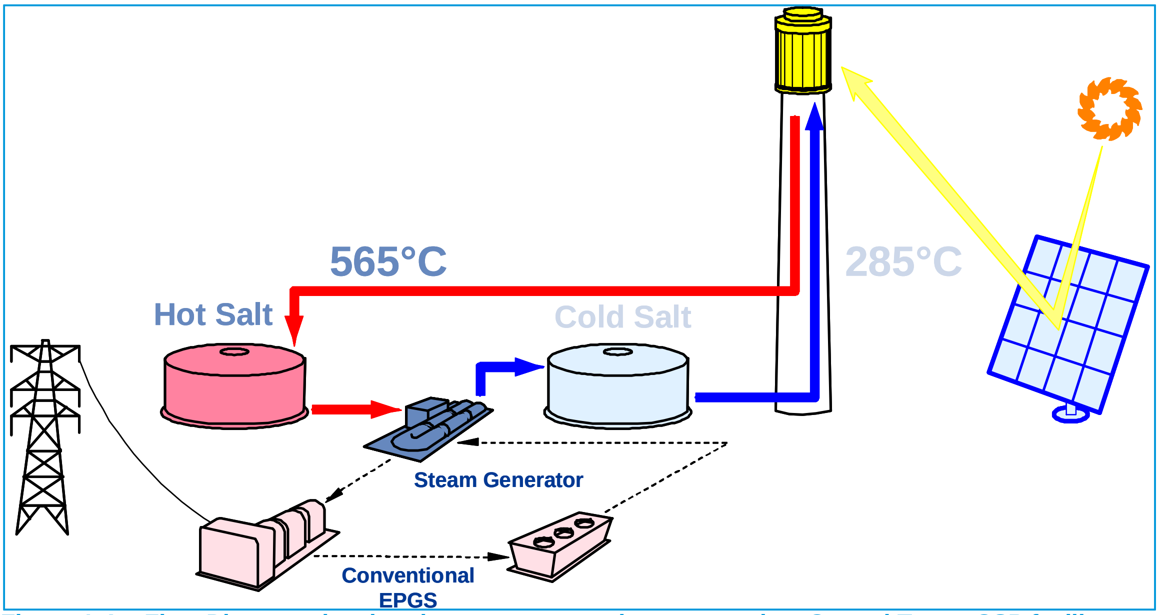

Figure 1-4: Flow Diagram showing the power generation process in a Central Tower CSP facility

Source: www.solarnovus.com

PROJECT INFRASTRUCTURE

A summary of the details of the Letsoai CSP 1 and 2 facilities and associated infrastructure is included in Table 1-1.

Table 1-1: Details of the Proposed Central Tower CSP Facility and the Associated Infrastructure

INFRASTRUCTURE	DETAILS / DIMENSIONS
Technology	CSP – Central Tower
Generation capacity	150MW
Tower	200 – 250 m high power tower with a central receiver located on the top of a concrete tower.
Power Generation Facility	à Steam turbine and generator à Auxiliary fossil fuel boilers à Air cooler condenser à Hot and cold molten salt storage tanks
Number of Heliostats	The number of heliostats is still to be confirmed, typicallyy 12,000 to 15,000. Heliostats will be two-axis mirrors.
Area occupied by each Heliostat	Typically 12 m^2 to 15m^2 per heliostat
Dimensions of Heliostats	Typically, W=5.75m, Collector length= 150m, Absorber diameter=0.070m. It must be noted that this is dependent on the manufacturer
Collector Height and orientation	Typically between 200-250m
Area of preferred Solar Field	Typically 930Ha
Foundation specifications and dimensions	Concrete.
Footprint of Operations and Maintenance building(s)	Approximately 225m^2
Area of preferred construction laydown area	To be confirmed based on the facility concept layout
Temporary and permanent laydown area dimensions	à Temporary laydown of 5Ha à Permanent laydown for the containers will be required for the storage of spares, which is to be located close to the Operations and Maintenance building
Cement Batching Plant	Gravel and sand will be stored in separate heaps whilst the cement will be contained in a silo. The actual mixing of the concrete will take place in the concrete truck. The footprint of the plant will be in the order of 0.25ha. The maximum height of the cement silo will be 20m. This will be a temporary structure during construction.
Access Road	An existing road currently provides access to the site off the N14. It is proposed that this road may be upgraded
Width of internal roads	Approximately 5m
Length of internal roads	To be confirmed based on the facility concept layout
Type and height of fencing	Galvanized steel type at approximately 2m high
Water Supply and Treatment	à Water supply pipeline

Infrastructure	Details / Dimensions
	à Water treatment plant à Raw water storage reservoir / tanks à Evaporation ponds
Sewage	Septic tanks (with portable toilets during the construction phase)
Power Evacuation	
Specifications of onsite switching stations, transformers, onsite cables etc.	There will be an onsite substation connected to the facility power island which is comprised of the steam turbine generator transformer. The power-island will be linked to the onsite substation using suitable underground cables (except where a technical assessment suggest that overhead lines are applicable). There will also be an overhead 132kV powerline linking this on-site substation to the one common substation.
Footprint of substation	Substation will occupy a footprint area of approximately 2.25ha
On-site substation capacity	Up to 132 kV
Width of the powerline servitude	31-36 m
Powerline tower types and height	Tower (suspension / strain) / Steel monopole structure, which may be self-support or guyed suspension.
List of additional infrastructure to be built	à Access roads and internal roads. à Administration, staff accommodation, control, workshops, water treatment plant and warehouse buildings

Refer to Table 1.1 for a broad technical description of the CSP facilities.

ENAMANDLA 1 - 5

Enamandla will be 5 separate Photovoltaic (PV) power generation facilities of up to 75MW each. Fixed and Tracking panel type technologies will be considered.

PHOTOVOLTAIC (PV) SYSTEMS

Internationally, PV is the fastest-growing power generation technology and between 2000 and 2009 the installed capacity globally grew on average by 60% per year. By the end of 2016, cumulative global installed PV installations will surpass 310 GW[1]. In South Africa as much as 8 GW of PV is planned to be installed by 2030, with approximately 1GW already installed and operating.

Large-scale or utility-scale PV systems are designed for the supply of commercial power into the electricity grid (Figure 1-5). Large-scale PV plants differ from the smaller units and other decentralised solar power applications because they supply power at the utility level, rather than to local users.

[1] http://www.solarpowerworldonline.com/2016/02/china-u-s-and-japan-to-lead-global-installed-pv-capacity-in-2016/

PV cells are made from semi-conductor materials that are able to release electrons when exposed to solar radiation. This is called the photo-electric effect. Several PV cells are grouped together through conductors to make up one module and modules can be connected together to produce power in large quantities. In PV technology, the power conversion source is via PV modules that convert light directly to electricity. This differs from the other large-scale solar generation technology such as CSP, which uses heat to drive a variety of conventional generator systems.

Solar panels produce direct current (DC) electricity, therefore PV systems require conversion equipment to convert this power to alternating current (AC), can be fed into the electricity grid. This conversion is done by inverters. **Figure 1-6** provides a flow diagram to illustrate the PV power generation process.

There are two primary alternatives for inverters in large scale systems; being centralised and string inverters.

Figure 1-5: Large-Scale Photovoltaic Power Generation Facility

Source: Biotherm.

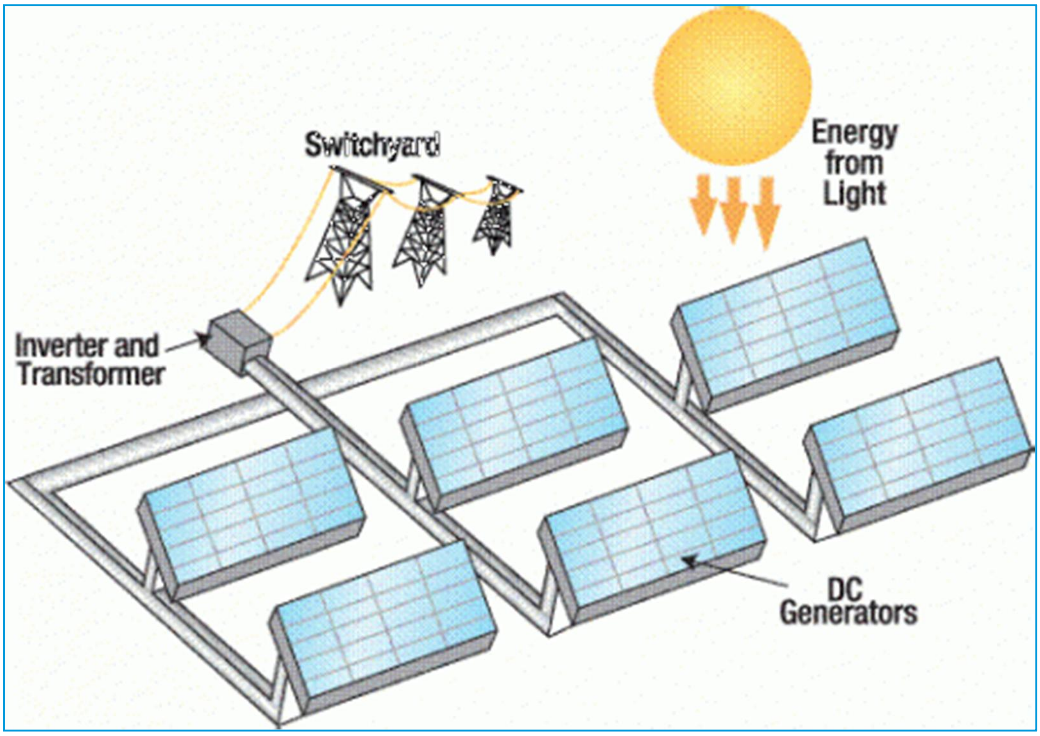

Figure 1-6: Simplified Photovoltaic Power Generation Flow Diagram

Source: www.holbert.faculty.asu.edu

PROJECT INFRASTRUCTURE

A summary of the technical components and associated infrastructure of each of the 5 facilities is included in **Table 1-2**.

Table 1-2: Details of the Proposed PV Plant and Associated Infrastructure

INFRASTRUCTURE	DETAILS / DIMENSIONS
Technology	Photovoltaic Panels with either fixed axis mounting or single axis tracking solutions. Panels will be crystalline silicon or thin film technology
Generation capacity	75MW
Number of panels	Approximately 281,000 to 274,000
Area occupied by each panels	Approximately 2 m^2/panel
Dimensions of solar PV panels	1956mm x 992mm x40mm
Panel Height and orientation	Approximately 4 - 6m
Area of preferred PV array	Approximately 350 Ha
Foundation specifications and dimensions	Concrete or rammed pile

INFRASTRUCTURE	DETAILS / DIMENSIONS
Footprint of Operations and Maintenance building(s)	Approximately 225m^2
Area of preferred construction laydown area	To be confirmed based on the conceptual layout
Temporary and permanent laydown area dimensions	à Temporary laydown of 5Ha. à Permanent laydown for the containers will be required for the storage of spares, which is to be located close to the Operations and Maintenance building.
Cement Batching Plant	Gravel and sand will be stored in separate heaps whilst the cement will be contained in a silo. The actual mixing of the concrete will take place in the concrete truck. The footprint of the plant will be in the order of 0.25ha. The maximum height of the cement silo will be 20m. This will be a temporary structure during construction.
Access Road	An existing road currently provides access to the site off the N14. It is proposed that this road may be upgraded.
Width of internal roads	Approximately 5m
Length of internal roads	To be confirmed based on the concept layout
Type and height of fencing	Galvanized steel type at approximately 2m high
Sewage	Septic tanks (with portable toilets during the construction phase)
Footprint of internal on-site substation	Internal on-site Substation will occupy a footprint area of approximately 2.25ha
On-site substation capacity	Up to 132kV
Specifications of onsite switching stations, transformers, inverters, onsite cables etc.	There will be an onsite substation connected to the facility power island which is comprised of the steam turbine generator transformer. The power-island will be linked to the onsite substation using suitable underground cables (except where a technical assessment suggest that overhead lines are applicable).
Width of the powerline servitude	31-36m
Powerline tower types and height	Tower (suspension / strain) / Steel monopole structure, which may be self-support or guyed suspension.
List of additional infrastructure to be built	à Access roads and internal roads. à Administration, staff accommodation, control, workshops, water treatment plant and warehouse buildings

1.6 PHASING OF THE DEVELOPMENT

The proposed phased construction of the 7 facilities are unknown. For the purpose of the impact assessment, it was assumed that it will be constructed in a single phase with an estimated construction period of 2 years.

1.7 APPROVAL OF SUBMISSIONS

This report will be subject to approval from the relevant local, provincial or national roads authorities, and will be submitted as part of the Final Environmental Impact Assessment.

2 LIAISON & DATA COLLECTION

2.1 LIAISON

Comments were requested from the South African National Roads Agency (SANRAL) regarding the proposed facilities and its potential impact on National Road N14. Refer to Section 4.1.

2.2 SITE VISITS

A specific transport related site visit was not deemed necessary at this stage of the assessment.

2.3 ROAD NETWORK & MASTER PLANNING

There is no known local, provincial or national roads planned in the vicinity of the site or the greater study area.

2.4 LATENT DEVELOPMENTS

Refer to Section 8: Cumulative Transport Impact Assessment.

3 SITE LOCATION & SURROUNDING ROAD NETWORK

3.1 SITE LOCATION

The proposed facilities are to be developed on the Farm Hartebeest Vlei 86 (SG Code: C05300000000008600000) located approximately 13km southeast of Aggeneys located within the Khâi-Ma Local Municipality under the jurisdiction of the Namakwa District Municipality in the Northern Cape Province. The farm portion is approximately 13,214 ha.

Refer to Figure 3.1 for the locality map of the farm portion, and Figure 3.2 for a map indicating the extent of each facility.

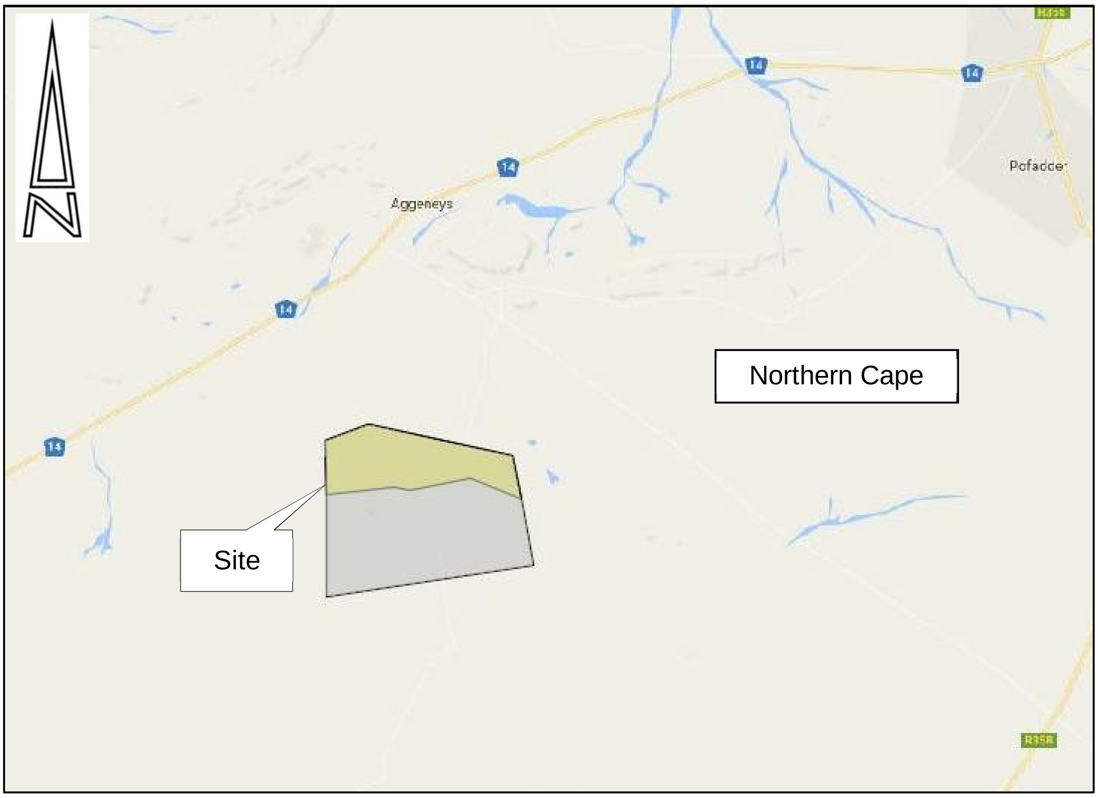

Figure 3-1 Locality map

Source: GoogleMaps

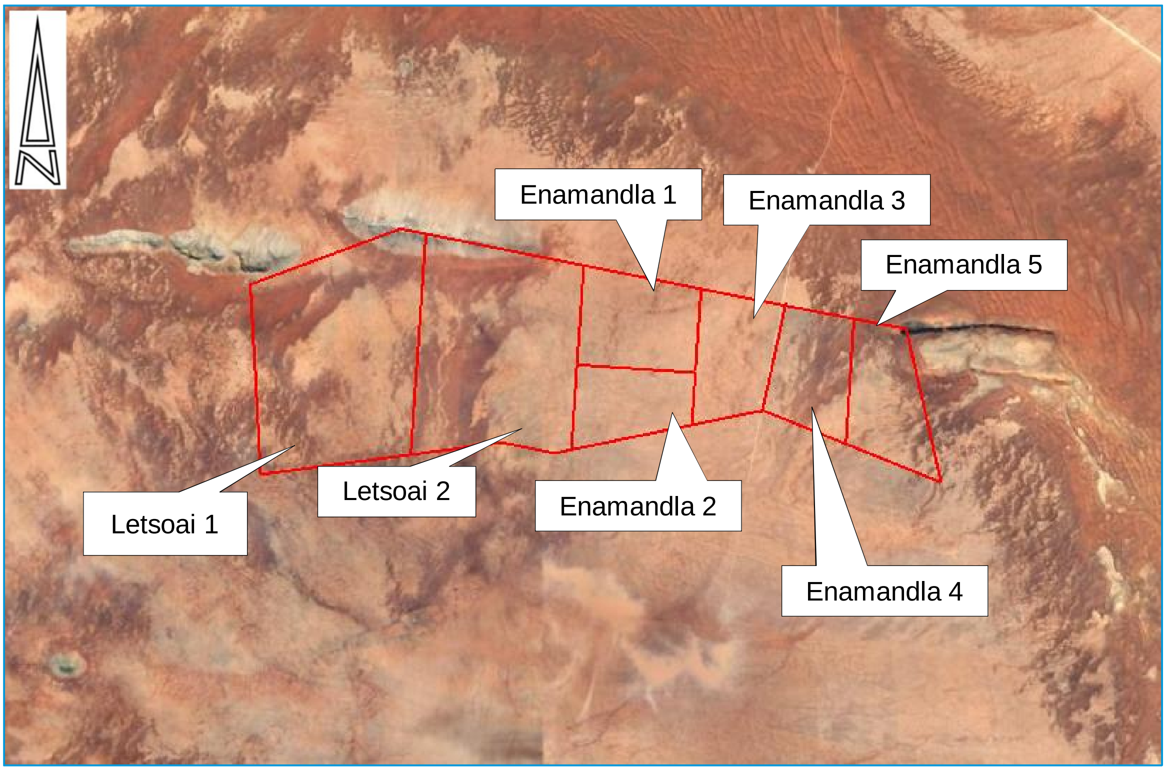

Figure 3-2 Facilities location

Source: GoogleEarth

3.2 ROAD NETWORK DESCRIPTION

The site is located south-east of National Road N14, near the town of Aggeneys. The N14 links Springbok to the south-west and Upington to the north-east.

The N14 is a single carriageway 2-way surfaced road (1 lane per direction), with narrow surfaced shoulders in the vicinity of the site.

4 SITE ACCESS & PARKING

4.1 DEVELOPMENT ACCESS

A new access road will be required to provide access to the site during the construction and the subsequent operational phases. Two options were considered, namely:

- Alternative 1: A 29 km road of which 18,4 km will be a new road up-to the existing gravel road, and 10,6 km along the Lus 10 gravel road to its intersection with the N14.
- Alternative 2: A new 11.6 km road with a new access off the N14 at an undetermined location.

Refer to Figure 4.1 for the high-level route alignments and access proposals.

Alternative 1 access

The existing intersection of the Lus 10 road with the N14 will be the future access to the National Road for all construction and later operational phase traffic. It is an existing approved access, with no known safety or operational issues.

Alternative 2 access

A new access road from the site to the N14 to provide access to the National Road for all construction and later operational phase traffic. This section of the N14 is located on a flat terrain with a near straight alignment. Sight distance should therefore not be problematic for a new access road. The access location will have to be assessed with regards to site specific details, such as road signs, telecom line towers etc.

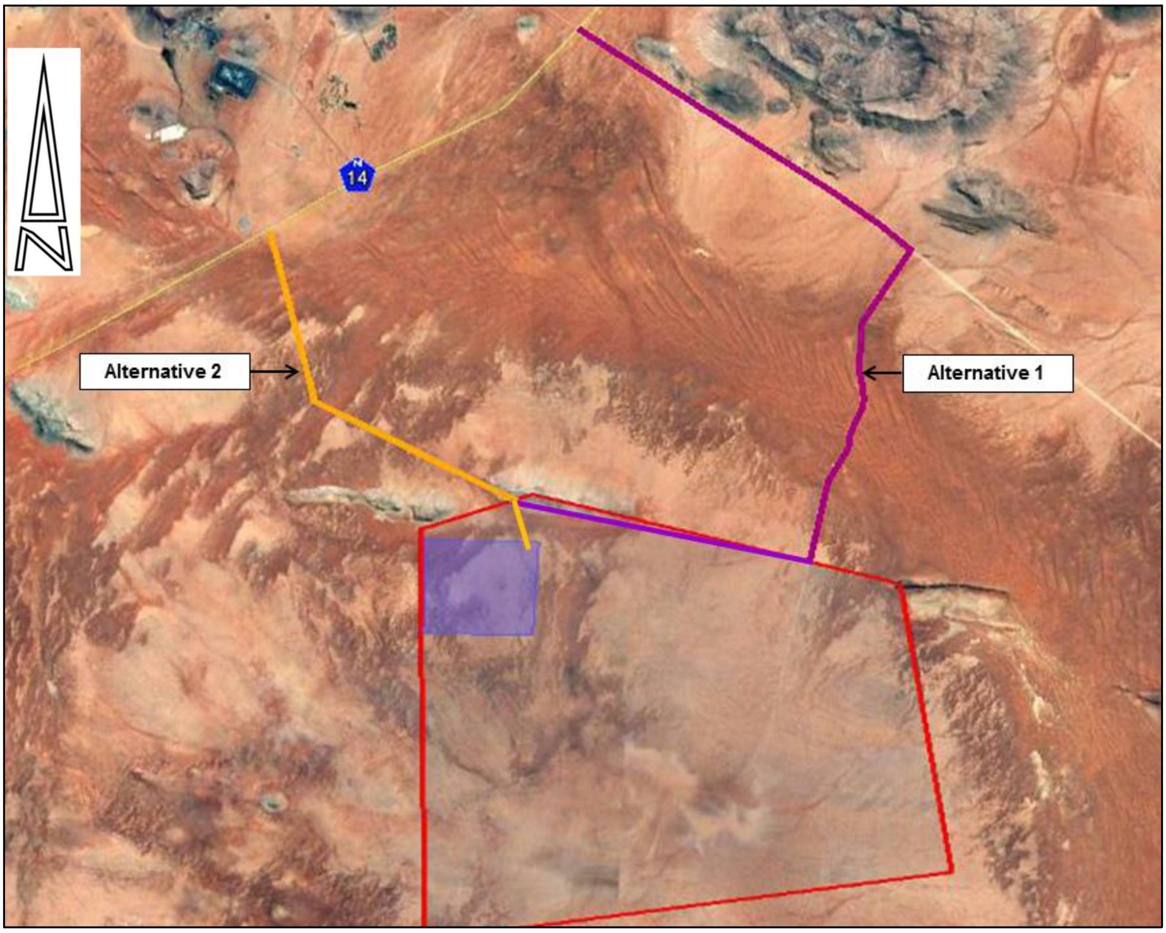

Figure 4-1 Proposed access road options

Source: GoogleMaps

CONCLUSION

- SANRAL confirmed the following in a letter dated 8 November 2016:
  - Both Letsoai and Enamandla Solar farms will make use of the existing access on the N14/1 at km 110, 2. SANRAL is not in favour of new access on the N14.
  - Approval must be obtained from the authority responsible for the proposed Lus 10 road which intersects with the N14 at km 110.2.
- Access Alternative 1 was provisionally approved by SANRAL.
- Access Alternative 2, if required, will require a separate access application with SANRAL. The application will require a detailed site survey to determine the most feasible location on the N14, an assessment of sight distances and an assessment of all road safety aspects.
- The expected traffic increase on the Lus 10 road during the construction phase may result in deterioration of the road, as it is not designed for abnormal and heavy traffic volumes. The cost of maintaining and repairing the road should be borne by the developer.

- The transport route/s of the construction materials, components and any oversized/weight components may be National, Provincial or Local roads; and approval will have to be obtained from each authority for the transportation of any oversized or abnormally heavy components. Upgrades to the vertical or horizontal alignment of the local gravel access roads may be required depending on the length and width of any abnormal vehicles. These alignment upgrades cannot be determined at this stage.
- It is recommended that an abnormal vehicle route management plan be undertaken when the port/s of entry of the components become known. This plan should will cover all aspects such as horizontal and vertical requirements, bridges along the route, speed limits, etc. These plans and the application for the abnormal permits is normally the responsibility of the logistics company that will transport the components to site.

4.2 PARKING PROVISION

The proposed on-site parking provision will be limited to the following:

- Construction phase – temporary parking for construction staff and construction deliveries.
- Operational phases – parking for operational & maintenance staff vehicles.

All parking will be accommodated on-site.

5 PUBLIC & NON-MOTORISED TRANSPORT ASSESSMENT

In terms of the National Land Transport Transition Act (NLTTA) 22 of 2000, section 29, it is a requirement that an assessment of public and non-motorised transport be included in a transport impact assessment.

Due to the remote location of the site, on private farms, public access will not be allowed or required during the construction or operational phases of the project. There is therefore no need for public transport services or non-motorised transport infrastructure, except for the transport of construction staff, refer to Section 6.3.

6 TRAFFIC FLOWS & TRIP GENERATION

6.1 EXISTING TRAFFIC FLOWS

Traffic surveys were sourced from the 2013 SANRAL yearbook. Very low traffic volumes were counted on the N14 between Pofadder and Springbok, 1312 ADT (Average Daily Traffic) with 10.5 % or 138 ADTT (Average Daily Truck Traffic). Although the counts are older than 2 years, they are not expected to have increased significantly.

6.2 LATENT TRAFFIC

Refer to Section 8: Cumulative Traffic Impact.

6.3 DEVELOPMENT TRIP GENERATION

The South African Trip Data Manual (TMH17) does not contain estimates for expected trip generation of a CSP or PV solar power facility. The following is however noted with regards to the expected trip generation during the construction and subsequent operational phase of the facility.

Note that the estimated traffic generation detailed below represents an ultimate maximum, assuming all 7 projects are approved and constructed at the same time. It is unlikely that this absolute maximum trip generation will be reached during any weekday peak period, therefore the analysis is conservative.

CONSTRUCTION PHASE TRAFFIC

The construction phase of the facility will generate the only notable vehicle volumes that requires assessment. Construction traffic will include vehicles for material and component deliveries, construction staff and all other associated personnel. Trips may include the delivery of over-sized components such as generators and transformers. The route/s between the origin of the material and components and the facility may be National, Provincial or Local roads, and each authority will be required to provide the necessary permits for the transportation of any oversized or weight components.

The construction phase traffic was estimated based on the assumptions listed per traffic type below.

CONSTRUCTION STAFF TRIP GENERATION (PER FACILITY)

- An estimated construction period of 24 months per facility, with a variable number of staff required depending on the construction phase.

- Approximately 500 workers will be on-site every day during the peak of the construction period. It should be noted that this will be for the peak only, and the numbers will normally be lower for the duration of the construction phase.
- Workers will not be accommodated on-site.
- 85% of the work force (unskilled and semi-skilled workers) will utilise public transport to site from Pofadder, Aggeneys and Pella It is unlikely that staff will travel from Kakamas or Springbok to the site, as these towns are located too far.
- Skilled personnel will travel by private car with an average occupancy of 1.5 persons.
- 80% of Public Transport will be by bus, with a 65 person per bus occupancy.
- 20% of Public Transport will be by mini-bus, with a 16 person per vehicle occupancy.
- Staff will not utilise Non-motorised transport (NMT) to site due to the excessive distances to the closest towns.
- It is assumed that the public transport vehicles will not remain on-site during the workday, therefore all these vehicles will arrive and again depart during the AM and PM peaks.

Refer to Table 6.1 for the total trip generation for total construction staff per CSP facility.

Table 6-1: Total peak hour trip generation – peak construction staff per CSP and PV facility

STAFF TYPE	TOTAL		
Unskilled/Semi-skilled staff (Maximum workers per day)	425		
Skilled staff (Maximum workers per day)	75		
Total (Maximum workers per day)	**500**		
TRIP TYPE	**TOTAL (VEH/HR)**	**IN (VEH/HR)**	**OUT (VEH/HR)**
AM Peak hour bus trips	12	6	6
AM Peak hour per mini-bus trips	12	6	6
AM Peak hour private vehicle trips	50	50	0
Total AM peak hour trips	74	62	12

CONSTRUCTION MATERIAL TRIP GENERATION (PER FACILITY TYPE)

Letsoai 1 & 2

- An estimated 10 000 heliostats are required per CSP facility.
- Each heliostat can consist of various types and numbers of mirrors. The technical specifications of a Spanish designed heliostat were used to estimate the number of vehicle trips required to transport the heliostats to site. Refer to Figure 6.1 and 6.2 for example images of these heliostats.
  - Type: Colon 70 Heliostat
  - Manufacturer: Inabensa, Instalaciones Abengoa S. A.
  - Each heliostat consists of 21 mirrors of 1.1m x 3.0 m.
  - 210,000 mirrors will be required.
  - Each heliostat installation, including metal frame, drive motors etc. weighs approximately 4,000 kg.

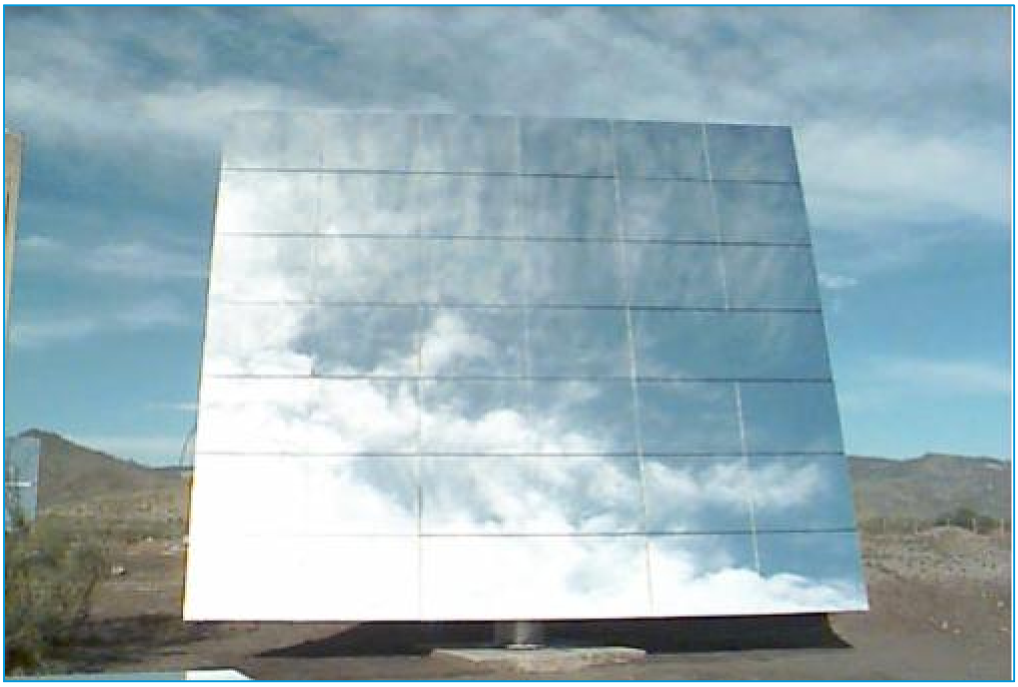

Figure 6-1 Front view of Colon 70 heliostat

Source: Sandia National Laboratories

Figure 6-2 Rear view of Colon 70 heliostat

Source: Sandia National Laboratories

- Mirrors will be manufactured locally or internationally and transported to site in standard shipping containers.
- Standard 40 foot containers of 27 tonnes capacity will be used to transport the heliostat components, except the foundations.
- Approximately 1482 fully loaded 40 foot containers will be required, at 1 container per heavy vehicle.
- If the heliostats are delivered over a period of 6 months on workdays only, approximately 12 containers will be delivered per day.
- The delivery of containers in the AM and PM peak hours will therefore be low, as trucks will arrive and depart throughout the day. Assume 2 container deliveries and departures for the peak hours.
- Heliostats: concrete foundations of 2.0m x 2.0m wide and 1.0m deep.
- Central tower: concrete, 250m height and 5.0m by 5.0m width.
- Central tower: Concrete foundation of 10m by 10m and 15m deep.
- Concrete will be batched on-site, and the aggregate and cement will be delivered in 22-ton truck loads. Refer to Table 6.2 for the total concrete requirements.
- Water will be sourced on-site.

- Deliveries will take place over a period of 12 months to stock the batching plant. Refer to Table 6.3 for the total trips require to deliver all the aggregate and cement.

Table 6-2: Bulk Construction material requirements

	Buildings, other	Heliostats (total)	Tower	Tower base	Total
Concrete (m³)	15,000	40,000	6,250	1,500	**62,750**

Table 6-3: Bulk Construction material requirements & deliveries

	Total
Concrete (m³)	**62,750**
Cement required (tonnes)	**22,904**
Sand required (tonnes)	**34,199**
Stone aggregate required (tonnes)	**68 ,600**
Cement required (truck trips)	**1,042 trips**
Sand required (truck trips)	**1,555 trips**
Stone aggregate required (truck trips)	**3,118 trips**
Total trips	**5,715 trips**
Total trips per day	**22**
Total vehicle trips per peak hour (assume 15% of daily total) In:Out trips	**4:4**

Table 6-4: Maximum Trip generation (Peak hour)

Maximum Trips per workday peak hour	Letsoai 1 (In : Out : Total)	Letsoai 2 (In : Out : Total)	Total (In : Out : Total)
Staff	62 : 12: 74	62 : 12 : 74	
Material deliveries – Heliostats & frames	2: 2 : 4	2 : 2 : 4	
Concrete (cement, sand, stone)	4 : 4 :8	4 : 4 : 8	
Total	68 : 18 : 86	68 : 18 : 86	136 : 36 : 172

Enamandla 1 to 5

- An estimated 275,000 PV panels of 2m² each are required per PV facility.
- A panel weighs approximately 25 kg, with an additional 25 kg for support frames etc.
- PV panels will be manufactured abroad and transported to site in standard shipping containers.
- Standard 40 foot containers of 27 tonnes capacity will be used to transport the PV panels and components.
- Approximately 510 fully loaded 40 foot containers will be required, at 1 container per heavy vehicle.
- If the PV panels and accessories are delivered over a period of 12 months on workdays only, approximately 2 containers will be delivered per day.
- The delivery of containers in the AM and PM peak hours will therefore be negligible, as trucks will arrive and depart throughout the day.
- PV panel foundations will be rammed earth steel piles or cast-in situ concrete. The quantities and type cannot be determined at this stage.
- An assumption was made that 10m long steel H-beam rammed piles will be used. The beams are 1,000 kg each.
- The PV panels will be installed in units consisting of 12 x 4 units each, and each unit requires 8 piles.
- A total of 5,730 PV units and 45,840 piles will be required.
- Deliveries of the piles will take place over a period of 18 months in 22 ton loads.
- A total of 2084 delivery trips will be required, which is approximately 6 trips a day.
- The delivery of the piles during the AM and PM peak hours will therefore be negligible, as trucks will arrive and depart throughout the day.

Total combined trip generation

Refer to Table 6.5 for the expected combined trip generation for all 7 facilities, assuming the absolute maximum with all facilities constructed during the same 2-year period. It is assumed that the peak construction activities and associated highest vehicle trips will not occur at the same time, however Table 6.5 shows a maximum total which is highly unlikely.

Table 6-5: Total maximum peak hour trip generation

Facility	Vehicle Trips per Peak hour		
	Staff (In : Out : Total)	**Material deliveries (In : Out : Total)**	**Total (In : Out : Total)**
Letsoai 1 (In:Out:Total)	62 : 12 : 74	6 : 6 : 12	68 : 18 : 86
Letsoai 2 (In:Out:Total)	62 : 12 : 74	6 : 6 : 12	68 : 18 : 86
Enamandla 1 (In:Out:Total)	62 : 12 : 74	Negligible	62 : 12 : 74
Enamandla 2 (In:Out:Total)	62 : 12 : 74	Negligible	62 : 12 : 74
Enamandla 3 (In:Out:Total)	62 : 12 : 74	Negligible	62 : 12 : 74
Enamandla 4 (In:Out:Total)	62 : 12 : 74	Negligible	62 : 12 : 74
Enamandla 5 (In:Out:Total)	62 : 12 : 74	Negligible	62 : 12 : 74
Total	434: 84 : 518	12 : 12 : 24	446 : 96 : 542

The potential maximum vehicle trips per hour is moderate, however given that the peak construction activities at each of the 7 sites is highly unlikely to coincide, the total number of peak hour trips are expected to be lower.

Engineers opinion: The above analysis and resultant trip generation represents an unlikely worse-case scenario. The vehicle volumes along the N14 from where all trips will distribute onto the road network is low. In conclusion, the transport impact of the facilities on the local road network is expected to be low. Also refer to Section 7.

E80 SUMMARY

The total E80 loading of the construction vehicles on the local road network was estimated for the concrete, steel and PV panel deliveries for the full construction period of all 7 facilities. The average E80 axle loading per heavy vehicle is estimated at 3.49, refer to Table 6.6. Refer to Table 6.7 for the calculation of the total E80 loading for the construction phase of the facilities.

Note that these calculations assume that all delivery and return trips occur along the same route to and from the site, and is therefore a conservative maximum. The return E80 pavement loading of the empty vehicles were not calculated, as these are negligible compared to the loaded vehicles.

Table 6-6: Average E80 loading – Construction phase

VEHICLE TYPE	% COMPOSITION OF TRIPS	E80/HV
Small	0.05	0.51
Medium	0.05	1.9
Large - Steel	1.0	4.7
Large - Concrete	98.0	3.5
Average number of E80 axles per heavy vehicle		**3.49**

Table 6-7: Total E80 loading - Construction phase

VEHICLE TYPE	FACILITY	NO. OF TRIPS (IN)
Large – Aggregate	**Letsoai 1 & 2**	5,715
Large - Heliostats		1,482
Large – Piles, etc.	**Enamandla 1 to 5**	2,084
Large - Heliostats		510
Sub-total		4,076
Average E80 loading		3.49
Total E80 loading		**14,221**

The estimated total E80 loading for the duration of the construction period is approximately 0.014 million, and no mitigating measures are deemed necessary for bulk material deliveries along the local major National or Provincial roads.

The expected traffic increase on the Lus 10 access road during the construction phase could result in deterioration of the road, as it is not designed for abnormal loads and large traffic volumes. The cost of maintaining and/or repairing the road during the Construction phase of the project should be borne by the developer.

OPERATIONAL PHASE TRAFFIC

The operational phase of the facilities will require very few permanent staff. The vehicle trips that will be generated by the personnel will be low and the associated traffic impact on the surrounding road network will therefore be negligible.

DECOMMISSIONING PHASE TRAFFIC

Following the initial 20-year operational period of the facilities, its continued economic viability will be investigated. If it is still deemed viable its life may be extended; if not it will be decommissioned. If it is completely decommissioned, all the components will be disassembled, reused and recycled or disposed of. The site will be returned to its current use i.e. agriculture (grazing).

It is not possible to determine the volume of traffic that will be generated during the decommissioning phase. It can however be expected that the volumes will be lower than during the construction phase, and the resultant traffic impact on the Lus 10 gravel road will be lower than during the Construction phase. Any damage to the road caused by the decommissioning phase traffic should be repaired at the cost of the developer.

6.4 CAPACITY ANALYSIS

A capacity analysis of the access intersection of the Lus 10 Road with the N14 was not undertaken, and is not deemed necessary for a development with such low daily and peak hour traffic generation. However, the safety of the intersection may be compromised due to the increase in especially heavy vehicle volumes along the routes. The current traffic volumes along the N14 and the expected low construction traffic volumes does not justify the construction of additional turning lanes. However, the following recommendations are made to improve the safety of the intersection.

N14/LUS10 ROAD INTERSECTION

Provide additional warning signs as follows:

- Side road junction warning sign (W108) on the southern approach of the N14, located approximately 100 m from the intersection.
- Provide a temporary truck crossing warning sign (TW345) on the same road sign pole as the W108 sign.
- Side road junction warning sign (W107) on the northern approach of the N14, located approximately 100 m from the intersection.
- Provide a temporary truck crossing warning sign (TW344) on the same road sign pole as the W110 sign.

7 TRANSPORT IMPACT ASSESSMENT

7.1 IMPACT ASSESSMENT METHODOLOGY

INTRODUCTION

The EIA, of which this TIA is an informant, uses a methodological framework developed by WSP | Parsons Brinckerhoff to meet the combined requirements of international best practice and NEMA, Environmental Impact Assessment Regulations, 2014 (GN No. 982) (the "EIA Regulations").

As required by the EIA Regulations (2014), the determination and assessment of impacts will be based on the following criteria:

- Nature of the Impact
- Significance of the Impact
- Consequence of the Impact
- Extent of the impact
- Duration of the Impact
- Probability if the impact
- Degree to which the impact:
  - can be reversed;
  - may cause irreplaceable loss of resources; and
  - can be avoided, managed or mitigated.

Following international best practice, additional criteria have been included to determine the significant effects. These include the consideration of the following:

- Magnitude: to what extent environmental resources are going to be affected;
- Sensitivity of the resource or receptor (rated as high, medium and low) by considering the importance of the receiving environment (international, national, regional, district and local), rarity of the receiving environment, benefits or services provided by the environmental resources and perception of the resource or receptor); and
- Severity of the impact, measured by the importance of the consequences of change (high, medium, low, negligible) by considering inter alia magnitude, duration, intensity, likelihood, frequency and reversibility of the change.

It should be noted that the definitions given are for guidance only, and not all the definitions will apply to all of the environmental receptors and resources being assessed. Impact significance was assessed with and without mitigation measures in place.

METHODOLOGY

Impacts are assessed in terms of the following criteria:

- The **nature**, a description of what causes the effect, what will be affected and how it will be affected

Table 7-1: Nature of Impact

NATURE OR TYPE OF IMPACT	DÉFINITION
Beneficial / Positive	An impact that is considered to represent an improvement on the baseline or introduces a positive change.
Adverse / Negative	An impact that is considered to represent an adverse change from the baseline, or introduces a new undesirable factor.
Direct	Impacts that arise directly from activities that form an integral part of the Project (e.g. new infrastructure).
Indirect	Impacts that arise indirectly from activities not explicitly forming part of the Project (e.g. noise changes due to changes in road or rail traffic resulting from the operation of Project).
Secondary	Secondary or induced impacts caused by a change in the Project environment (e.g. employment opportunities created by the supply chain requirements).
Cumulative	Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.

à The physical **extent**, wherein it is indicated whether:

Table 7-2: Extent of Impact

SCORE	DESCRIPTION
1	the impact will be limited to the site;
2	the impact will be limited to the local area;
3	the impact will be limited to the region;
4	the impact will be national; or
5	the impact will be international;

à The **duration**, wherein it is indicated whether the lifetime of the impact will be:

Table 7-3: Duration of Impact

SCORE	DESCRIPTION
1	of a very short duration (0 to 1 years)
2	of a short duration (2 to 5 years)
3	medium term (5–15 years)
4	long term (> 15 years)
5	permanent

- à The **magnitude of impact on ecological processes**, quantified on a scale from 0-10, where a score is assigned:

Table 7-4: Magnitude of Impact

SCORE	DESCRIPTION
0	small and will have no effect on the environment.
2	minor and will not result in an impact on processes.
4	low and will cause a slight impact on processes.
6	moderate and will result in processes continuing but in a modified way.
8	high (processes are altered to the extent that they temporarily cease).
10	very high and results in complete destruction of patterns and permanent cessation of processes.

- à The **probability of occurrence**, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale where:

Table 7-5: Probability of Impact

SCORE	DESCRIPTION
1	very improbable (probably will not happen.
2	improbable (some possibility, but low likelihood).
3	probable (distinct possibility).
4	highly probable (most likely).
5	definite (impact will occur regardless of any prevention measures).

- à the **significance**, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high;

- the **status**, which is described as either positive, negative or neutral;
- the degree to which the impact can be reversed;
- the degree to which the impact may cause irreplaceable loss of resources; and
- the *degree* to which the impact can be mitigated.

The **significance** is determined by combining the criteria in the following formula:

$$S = (E+D+M)*P$$

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

The **significance weightings** for each potential impact are as follows:

Table 7-6: Significance weightings per Impact

OVERALL SCORE	SIGNIFICANCE RATING	DESCRIPTION
< 30 points	**Low**	where this impact would not have a direct influence on the decision to develop in the area
31-60 points	**Medium**	where the impact could influence the decision to develop in the area unless it is effectively mitigated
> 60 points	**High**	where the impact must have an influence on the decision process to develop in the area

The impact significance without mitigation measures will be assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the Project's actual extent of impact, and are included to facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures, and is thus the final level of impact associated with the development of the Project. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in this EIA Report.

7.2 TRANSPORT IMPACT ASSESSMENT PER FACILITY

Refer to a Table 7.7 for the Construction Phase impact assessments per facility. Note that the impacts are expected to be similar for each site during the construction phase when the peak vehicle trip generation is expected.

The Operational and Decommissioning phases were not assessed, as the trip generation during these phases will either be negligible or very low.

Table 7-7: Impact assessment per facility - Construction phase

Potential Impact		Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	Significance (S=(E+D+M)*P)	
Noise, dust & exhaust pollution due to vehicle trips on-site	Nature of impact:	Vehicle and tyre noise, dust, exhaust pollution					
	Without Mitigation	2	2	2	4	24	Low
	degree to which impact can be reversed:	Temporary impact, no long term effect					
	degree of impact on irreplaceable resources:	N/a					
	Mitigation Measures	None					
	With Mitigation						
Noise and exhaust pollution due to additional vehicle trips on Lus 10 Road	Nature of impact:	Vehicle and tyre noise, exhaust pollution					
	Without Mitigation	2	2	4	4	32	Medium
	degree to which impact can be reversed:	Temporary impact, no long term effect					
	degree of impact on irreplaceable resources:	N/a					
	Mitigation Measures	None					
	With Mitigation						
Noise and exhaust pollution due to additional vehicle trips on N14	Nature of impact:	Vehicle and tyre noise, exhaust pollution					
	Without Mitigation	2	2	2	4	24	Low
	degree to which impact can be reversed:	Temporary impact, no long term effect					
	degree of impact on irreplaceable resources:	N/a					
	Mitigation Measures	None					
	With Mitigation						

7.3 SUMMARY

The overall significance of each impact during the Construction Phase of the facilities, as detailed in Table 7.7, is Low or Medium. The impacts are limited to the peak construction period only, local in nature, and minor and will not result in an impact on processes or low and will cause a slight impact on processes.

Mitigating measures are therefore not recommended for the expected trip generation of the facilities.

8 CUMULATIVE TRANSPORT IMPACT ASSESSMENT

8.1 BACKGROUND

The DEA requested that a cumulative transport impact assessment be undertaken of the latent power facilities in the vicinity of the Enamandla and Letsoai facilities.

8.2 LATENT DEVELOPMENTS

The known developments that may have a cumulative impact on the surrounding road network are shown Figure 8.1.

Refer to Table 8.1 for the facilities that were assessed in terms of their potential cumulative transport impact on the road network. This was assessed in combination with the impact of Letsoai and Enamandla facilities. The facilities listed below will also take access off the N14 via the Lus 10 Road during their construction and operational phases. Latent development that will take direct access off the N14 were not assessed, as these will have no cumulative transport impact on the Lus 10 road, for example the proposed Biotherm Aggeneys 40MW Solar PV plant.

Table 8-1 Latent developments in the study area

ID	DEA number	Name	Type	Access to major road network
8	14/12/16/3/3/2/550	Namies Wind Farm	Wind Energy	Option 1: N14 via Lus 10 gravel road Option 2: Unnamed gravel road from Pofadder Option 3: “Pofadder Road” from Lus 10 gravel road towards Namies farmstead
11	14/12/16/3/3/2/680	Khai-Ma Wind	Wind Energy	Alt 1: N14 via Namies Suid North Road and new internal access road Alt 2: N14 via Poortjies South road and new access road Note: The EIA does not state a preferred access road alternative, however the developer prefers Alternative 2
12	14/12/16/3/3/2/683	Korana Solar	PV Facility	N14 via Namies South-North Road and new access road

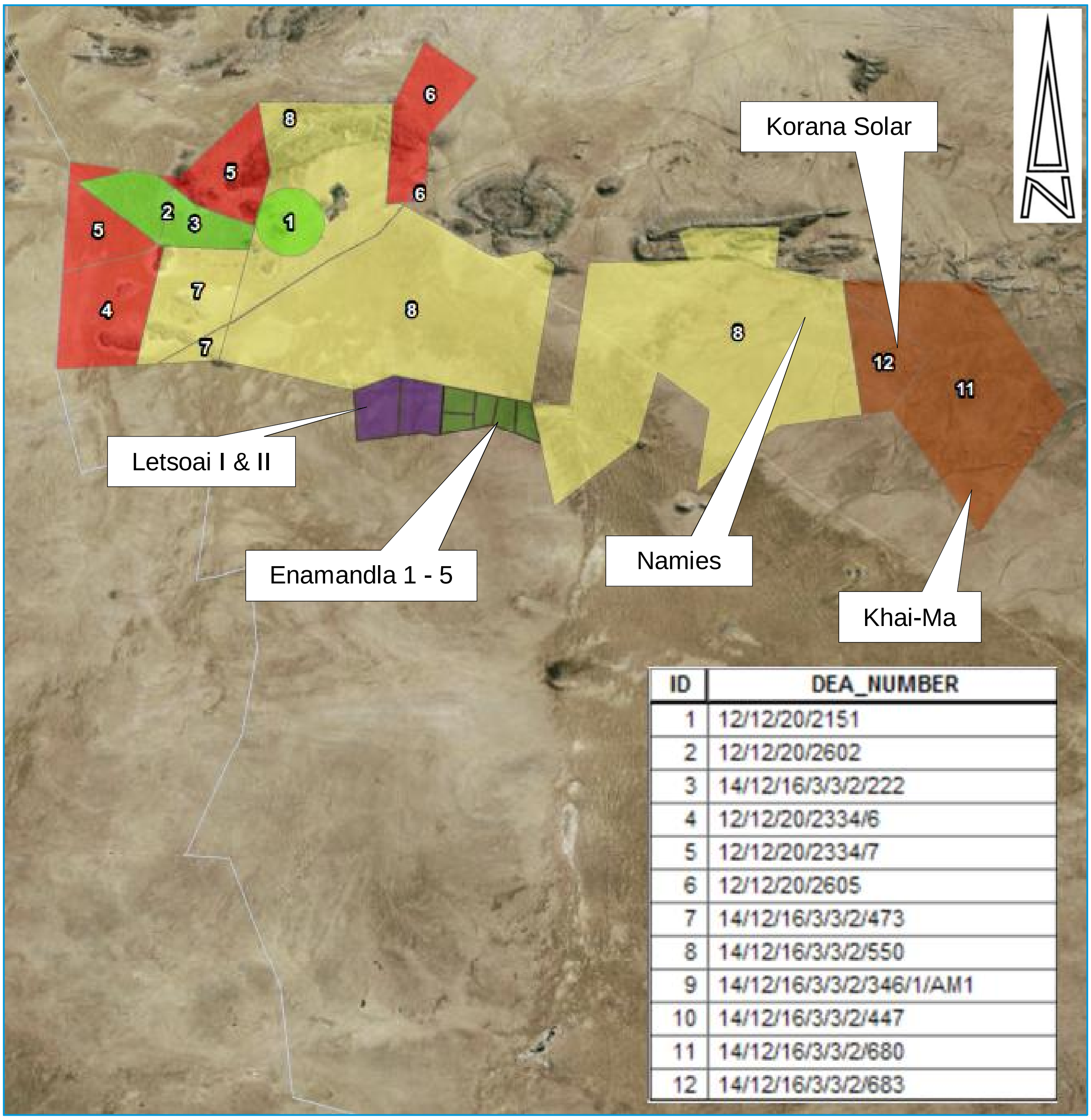

Figure 8-1 Latent Power Facilities

Source: WSP

8.3 CUMULATIVE TRANSPORT IMPACTS

Refer to Table 8.2 for the expected cumulative transport impacts on the local road network due to the latent facilities in the study area.

Table 8-2 Summary of transport impacts of the latent developments

DEA number	Facility	Traffic Impact	Cumulative Traffic Impact
14/12/16/3 /3/2/550	Namies Wind	The EIR does not state the expected number of vehicle trips due to the facility. An abnormal route assessment was undertaken and the preferred route identified is from the Port of Saldanha via the R358.	The maximum traffic generation of each site occurs at an unknown future time period that cannot be determined from the information available. It is unlikely that these impacts will occur at the same time, therefore no cumulative impact is foreseen.
14/12/16/3 /3/2/680	Khai-Ma Wind	The EIR does not state the expected number of vehicle trips due to the facility. The EIA states that noise level due to construction traffic will be monitored as stipulated by SANS 10210:2004.	
14/12/16/3 /3/2/683	Korona Solar	The EIR does not state the expected number of vehicle trips due to the facility, however it recommends that the Old Springbok Road be maintained at the cost of the developer.	

8.4 SUMMARY

The maximum traffic generation of each site occurs at an unknown future time period that cannot be determined from the information available.

It is unlikely that these impacts will occur at the same time, therefore no cumulative transport impact is foreseen.

It should be noted that the Significance of the transport impact of each of these facilities is expected to be similar to the Letsoai and Enamandla facilities, namely Low or Medium.

9 CONCLUSIONS & RECOMMENDATIONS

Based on this study, the following key conclusions and recommendations are relevant:

- The proposed Letsoai Solar CSP and Enamandla Solar PV Facilities will be located near Aggeneys in the Northern Cape Province.
- The facilities will be located over the Remaining Extent of the Farm Hartebeestvlei 86, located in the Khai-Ma Municipality, Division of Namaqualand, in the Northern Cape Province. The extent of the facilities will be approximately 13,214 ha.
- Letsoai will be 2 x 150MW CSP Facilities, and Enamandla will be 5 x 75MW PV Facilities.
- The Scope of the TIA was informed by the Committee of Transport Officials' South African Traffic Impact and Site Traffic Assessment Manual, TMH16, Vol. 1, Version 1, August 2012.
- A single short term (2 year) implementation was assumed for analysis purposes.
- There are no known planned road upgrades in the study area.
- There are no known large scale latent developments in the vicinity of the site that may have an impact on the local road network.
- There are 2 site access alternatives off the N14, and the N14 is a single carriageway 2-way surfaced road (1 lane per direction) with narrow surfaced shoulders at both access alternatives:
  - Alternative 1 is a new route via the Lus 10 gravel road with an existing intersection with the N14.
  - Alternative 2 is a new road with a new direct access off the N14. The exact site access location for Alternative 2 has not been determined.
- SANRAL has confirmed that access Alternative 1 will be permissible
- A separate access application will be required by SANRAL for the Alternative 2 access.
- Construction and operational phase parking will be accommodated on-site.
- There is no need for public transport services or non-motorised transport infrastructure to serve the site for the construction and operational phase.
- The likely trip generation of the construction phase of each of the facilities are estimated as follows (AM weekday peak):
  - Letsoai 1 & 2 (each): 68 veh/hr (In), 18 veh/hr (Out), 86 veh/hr (Total)
  - Enamandla 1 – 5 (each): 62 veh/hr (In), 12 veh/hr (Out), 74 veh/hr (Total)
  - Total combined: 446 veh/hr (In), 96 veh/hr (Out), 542 veh/hr (Total)
- The total number of peak hour vehicle trips are moderate, and would normally require capacity analysis of the adjacent intersections. However, it is highly unlikely that the maximum vehicle trips will be generated seeing as the expected combined trip generation

for all 7 facilities listed above is the absolute maximum with all facilities constructed during the same 2-year period and peak construction activities on each site taking place during the same period. It is unlikely that the peak construction activities of all 7 facilities and associated highest vehicle trips will occur at the same time.

- The vehicle volumes on the N14 are low, and the Lus 10 access is an approved low volume access intersection. The upgrade of the intersection is therefore not regarded as a requirement for the estimated traffic generation of the facilities, and the temporary duration of this increased volume during the construction phase only.

- A capacity analysis of the access intersection of the Lus 10 Road with the N14 was not undertaken, and is not deemed necessary for a development with such low daily and peak hour traffic generation. However, the safety of the intersection may be compromised due to the increase in especially heavy vehicle volumes along the routes. The current traffic volumes along the N14 and the expected low construction traffic volumes does not justify the construction of additional turning lanes. However, the following recommendations are made to improve the safety of the intersection:

- Provide additional warning signs as follows:

  - Side road junction warning sign (W108) on the southern approach of the N14, located approximately 100 m from the intersection.
  - Provide a temporary truck crossing warning sign (TW345) on the same road sign pole as the W108 sign.
  - Side road junction warning sign (W107) on the northern approach of the N14, located approximately 100 m from the intersection.
  - Provide a temporary truck crossing warning sign (TW344) on the same road sign pole as the W110 sign.

- The estimated total E80 loading for the duration of the construction period is 0.014 million, and no mitigating measures are deemed necessary on the Lus 10 Road or the N14. However, the expected traffic increase on the Lus 10 gravel road during the construction phase may result in deterioration of the road, as it is not designed for abnormal and heavy traffic volumes. The cost of maintaining and repairing this road during the Construction phase of any number of the 7 facilities should be borne by the developer.

- It is not possible to determine the volume of traffic that will be generated during the decommissioning phase. It can however be expected that the volumes will be lower than during the construction phase, and the resultant transport impact on the Lus 10 gravel road will be lower than during the Construction phase. Any damage to the road caused by the decommissioning phase traffic should be repaired at the cost of the developer.

- The transport route/s of the construction materials, components and any oversized/weight components may be National, Provincial or Local roads; and approval will have to be obtained from each authority for the transportation of any oversized or abnormally heavy components. Upgrades to the vertical or horizontal alignment of the local gravel access roads may be required depending on the length and width of any abnormal vehicles. These alignment upgrades cannot be determined at this stage as the specific abnormal loads, if any, are unknown.

- It is recommended that an abnormal vehicle route management plan be undertaken when the port/s of entry of the components become known. This plan should will cover all aspects such as horizontal and vertical requirements, bridges along the route, speed limits, etc. These plans and the application for the abnormal permits is normally the responsibility of the logistics company that will transport the components to site.

- The overall significance of each traffic related impact during the Construction Phase of the facilities are Low or Medium. The impacts are limited to the peak construction period only, local in nature, and minor and will not result in an impact on processes or low and will cause a slight impact on processes. Mitigating measures are therefore not recommended for the expected trip generation of the facilities.
- Cumulative impact assessment: The maximum traffic generation of the latent sites may occur at an unknown future time period that cannot be determined from the information available. The implementation programme of these sites has also not been determined. It is unlikely that these impacts will occur at the same time, therefore no cumulative transport impact is foreseen. It should be noted that the Significance of the transport impact of each of these facilities is expected to be similar to the Letsoai and Enamandla facilities, namely Low or Medium. Note that the maintenance and repair of the Lus 10 gravel road due to damage by construction vehicles is stated as the responsibility of each of the developers of the latent energy facilities that will take access via the route.

It is concluded that the proposed Letsoai Solar CSP and Enamandla Solar PV Facilities will have a negligible short-term transport impact on the adjacent road network, and it is recommended that the TIA should be accepted as part of the EIA application.

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- Final Environmental Impact Assessment Report, Proposed Korana Solar Energy Facility near Pofadder, Northern Cape Province, Savannah Environmental (Pty) Ltd, February 2015.
- Final Environmental Impact Assessment Report, Proposed Khai-Ma Wind Energy Facility near Pofadder, Northern Cape Province, Savannah Environmental (Pty) Ltd, February 2015.

Appendix A

PEER REVIEW

Ref: P0009/WSP Wind Farm TIA Review

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For the attention of Mr Christo Bredenhann

Dear Sir

INDEPENDENT PEER REVIEW
LETSOAI & ENAMANDLA SOLAR POWER FACILITIES TRAFFIC IMPACT ASSESSMENT

I hereby confirm that I have undertaken a comprehensive review of the above-mentioned Traffic Impact Assessment (TIA) (*Ver 1.2, Project no. 21102, dated November 2016*) as per the following terms of reference:

- Is the methodology clearly explained and acceptable;
- Evaluate the validity of the findings (review data evidence);
- Discuss the suitability of the mitigation measures and recommendations;
- Identify any short comings and mitigation measures to address the short comings;
- Evaluate the appropriateness of the reference literature;
- Indicate whether a site-inspection was carried out as part of the peer review; and
- Indicate whether the article is well-written and easy to understand.

Please note that this is a desk-top review and no site-inspection was made as part of this review. In addition, please note that this review was undertaken with limited understanding of the project and its context, other than what was written in the supplied TIA document.

My comments are as follows:

- P. 17 – The heavy / abnormal vehicle route is mentioned and it is stated that special permits will be required. You should probably go one step further and recommend that a separate heavy/abnormal vehicle route management plan will be required which assesses the route from the closest port to the site, checks that there are no bridges or obstructions along the route, determines hours of operation and speeds; and determines road widening / upgrades required etc.
- P. 23 – E80 Summary – Why has a summary of the E80 loads not been undertaken in this TIA?
- P. 24 – Capacity Analysis. I agree that from a traffic capacity analysis perspective, no upgrades are required, however I am not so sure from a safety perspective. Upgrades of intersections in rural areas are mostly dictated by safety issues that arise due to large speed differentials. I assume The N14 has a speed limit of 100 or 120 km/h. With an AADT of 1312, this development

will significantly increase this number during the construction phase, most of which will be heavy / abnormal vehicles. So, a heavy vehicle stopping to turn right off the N14 onto an unsurfaced road, could potentially have a vehicle travelling at 120 km/h coming up behind it. Under these circumstances, I think you may find that the National Authorities would want these intersections upgraded to include a separate through-right or right-turn lane for safety reasons.

- P. 30 Section 7.2: As discussed above, I think that the potential impact on traffic safety will be an issue. Road accidents and deaths on high speed rural roads is a major issue these days. I suggest you add this as a factor and propose the mitigation discussed in the point above.
- Is the possible deterioration and damage to the unsurfaced access road and/or the construction of a new unsurfaced road an impact that should be considered here? (it is mentioned earlier in the report) I am sure the mitigation will be that they will have to regrade this road on a regular basis to keep it in acceptable condition, but a road materials engineer should probably be consulted. I am not sure if the construction of a new 18.4 km unsurfaced road is an impact that should also be considered?
- P. 34 Cumulative Impact – I agree that there is not much you can assess here if you do not have any information, but there is a possibility that even more heavy vehicles will be using the N14/Lus10 intersection, which makes the proposed intersection upgrades even more important.
- If an extreme accumulated worst-case scenario is required to be tested, then you could undertake a “what if” analysis assuming that at least one other development coincides with this one.

Please do not hesitate to contact me should you wish to discuss any of the above comments.

Yours faithfully
for UrbanEQ Consulting Engineers (Pty) Ltd

ANDREW BULMAN PrEng
Director