

## **13. NOISE IMPACT ASSESSMENT**

### **13.1. Introduction**

#### **13.1.1. General**

Eskom is planning the construction of a 100 MW concentrating solar power (CSP) plant in the Upington area in the Northern Cape Province. Bohlweki Environmental (Pty) Ltd is undertaking the environmental impact assessment (EIA). As part of the EIA, a noise impact assessment has been undertaken by Jongens Keet Associates (JKA). This report documents the findings of the EIA Phase of the investigation. Three candidate sites were evaluated in the first phase of the environmental investigation. The site near Upington was selected as the most favourable and this site is the subject of this study.

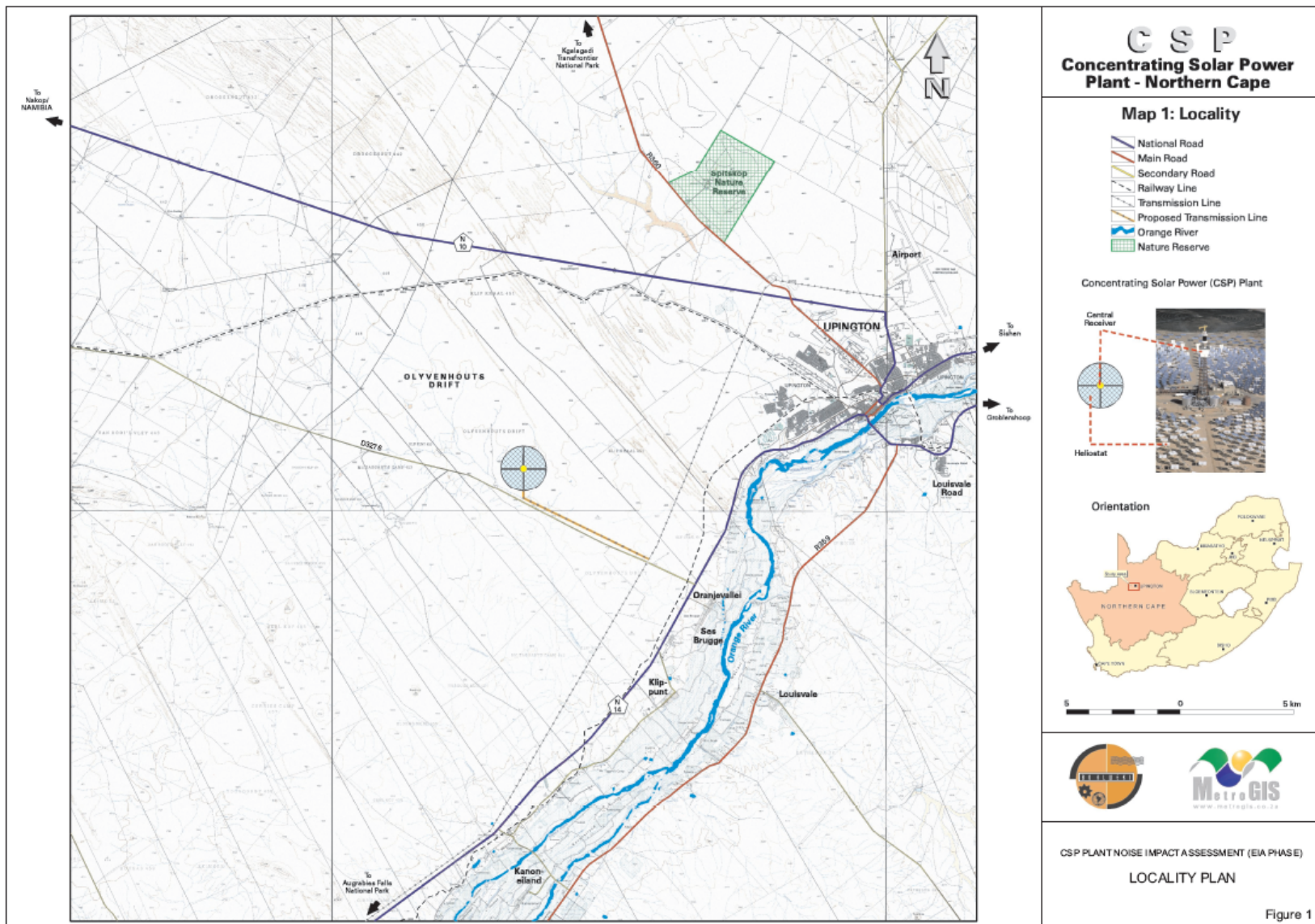
#### **13.1.2. Terms of Reference**

The terms of reference (TOR) are as follows:

- A sufficiently detailed quantitative (by measurement) and qualitative assessment was to be undertaken within the area of influence of the proposed CSP Plant in order to enable a full appreciation of the nature, magnitude, extent and implications of the potential noise impact.
- The level of investigation was to be sufficiently detailed to enable the environmental authority to make an informed decision on the matter.
- All aspects of investigation were to conform to the requirements of relevant environmental legislation and noise standards.
- The potential impacts of the pre-construction, construction and operational phases of the project were to be assessed.
- Where relevant, appropriate noise mitigating measures were to be identified. These needed only to be conceptual at this stage.

#### **13.1.3. Location and Extent of the Study Area**

The site being investigated for the construction of the proposed CSP Plant is on the farm Olyvenhouts Drift which is situated about 10 km west of Upington. Refer to Figure 13.1. The core study area was that within the area of influence of the noise generated by the operations at the respective CSP Plant and appurtenant works. An area within 10 km of the Development site has been evaluated. Where necessary however, a wider area of influence has been considered.



**Figure 13.1:** Locality Map showing the proposed location of the CSP Plant

### **13.2. Details of the Planned CSP Plant**

The planned CSP Plant will have an electricity generating capacity of 100MW. The plant will comprise an array of heliostats (mirrors), which will focus the sun's rays onto central receiving plant where a liquid salt which is pumped through the system is heated to 565°C. This heated salt medium is then circulated to a steam (water system) generator. The steam is then used to drive the generators in a conventional electrical power generation station (EPGS). The power station will operate on a dry cooling system. The whole installation will comprise:

- An array of 6000 heliostats.
- A central receiving plant mounted on a 190 m high tower.
- A cold salt storage tank.
- A hot salt storage tank.
- A cold salt heating plant (for preliminary heating to 285°C in order to liquidise the salt for pumping to the central receiving plant).
- Salt pumps.
- A steam generation plant.
- EPGS inclusive of a dry cooling system.
- Electrical sub station.

The extent of the Plant property will be of the order of 2000 metres by 2000 metres.

At present it is proposed to source the Upington Local Authority in order to supply the CSP Plant with water (for steam generation and washing of mirrors). A primary water purification plant and a reservoir will be required on site. It should be noted that water is to be sourced from the local authority, therefore, a water pump station will not be required to be constructed at the Orange River. Therefore, the noise impact of a pump station has not been considered in this investigation.

Based on the solar insolation characteristics of the Upington area, the power station will be able to operate on average for up to 10 hours during the day (08h00 to 18h00) in the summer.

### **13.3. Methodology**

The general procedure used to determine the noise impact was guided by the requirements of the Code of Practice SANS 10328:2003: *Methods for Environmental Noise Impact Assessments*. The level of investigation was the equivalent of an EIA. A comprehensive assessment of all noise impact descriptors (standards) has been undertaken. The noise impact criteria used specifically take into account those as specified in the South African National Standard SANS 10103:2003, *The Measurement and Rating of Environmental Noise with Respect to Land Use, Health, Annoyance and Speech Communication* as well as those in the National Noise Control Regulations. The investigation comprised the following:

- Determination of the existing situation (prior to the planned Development).
- Determination of the situation during and after development.
- Assessment of the change in noise climate and impact.
- Comparison of alternative sites.
- Identification of mitigating measures.

### **13.3.1. Determination of the Existing Conditions**

This phase comprised the following:

- The relevant technical details of the planned CSP Plant, the existing traffic patterns and the existing and planned land use in the study area were reviewed in order to establish a comprehensive understanding of all aspects of the project that will influence the future noise climate in the three respective study areas.
- Using these data, the limits of the study area for each alternative development site were determined and the potential noise sensitive areas, other major noise sources and potential problems in these areas were identified.
- Applicable noise standards were established. The National Noise Control Regulations, and the SANS 10103:2004 standards were applied.
- The existing *noise climate* of the study area was determined by means of a field inspection and a noise measurement survey. The measurement survey appropriately covered the whole extent of the study area, focussing specifically on the identified noise sensitive/problem areas. Measurements were taken at 6 main monitoring sites. The daytime conditions were measured at all sites. Night-time conditions were only measured at a few locations. The sound pressure level (SPL) (noise) measurements were taken in accordance with the requirements of the Code of Practice SANS 10103:2004, *The Measurement and Rating of Environmental Noise with Respect to Land Use, Health, Annoyance and to Speech Communication*. Type 1 Integrating Sound Level meters were used for the noise measurements. All measurements were taken under dry weather and normal traffic (that is mid-week/school term) conditions.
- On the general field inspection and at the same time as each individual measurement was being taken, the qualitative nature of the *noise climate* in the area of the measurement site was assessed and recorded. This comprised an appraisal of the general prevailing acoustic conditions based on the subjective response to the sounds as perceived by the listener (i.e. *auditory observation* by the surveyor), as well as identifying those noise incidents, which influenced the noise meter readings during that measurement period. This procedure is essential in order to ensure that there is a *human* correlation between the noise as perceived by the human ear and that, which is measured by the meter, as well as to establish any anomalies in the general ambient noise conditions.
- The existing noise climates along the main roads as related to the current traffic volumes and patterns were established. These traffic noise levels were calculated using the South African National Standard SANS 10210 (SABS 0210) *Calculating and*

*Predicting Road Traffic Noise* for Route. The latest traffic was used as the baseline reference. The calculated 24-hour period noise indicators, as well as those for the daytime period and night-time period provided the main data for the impact assessment. The measured data provided a field check of the acoustic conditions.

### **13.3.2. Assessment of Planning/Design Phase and Construction Phase Impacts**

Aspects of the pre-design field surveys and construction activities that potentially will have a noise impact were identified and, where appropriate, mitigating measures have been recommended.

### **13.3.3. Assessment of Operational Phase Impacts**

The main focus of the operational phase assessment was to establish the nature, magnitude and extent of the potential change in *noise climate* in the study area directly related to and within the area of influence of the Development site. This was done as follows:

- The likely noise that will be generated by the CSP Plant operations was established and this was used to determine the potential footprint of noise impact.
- Specific noise impact conditions in the area were determined.
- Based on the findings, appropriate noise mitigating measures (site scale) have been investigated and recommendations made. These are conceptual and not detailed to final design level.

## **13.4. Details of the Study Area**

Only the details relevant to the noise impact assessment are given.

### **13.4.1. Topography**

The main topographical feature in the area is the Orange River, which flows in a north-east to south-west direction through the study area. The river is the southern boundary of the farm Olyvenhouts Drift. The terrain across the farm and in the surrounding areas is relatively flat. The land falls gently towards the Orange River.

### **13.4.2. Land Use**

The area to the west of Upington is predominantly agricultural. The main farming endeavour is saltana grapes. The vineyards are planted along both banks of the Orange River and are generally contained to an area close to the river (1 000 m to 2 000 m). Other significant land uses in the area are:

- Residential.
  - \* The town of Upington is located approximately 7 km east of the eastern boundary of the farm Olyvenhouts Drift.
  - \* The urban settlements (townships) of Oranjevallei, Ses Brugge, Klippunt (North) and Klippunt (South), which are located on the western bank of the Orange River on the farm Olyvenhouts Drift.
  - \* Numerous farmhouses and farm labourer houses on the western and eastern banks of the Orange River. These are residences related mainly to the saltana grape farms.
- Educational. There are a number of schools in the western sector of Upington and one school in Oranjevallei.
- Recreation. There is a golf course and recreation centre on the western boundary of Upington.
- Industrial. The industrial area of Upington is located in the northern sector of the town.

The residential, educational and recreational land uses are considered to be noise sensitive sites.

#### **13.4.3. Roads**

There are a number of major roads and secondary roads servicing the area:

- National Road N14, which links Upington and Keimos, is aligned in a north-south direction through the study area passing through the south-eastern portion of the farm Olyvenhouts Drift. The road essentially follows the course of the Orange River along its western/northern bank. It lies 9 000 m to the south-east of the development site for the CSP Plant.
- National Road N10, which links Upington to Ariamsvlei in Namibia, is aligned in an east-west direction through the study area, passing 9 500 m to the north of the development site for the CSP Plant (1,5 km to the north of the northern boundary of the farm Olyvenhouts Drift).
- Road 359 which links Upington to Louisvale and Kanoneiland is aligned along the eastern/southern bank of the Orange River.
- Road D3276, which links from National Road N14 to Lutzputs is aligned in a south-east to northwest direction through the central portion of the farm Olyvenhouts Drift. The planned development site lies just to the north of the road which will be the main access route from National Road N14 to the site.

#### **13.4.4.      *Railway Lines***

Two railway lines pass through the study area:

- The Upington-Keetmanshoop (Namibia) line is aligned through the northern portion of the farm Olyvenhouts Drift.
- The Upington-Keimos line is aligned through the southern portion of the farm Olyvenhouts Drift.

#### **13.4.5.      *Factors of Acoustical Significance***

The relatively flat topographical features in the study area provide little acoustic shielding between the possible development sites and the adjacent noise sensitive areas. Noise will tend to be channelled along the shallow drainage valleys in the area.

The main meteorological aspect that will affect the transmission (propagation) of the noise is the wind. The wind can result in periodic enhancement downwind or reduction upwind of noise levels. Analysis of the wind records for the area indicates that the main prevailing winds blow from the northeast (48% of the time) and the northwest (21%). Approximately 6,7% *still* periods are experienced annually.

### **13.5. Findings and Assessment of Impact**

#### **13.5.1.      *Noise Sources***

The main noise sources presently affecting the study area and the additional sources that will affect the area once the CSP Plant is commissioned are:

- Road traffic. Mainly from the traffic on National Road N14 and National Road N10, but also the secondary roads such as Road 359.
- Railway traffic on the lines through the north and south sectors of the farm.
- Factories in the northern sector of Upington.
- Planned CSP Plant.

#### **13.5.2.      *Noise Sensitive Areas/Sites***

The noise sensitive areas/sites in the study area that are potentially affected by the development of the CSP Plant on this site are the urban areas, settlements and farm residences, schools and recreational areas listed in Section 13.4.2. There are no noise sensitive areas/sites within an 8 000 m radius of the planned development site.

### **13.5.3.      *The Residual (Existing) Noise Climate***

The determination of the residual (existing) noise climate in the study area is based on the measurements and observations made in the area, and where relevant also from the calculation of the noise from the traffic on the main roads. For details of the noise measurement survey and assessment of the residual noise climate refer to Appendix I.

The areas on the farm Olyvenhouts Drift that are remote from the main roads and other farms along the banks of the Orange River are extremely quiet, and are typical of a rural/agricultural noise environment. The noise levels on the western perimeter of Upington and at the settlements on Olyvenhouts Drift between the Orange River and National Road N14 (namely Oranjevallei, Ses Brugge and Klippunt) are typical of urban residential areas. The noise climate in areas adjacent to National Road N14 and National Road N10 are significantly degraded. There is a noise nuisance factor in areas close to the railway lines when trains pass.

### **13.5.4.      *The Predicted Noise Climate (Pre-construction Phase)***

Activities during the planning and design phase that normally have possible noise impact implications are those related to field surveys (such seismic testing and geological test borehole drilling for large building foundations). As these activities are usually of short duration and take place during the day, they are unlikely to cause any noise disturbance or nuisance in adjacent areas.

### **13.5.5.      *The Predicted Noise Climate (Construction Phase)***

This Section summarises the more detailed analysis, which is documented in Appendix J.

Construction will likely be carried out during the daytime only (07h00 to 18h00 or 20h00). It should however be noted that certain activities may occasionally extend into the late evening period, while others such as de-watering operations may need to take place over a 24-hour period. It is estimated that the development of the project will take place over a period of 3 to 4 years. A large construction camp will need to be established. Details of the anticipated main sources of construction noise and the noise levels generated are given in Table J1a and Table J1b in Appendix J.

The nature of the noise impact from the construction sites is likely to be as follows:

- Source noise levels from many of the construction activities will be high. Noise levels from all work areas will vary constantly and in many instances significantly over short periods during any day working period.
- Exact daytime period and night-time period continuous equivalent sound pressure levels are not possible to calculate with certainty at this stage as the final construction site layout, work programme, work *modus operandi* and type of equipment have not been



finalised. Typical ambient noise conditions from a construction site are as indicated in Table J1b (Appendix J). Ideally the daytime outdoor ambient noise levels should not exceed 45 dBA for rural residential areas or 55 dBA for urban residential areas (as specified in SANS 10103). For the ambient conditions, there will be no noise disturbance further than 800 m from the construction activity. Working on a worst case scenario basis, it is estimated that the short term maximum noise levels from general construction operations should not exceed 62 dBA at a distance of 1 500 m from the activity site.

- Slightly higher ambient noise levels than those normally considered as reasonable are acceptable during the construction period provided that the very noisy construction activities are limited to the daytime and that the contractor takes reasonable measures to limit noise from the work site.
- There are however unlikely to be noise disturbance and noise nuisance effects, as the nearest noise sensitive sites are more than 8 000 m from the construction sites.
- For all construction work, the construction workers working with or in close proximity to equipment will be exposed to high levels of noise as can be seen from Table J1a (refer to the 5 m offset noise levels).

The significance rating of the construction phase impacts is analysed in Section J7 of Appendix J.

### **13.5.6. The Predicted Noise Climate (Operational Phase)**

With the commissioning of the CSP Plant, the noise climate close to the new facility will alter. The main noise sources at the CSP Plant will be from:

- The main CSP Plant operations:
  - \* Conventional electrical power generating station (EPGS) (specifically the cooling fans).
  - \* Salt circulation pumps.
  - \* Steam generating plant.
  - \* Heliostat spraying trucks.
- Noise impact from ancillary works (such as waste water purification works).
- CSP Plant generated traffic.

Refer to Appendix J for the details of the predicted noise generation from the various components of the planned installation. The noise from the cooling fans will be the loudest and will predominate at areas outside the CSP Plant property. Noise from the other sources will hardly contribute to the new external ambient noise levels. Conservatively an additional 1,5dBA has been allowed for over and above the fan generated noise. It is estimated that the CSP Plant will on average operate for 10 hours per day (annual average). However it has conservatively been assumed that the average operating time will be 12 hours per day. The predicted equivalent continuous daytime period rating (noise) levels ( $L_{Req,d}$ ) (based on a 12-hour per day operation) and

the noise levels for continuous operation (for 1-hour) ( $L_{Aeq,1h}$ ) at various offsets from the CSP Plant are summarised in Table 13.1. The  $L_{Aeq,1h}$  is the actual noise level from the CSP Plant that will be constantly be heard at a receptor during a period of continuous operation of the Plant. The  $L_{Req,d}$  is a factor indicating the “average” noise level over the 16-hour daytime period but allowing for 12-hours of operation during this period. The influence of the CSP Plant’s generated noise on the area is depicted graphically on Figure 13.2.

**Table 13.1:** Noise Levels Generated by the CSP Plant

Offset	Noise Level (dBA)	
	( $L_{Aeq,1h}$ )	( $L_{Req,d}$ )
500m	59.5	58.3
1000m	52.5	51.3
2000m	44.5	43.7
3000m	38.5	38.9
4000m	34.5	36.6

For daytime operation, no noise impact from the CSP Plant is predicted beyond 1 800 m from the centroid of EPGS of the Plant. There are therefore unlikely to be noise disturbance and noise nuisance effects from the operations at the CSP Plant, as the nearest noise sensitive sites are more than 8000 m from the Plant. The nearest adjacent farm boundary to the CSP Plant is at approximately 2 300 m, and thus there unlikely to be any impacts in the future if development s take place on any of the adjacent farms.

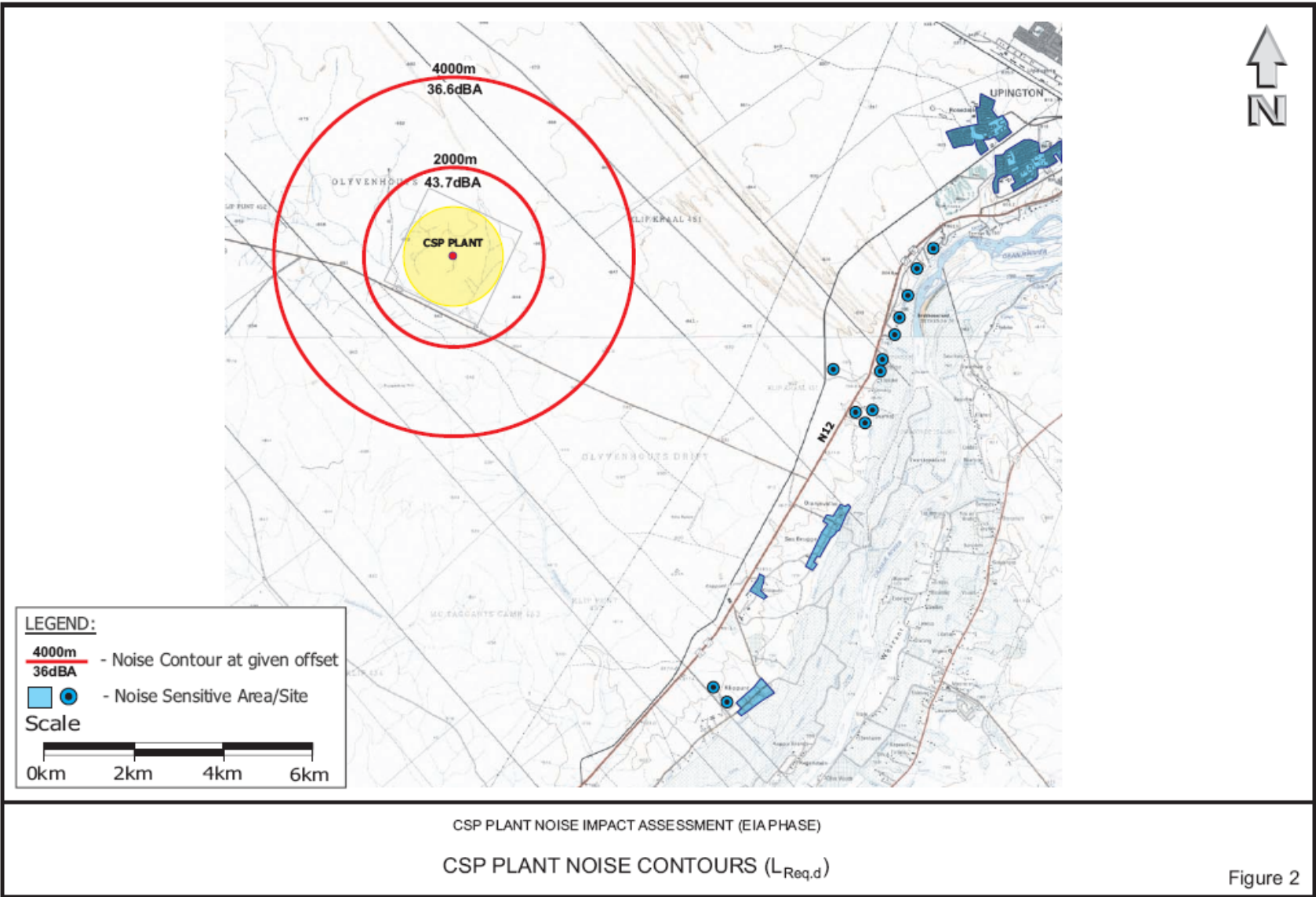


Figure 13.2: The influence of the CSP Plant’s generated noise on the study area

The total volume of traffic generated by the CSP Plant will be very small in relation to the total volume of traffic on the adjacent main road, namely National Road N14. The average maximum number of vehicle trips to and from the Plant daily is estimated to be in the order of 60 (two-way trips). These volumes will be far too small to cause any significant noise impact.

### 13.5.7. Significance Rating of the Noise Impact

Table 13.2 and 13.3 include an assessment of the potential noise impact of the CSP Plant is based on DEAT's (1998) Guideline Document: EIA Regulations methodology. Both the construction phase and the operational phase are analysed.

**Table 13.2:** Significance of the Noise Impact during Construction

Rating Criteria	IMPACT: Noise Impact during Construction	
	With Corrective Actions	Without Corrective Actions
Nature/Extent	Local (2)	Local (2)
Duration	Short term (2)	Short term (2)
Magnitude	Minor (2)	Low (4)
Probability	Medium (3)	Medium (3)
Significance	Low (18)	Low (24)
Status	Negative	Negative
Corrective action	Refer to Section 7.2 in the main report	

**Table 13.3:** Significance of the Noise Impact during Operation

Rating Criteria	IMPACT: Noise Impact during Operation	
	With Corrective Actions	Without Corrective Actions
Nature/Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Low (2)	Low (2)
Significance	Low (20)	Low (20)
Status	Negative	Negative
Corrective action	Refer to Section 7.3 in the main report	

### **13.6. Conclusions**

The following may be concluded from the foregoing analysis:

- Although not all of the final baseline noise design data for the CSP Plant was available for the analysis, the loudest noise generating plant and equipment was available and, the assumptions made are for other minor plant were considered adequate to give a meaningful analysis of the noise impact situation.
- The area of potentially serious noise impact around the planned CSP Plant will be fairly small. It is predicted that any impacts will be contained an area within a radius of about 1 800 m of the centroid of the EPGS of the Plant. There are no noise sensitive sites within this area of influence.
- The Upington site is suitable for the construction of the CSP Plant as potential noise impacts will be minor.
- There are practical mitigating measures that can be implemented to prevent or reduce potential impact.

### **13.7. Mitigating Measures**

Potential noise mitigating measures for the project were assessed.

#### **13.7.1. *Pre-construction Phase***

Local residents are to be notified of any potentially noisy field survey works or other works during the planning and design phase and these activities are to be undertaken at reasonable times of the day.

During this phase, consideration must be given to the noise mitigating measures required during the construction phase and which should be included in the tender document specifications and the design.

#### **13.7.2. *Construction Phase***

The noise mitigating measures to be considered during the construction phase are as follows:

- Construction site yards, concrete batching plants, asphalt batching plants, construction worker camps (accommodation) and other noisy fixed facilities should be located well away from noise sensitive areas adjacent to the development site.
- All construction vehicles and equipment are to be kept in good repair.
- Construction activities, and particularly the noisy ones, are to be contained to reasonable hours.

- With regard to unavoidable very noisy construction activities in the vicinity of noise sensitive areas, the contractor should liaise with local residents on how best to minimise impact.
- In general operations should meet the noise standard requirements of the Occupational Health and Safety Act (Act No 85 of 1993).
- Construction staff working in areas where the 8-hour ambient noise levels exceed 75 dBA should wear ear protection equipment.

### **13.7.3. Operational Phase**

The following noise mitigating measures, which will need to be considered where appropriate:

- The design of the CSP Plant is to incorporate all the necessary acoustic design aspects required in order that the overall generated noise level from the new installation does not exceed a maximum equivalent continuous daytime rating level ( $L_{Req,d}$ ), namely a noise level of 70 dBA (just inside the *property projection plane*, namely the property boundary) as specified for industrial districts in SANS 10103. Refer to Appendix H. Notwithstanding this provision, the design is also to take into account the maximum allowable equivalent continuous day/night rating level of the potentially impacted sites outside the new installation's property. Where the  $L_{Req,d}$  for the external site is presently lower than the maximum allowed, the maximum shall not be exceeded. Where the  $L_{Req,d}$  for the external site is presently at or exceeds the maximum, the existing  $L_{Req,d}$  shall not be increased. (It has been assumed that the Plant will only operate during the daytime period).
- The latest technology incorporating maximum noise mitigating measures for the CSP Plant components should be designed into the system.
- The design process is to consider, *inter alia*, the following aspects:
  - \* The position and orientation of buildings on the site.
  - \* The enclosure of noisy plant in buildings where possible and practical.
  - \* The design of the buildings to minimise the transmission of noise from the inside to the outdoors.
  - \* The insulation of particularly noisy plant and equipment.
- Normal operations of the CSP Plant should be limited to the period between 06h00 and 20h00, unless conditions necessitate 24 hour operation.

### **13.8. Recommendations**

The following are recommended:

- The National Noise Control Regulations and SANS 10103 should be used as the main guidelines for addressing the potential noise impact on this project.

- Once all the plant /equipment technical details and the operating details of the CSP Plant are known, further more detailed analysis of the noise impact situation will need to be undertaken in order to confirm the final footprint of the CSP Plant.
- The noise mitigating measures indicated in Section 7 should be applied as guidelines for further design on the project.