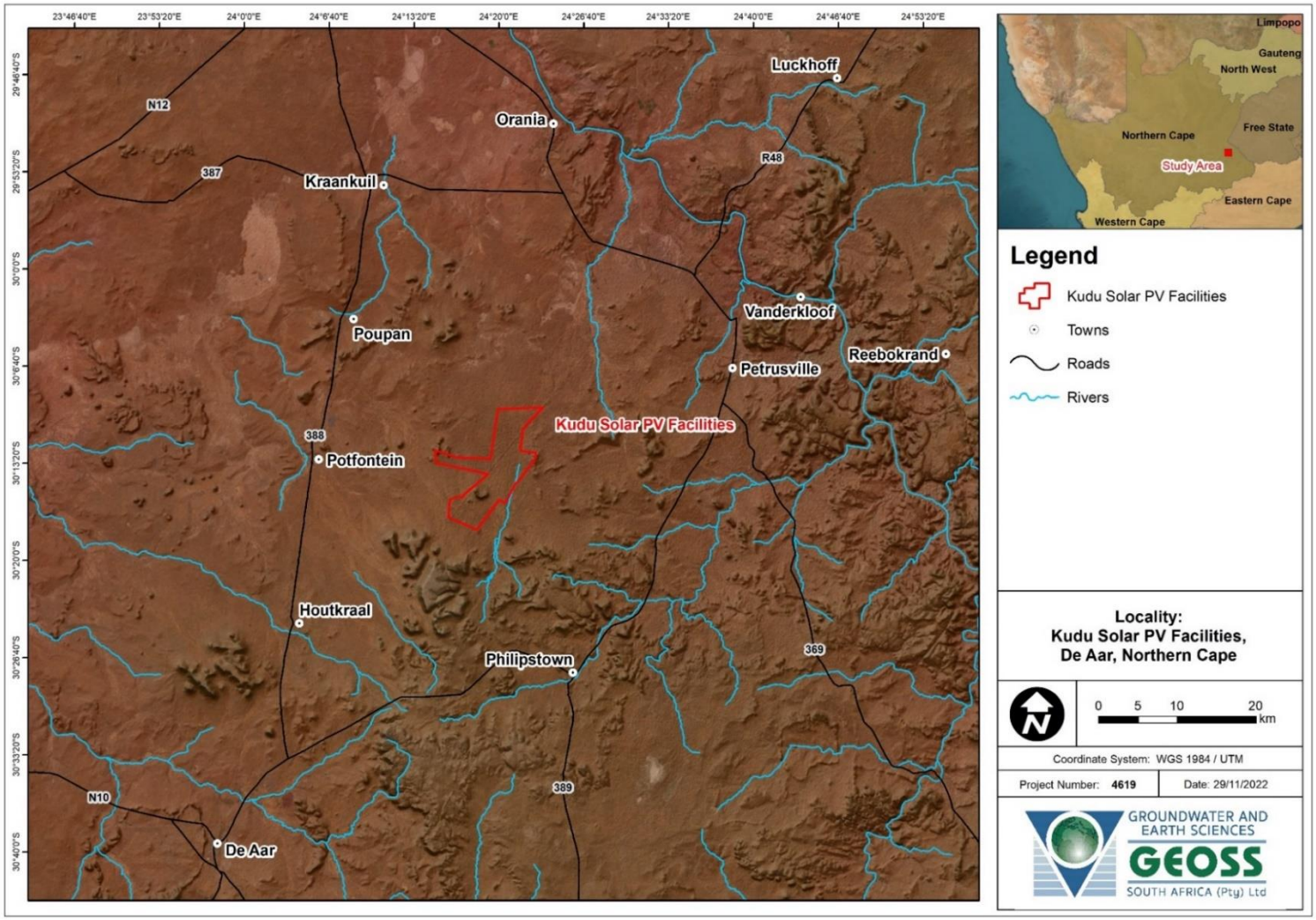


Map 17-1: Locality map showing the location of the proposed Kudu Solar Facility and surrounds.

17.2 Approach and Methodology

The following approach and methodology were followed for this desktop geotechnical assessment:

Task 1: Obtain all data relevant to the project (i.e., previous geotechnical reports), and search the internal GEOSS database (including relevant information pertinent to the study area). Review/acquire geological, geotechnical, and hydrogeological maps for the area. Review any reports that have been compiled for the study area. Compile a project GIS.

Task 2: Conduct a literature review. Compile geotechnical impact assessment using the methodology presented in Appendix D of this assessment chapter. Draw from data gathered during the site visit undertaken by GEOSS during the separate Hydrogeological study (Chapter 16 of this EIA Report), during which time the geotechnical and geological conditions were generally confirmed visually.

Task 3: Compile and analyse the data using geotechnical methods and address the questions raised in the project objectives. Document findings in the desktop geotechnical report.

17.2.1 Information Sources

The information sources used in this study are listed in Table 17-1.

Table 17-1: Information sources used to assess the Geotechnical conditions for the proposed Kudu Solar Facility.

Data / Information	Source	Date	Type	Description
Geological Map	Council for Geosciences	1997	Spatial	1:250 000 scale Geological Map Series of 3024 Colesberg
[Geotechnical] Engineering Geology of Southern Africa: The Karoo Sequence Volume 3	A. B. A. Brink	1983	Literature	Engineering properties of rocks and soils of the Karoo Supergroup
Climatology and Geohydrology	Cape Farm Mapper	2009	Database	SA Atlas of Climatology and Geohydrology; obtained from Western Cape Government Agriculture
Groundwater recharge and vulnerability mapping	Conrad J. and Munch Z.	2007	Spatial	A National scale approach to groundwater recharge and vulnerability mapping
Hydrogeological map series	Department of Water Affairs and Forestry	2005	Spatial	Hydrogeological map series of the republic of South Africa
NGA Database	NGA	14 April 2022	Database and Spatial	Spatial delineation of NGA registered boreholes

17.2.2 Assumptions, Knowledge Gaps and Limitations

The following is important to note regarding the completion of this project:

- A site visit was not undertaken during the geotechnical desktop study. However, the services performed by GEOSS South Africa (Pty) Ltd are consistent with the level of care and skill ordinarily exercised by the geotechnical unit and/or members of the geotechnical profession practising under similar conditions in the locality of the project. This report is therefore considered to fulfil the scope of the present investigation, and third party information has been utilised in good faith in compilation of this report.
- The duration of the construction phase and decommissioning phase is assumed to be approximately one and a half years, and one year respectively.
- The interpretation of the site conditions is based on the available information (from literature and experience in the region). Professional judgement (analysis of available data) is considered to provide sufficient confidence to meet the objectives of this specialist desktop geotechnical study.
- Earth materials are, by nature, variable. Therefore, reasonable variance between the conditions and properties described and actual site conditions are expected. Recommendations provided are suitable for the purposes of this investigation, but are provisional in nature and will need to be confirmed by intrusive on-site investigations prior to construction.
- Third-party information (e.g., literature) has been utilised in good faith.
- Cumulative impacts are assessed by adding effects expected from this proposed development to existing and proposed developments with similar impacts in a 30 km radius. The current and proposed developments that were considered for cumulative impacts are discussed and displayed in Section 17.6.4.
- The cumulative impacts of the construction period are expected to be staggered, i.e., as one development's construction period is complete, the next commences, prolonging the cumulative impacts of the construction period. A similar approach has been adopted for the operation and decommissioning phases.
- It must be noted that there are no areas on site that should be avoided from a geotechnical sensitivity perspective. However, areas of moderate to steep topography would likely render development financially unfeasible (Map 17-5). Further, the Digital Elevation Model (DEM) used to generate the slope map (Map 17-5) indicated anomalous elevation values that run along the length of the overhead transmission lines. Based on the available evidence, these anomalous elevation values are considered erroneous.
- No responsibility will be accepted for consequences arising out of the fact that actual conditions vary from those presented/inferred. Engineering recommendations provided in this report are preliminary and must be confirmed through further intrusive investigations. The information must be verified by the undertaking of a detailed geotechnical site investigation. Such investigations would not be required to fulfil the requirements of the EIA process. However, it would be necessary prior to construction.
- There is no specific Assessment Protocol devised for Geotechnical Assessments, and the Screening Tool does not include any layers or themes for geotechnical conditions (as at May 2023). Therefore, the report needs to comply with Appendix 6 of the 2014 National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) EIA Regulations (as amended). Appendix E of this chapter contains a table complying with Appendix 6 of the 2014 NEMA EIA Regulations (as amended).

17.2.3 Consultation Processes Undertaken

During the undertaking of the geohydrological[1] and geotechnical site verification process, all landowners were contacted to ensure that GEOSS was able to locate their boreholes and inspect the landforms across their properties. This was mainly to ensure consent was granted; this was achieved telephonically by Christel Van Staeden of GEOSS South Africa.

17.3 Description of Project Aspects relevant to this Geotechnical Specialist Assessment

The project applicant intends to construct several solar panel arrays across the proposed development area of Kudu Solar Facility. To do so, construction will be required, which typically entails the following:

1. Stripping and clearing of vegetation, where necessary, within the approved development footprint to facilitate the construction and/or establishment of infrastructure. Note that vegetation is planned to be trimmed within the PV array area (and not removed completely);
2. Levelling and grading of the site.
3. Excavation of foundation trenches and/or installation [method dependent on conditions] of pile foundation systems for the solar panel arrays and related infrastructure.

The above activities generally affect the surrounding environment as follows:

- Displacement of geological materials.
- Contamination of geological materials.
- Generation of construction and demolition waste.

To date, apart from the construction of farmhouses and the erection of boundary and subcamp fences for farming purposes; little disturbance of the subsoils and rocks in the area proposed for development has taken place.

17.4 Baseline Environmental Description

17.4.1 Study Area Definition

The study area for the proposed Kudu Solar Facilities 1 to 12 is the full extent of the eight affected farm properties on which the proposed PV Facilities will be constructed. The full extent of these properties has been assessed in this study in order to identify environmental sensitivities and no-go areas. The total **study area** for Kudu Solar Facilities 1 to 12 is approximately 8 150 hectares (ha).

At the commencement of this Scoping and EIA Process, the **Original Scoping Buildable Areas** which fall within the study area were identified by the Project Developer following the completion of high-level environmental screening based on the Screening Tool.

[1] Note that a separate Geohydrology Assessment is included in Chapter 16 of this EIA Report

Following the identification of sensitivities during the Scoping Phase, the Project Developer considered such sensitivities and formulated the **Revised Scoping Buildable Areas**. The **Revised Scoping Buildable Areas** were used to inform the design of the layout, and further assessed during this EIA Phase of the project in order to identify the preferred development footprint of the proposed project on the approved site as contemplated in the accepted Scoping Report. The development footprint is where the actual development will be located, i.e. the footprint containing the PV solar arrays and associated infrastructure.

For simplicity, the maps contained within this report include all boundaries of the study area. However, each report is focused on a single component of the investigation, e.g., Kudu Solar Facility 3.

17.4.2 General Description

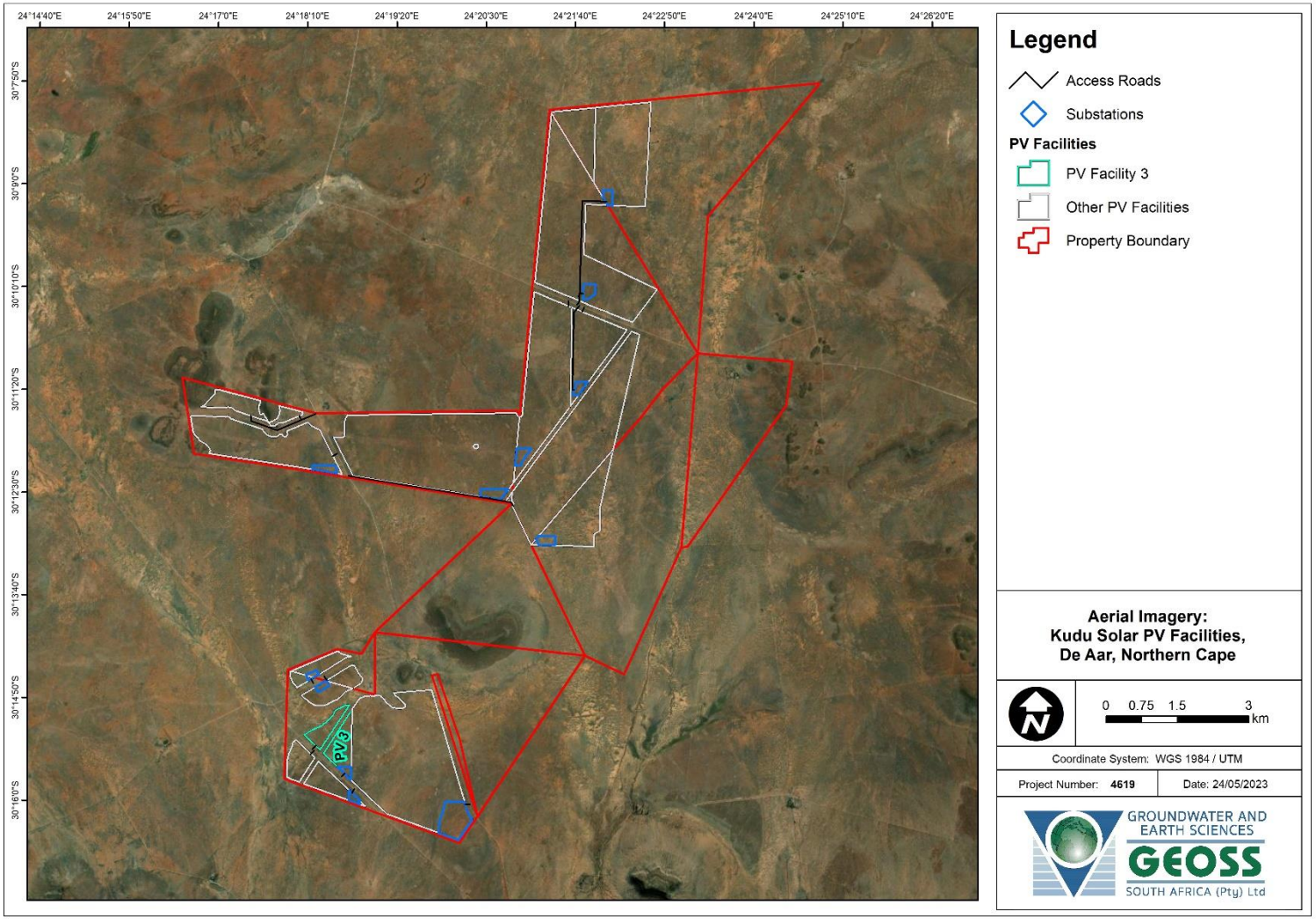
The nearest town to the proposed project is De Aar, approximately 60 km to the southwest. The landscape in the surrounding area is arid, with transported sands occurring widely along plains with dolerite sills (generally northwest of the study area) and mudstone, shale and sandstones (generally southeast of the study area) outcropping in areas of higher elevation. It is understood that the farms in the area are mainly used for livestock farming purposes.

Receptors that could be impacted by changes in the geotechnical conditions of the study area include (but are not limited to):

- Destruction/alteration of endemic fauna and flora environment due to displacement of geologic materials, e.g., removal of soils and/or rocks on site.
- Reduced food for livestock and inhabitants of the farms, decreased crop yields (although uncommon in this region) due to erosion and contamination, and consequential soil loss.

Acceptable levels of change in terms of geotechnical conditions would generally be characterised by safe tolerable levels. For the EIA process this would include identification of fatal flaws and levels of change via desktop study. This information can be later refined after EA with data based on observations made during the structural design phase which includes intrusive investigations, detailed designs, design verifications and calculations. This would also include applicable norms and standards deemed relevant by the geotechnical professional.

Map 17-2 presents relevant boundaries of the study area with solar facility boundaries superimposed on the aerial imagery, and Map 17-3 presents the solar facility and land portion boundaries overlain on the geological map.



Map 17-2: Aerial view delineating the study area of the 12 Kudu Solar Facilities (Google, 2022). Note that this report is focused on Kudu Solar Facility 3.

17.4.3 Project Specific Description

17.4.3.1 Climate

The study area experiences a semi-arid climate, with most of the rainfall occurring during February to March. Figure 17-1 shows the monthly average minimum and maximum air temperature distribution and Figure 17-2 shows the monthly average rainfall and evaporation distribution for the study area (Schulze, 2009). The long-term (1950 – 2000) average annual precipitation for the study area is 281 mm/a. The rainfall does not exceed evaporation during the course of the year.

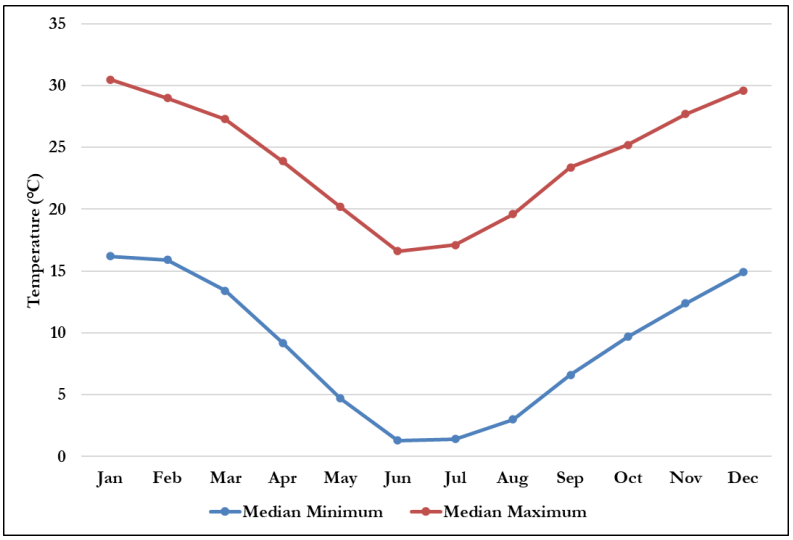


Figure 17-1: Monthly average air temperature distribution for the Kudu Solar Facility study area (Schulze, 2009)

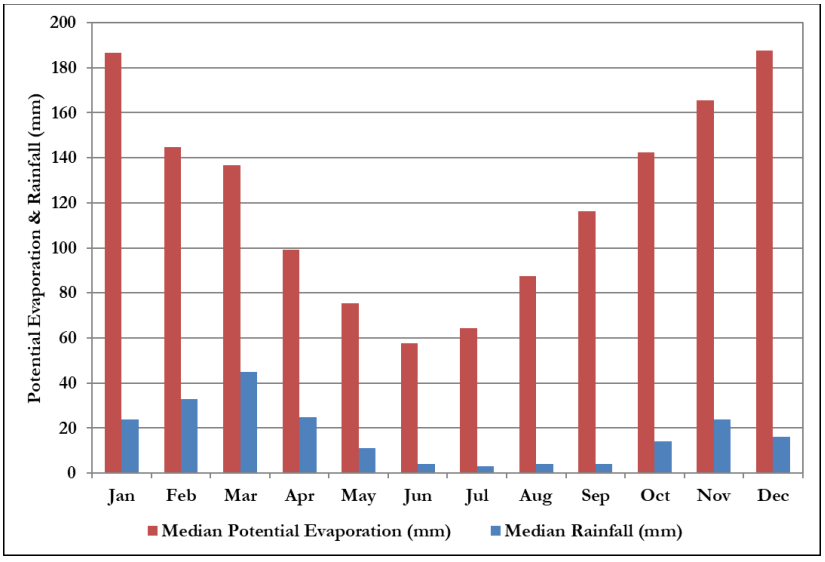


Figure 17-2: Monthly average rainfall and potential evaporation distribution for the Kudu Solar Facility study area (Schulze, 2009).

17.4.3.2 Weinert 'N' Value

The present and past climate is a useful indicator of the typical soil conditions that may be encountered on a particular site (Weinert, 1975). Weinert (1975) developed a general model to categorise the climate of southern Africa based on what he termed the 'N'-value (Figure 17-3). The Weinert 'N'-value for the project area is greater than 5 (Brink, 1983). For areas where Weinert 'N'-values exceed five (5), transported soils vary in thickness, and residual soils are anticipated to be shallow, and where pedocretes are developed they are expected to be calcrete and less commonly silcrete.

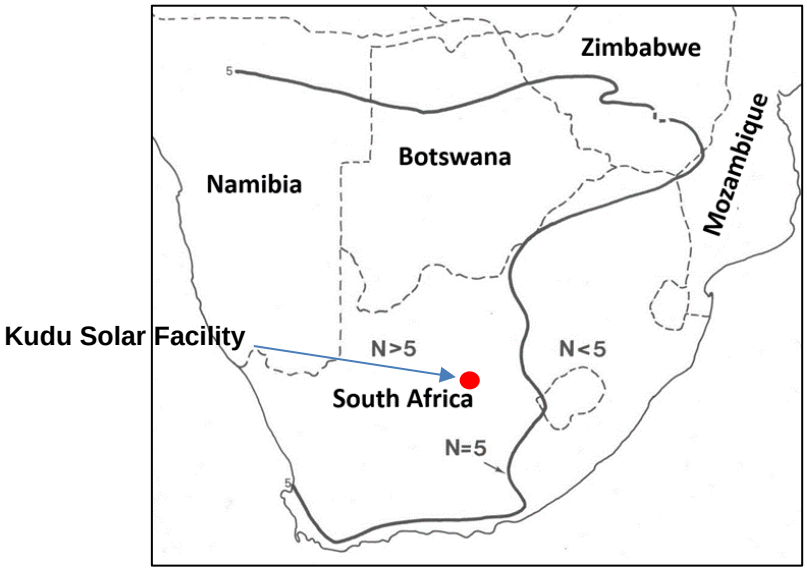


Figure 17-3: Climatic 'N' value = 5 plotted for southern Africa (after Weinert, 1967).

17.4.3.3 Regional Geology

The Geological Survey of South Africa (now the Council for Geoscience) has mapped the area at 1:250 000 scale (3024, Colesberg). The geological setting is shown in Map 17-3. The main geology of the area is listed in Table 17-2.

Table 17-2: Geological formation within the study area.

Symbol	Formation	Group	Lithology
~	Quaternary Deposit		Alluvium / Terrace Gravel
Qc			Calcrete
Jd	Jurassic Intrusion		Dolerite
Pa	Adelaide Subgroup	Beaufort Group	Blue-grey silty mudstone, subordinate brownish-red mudstone; sandstone
Pt	Tierberg Formation	Ecca Group	Blue-grey to black shale with carbonate-rich concretions; subordinate siltstone and sandstone in upper part

The Kudu Solar Facility 3 is mainly underlain by well-developed calcretes, with a small portion to the west underlain by Quaternary alluvium deposits. These quaternary deposits, in turn, overly either dolerite sills and dykes, (Jd) or undifferentiated sediments of the Adelaide Subgroup (Pa) and/or Tierberg Formation (Pt). The Adelaide Subgroup (Pa) comprises interbedded mudstones, siltstones and sandstone, whilst the Tierberg Formation (Pt) consists primarily of shale and sandstone. Both of these units were deposited within a braided river to deltaic setting within the Karoo basin during the Permian Period some 268 to 247 Million years ago (Johnson et al., 2006). These sediments were subsequently intruded during the Jurassic Period by dolerite sills and dykes of the Karoo Dolerite Suite. There are no known large structural geological features in the surrounding area of the proposed project; however, the dolerite sills in the area commonly show extensive jointing as a result of cooling and exhumation (Senger et al., 2015).

The site has been broadly classified into three zones of similar anticipated geological and geotechnical characteristics (Zones A, B and C). The zones are presented in Map 17-4, and are expanded upon in subsequent sections. Supporting information and literature on the anticipated engineering characteristics for materials anticipated for soils and rocks in geotechnical zones are presented in **Appendix G of this chapter**.

17.4.3.4 Geotechnical Properties and Engineering Geology

Sandstones and mudstones (Zone A)

Problems with slope stability may be experienced where sandstones and shales/mud rocks of the Karoo Supergroup are closely intercalated, as weathering of the fine-grained rocks may result in undercutting (Brink, 1983). Porewater pressure may develop at the interface between sand- and mud-/siltstones (Brink, 1983). Where sandstones are thickly bedded and highly jointed, joint-controlled block and wedge failures can potentially occur (Brink, 1983).

Dolerite (Zone B)

The end of the Karoo age was terminated by the intrusion of dolerite dykes and sills into the Karoo sedimentary rocks. The intrusive dolerites only had a limited thermal metamorphism effect on the surrounding Karoo sediments, as a rule of thumb, causing changes to the host lithology of equivalent thickness to the dyke itself (Brink, 1983).

During the late 1960s and early 1970s, several tests were undertaken to determine the strength properties of dolerite rock. The general description of dolerite was as follows, bluish-grey, very hard to extremely hard rock, variably fine- and medium-grained, variably jointed and fractured, with calcite, chlorite and zeolite minerals present on the joint and fracture surfaces in varying amounts (Brink, 1983). Of relevance to this assessment, dolerite rocks are considered erosion resistant.

Quaternary sediments (Zone C)

Quaternary sediments in the region include alluvium and terrace gravels (CGS, 1991). The geotechnical characteristics of such materials are variable in nature. Typical construction constraints with such materials include a potentially collapsible grain structure associated with sandy sediments, and challenging excavation conditions associated with terrace gravels, particularly where boulders are encountered. Often, transported soils of mixed origin may be potentially collapsible (Brink, 1983). Moreover, alluvium, depending on several factors, can be potentially expansive. The potential geotechnical problems would have to be investigated during the field investigations. Calcrete has been

mapped in the area. Calcrete could be investigated as a construction material for incorporation in the construction of the proposed development. The reserves of calcrete would have to be proven on-site.

Expected soil profile

In the region between Orange River and Beaufort West, the sandstones and mudrocks of the Karoo supergroup often dip gently. The topography is generally undulating, and areas of strong relief are usually present where intrusive dolerite sills create a capping characterised by a landscape of mesas and buttes. According to Brink (1983), the hillslopes of such topography, here and in most arid areas of the world, usually display up to four soil profiles (Figure 17-4).

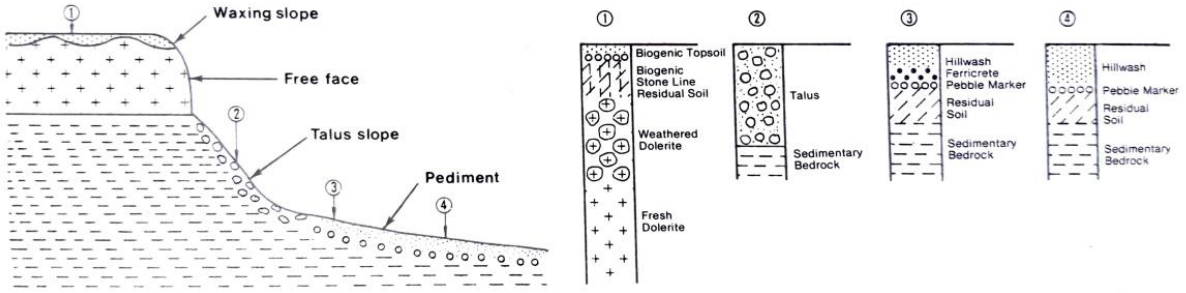


Figure 17-4: Elements of typical Karoo hillslopes and anticipated soil profiles (Brink, 1982)

Slope Classification

The topography is the region that has been classified in terms of development based on classes suggested by Stiff et al. (1996), see Map 17-5. A digital elevation model (DEM, 2018) has been used to determine slope gradients, which have been classified in terms of development potential in the region where development is to take place. The majority of the region is classified as “most favourable” and “intermediate” due to the generally flat nature of the site. A northeast trending linear feature of “least favourable” development potential (red) has been determined to be an overhead transmission line, i.e., a powerline (Map 17-5).

Seismicity

It is common practice to design structures for seismic loads when the nominal peak acceleration exceeds a 0.1 g once every 475 years (Retief and Dunaiski, 2009). Retief and Dunaisk (2009) delineated such regions in southern Africa, the approximate position of the proposed Kudu Solar Facility is shown in red on Figure 17-5 relative to these regions. The region surrounding Kudu Solar Facility, although generally low, is shown to have a nominal peak ground of more than 0.1 g; therefore, seismic loads should be considered when designing structures in this area.

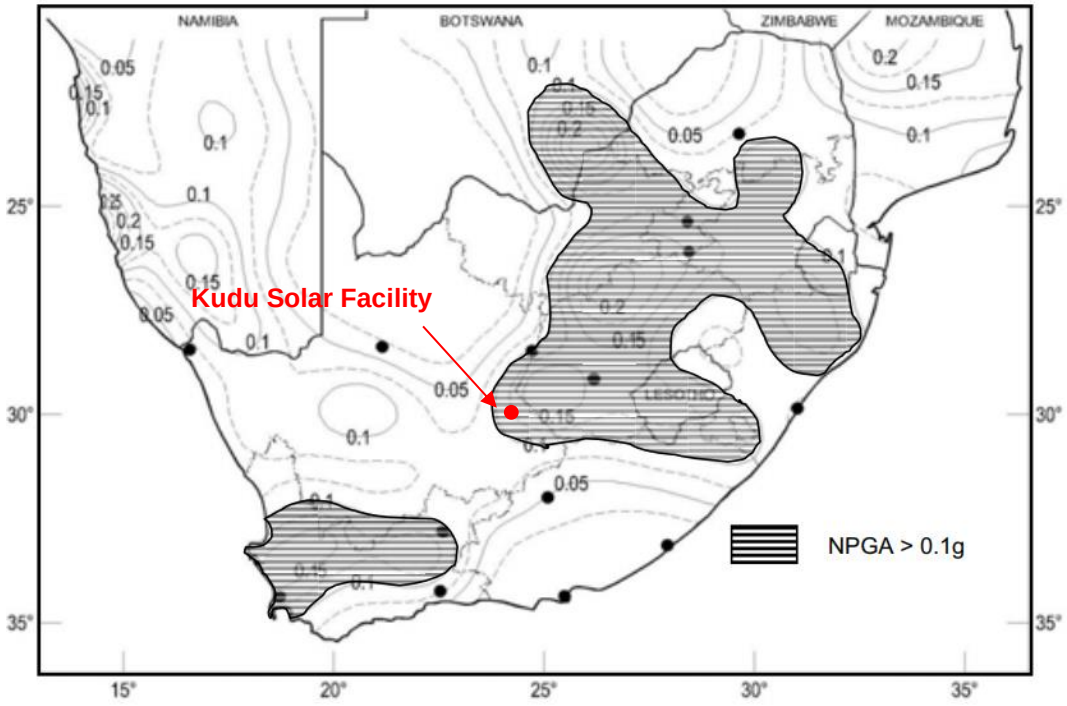
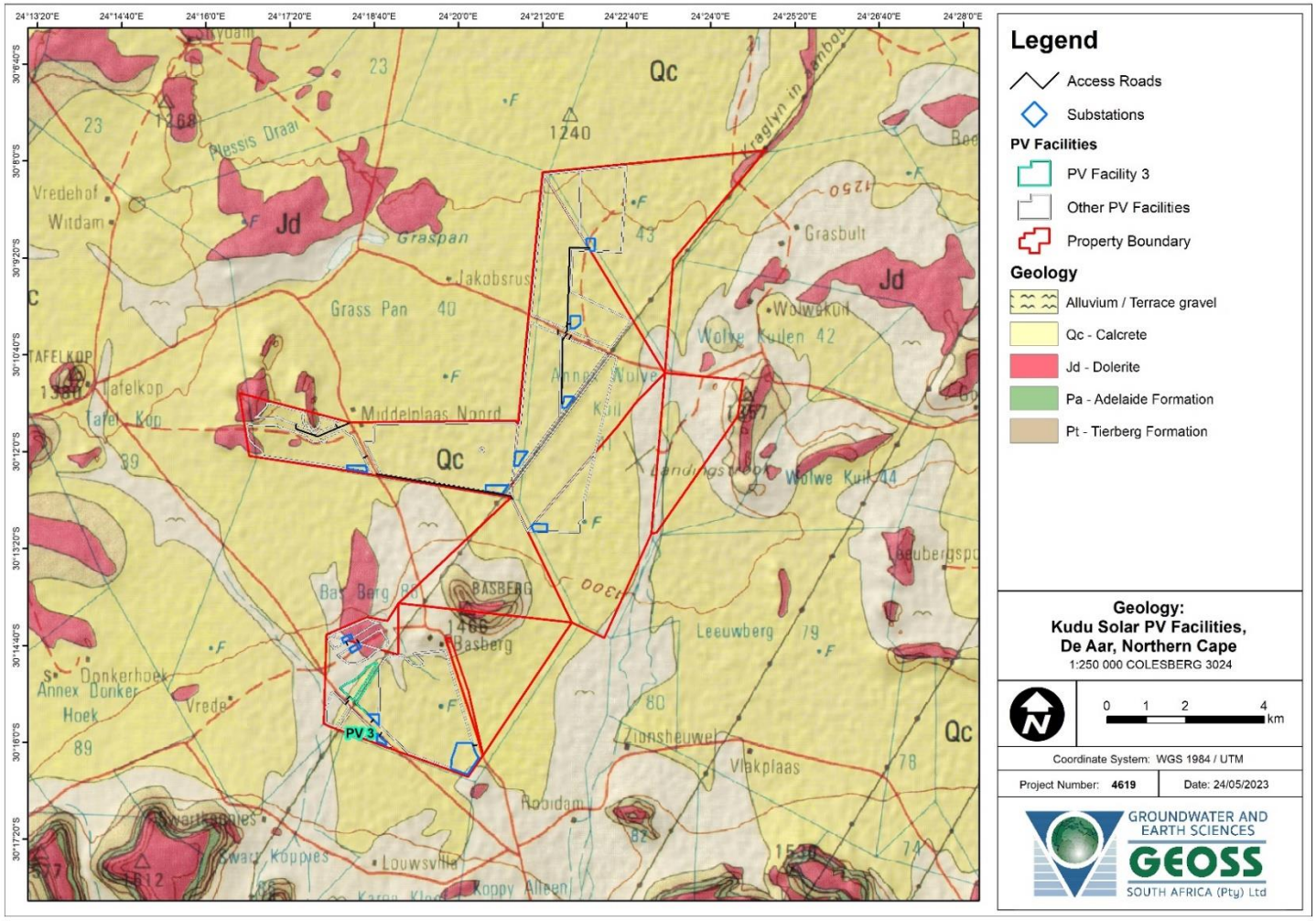


Figure 17-5: Zones in South Africa with nominal peak ground acceleration (NPGA) of more than 0.1 g for 10% in 50 years probability showing approximate position of the Kudu Solar Facility (after Retief and Dunaiski, 2009).

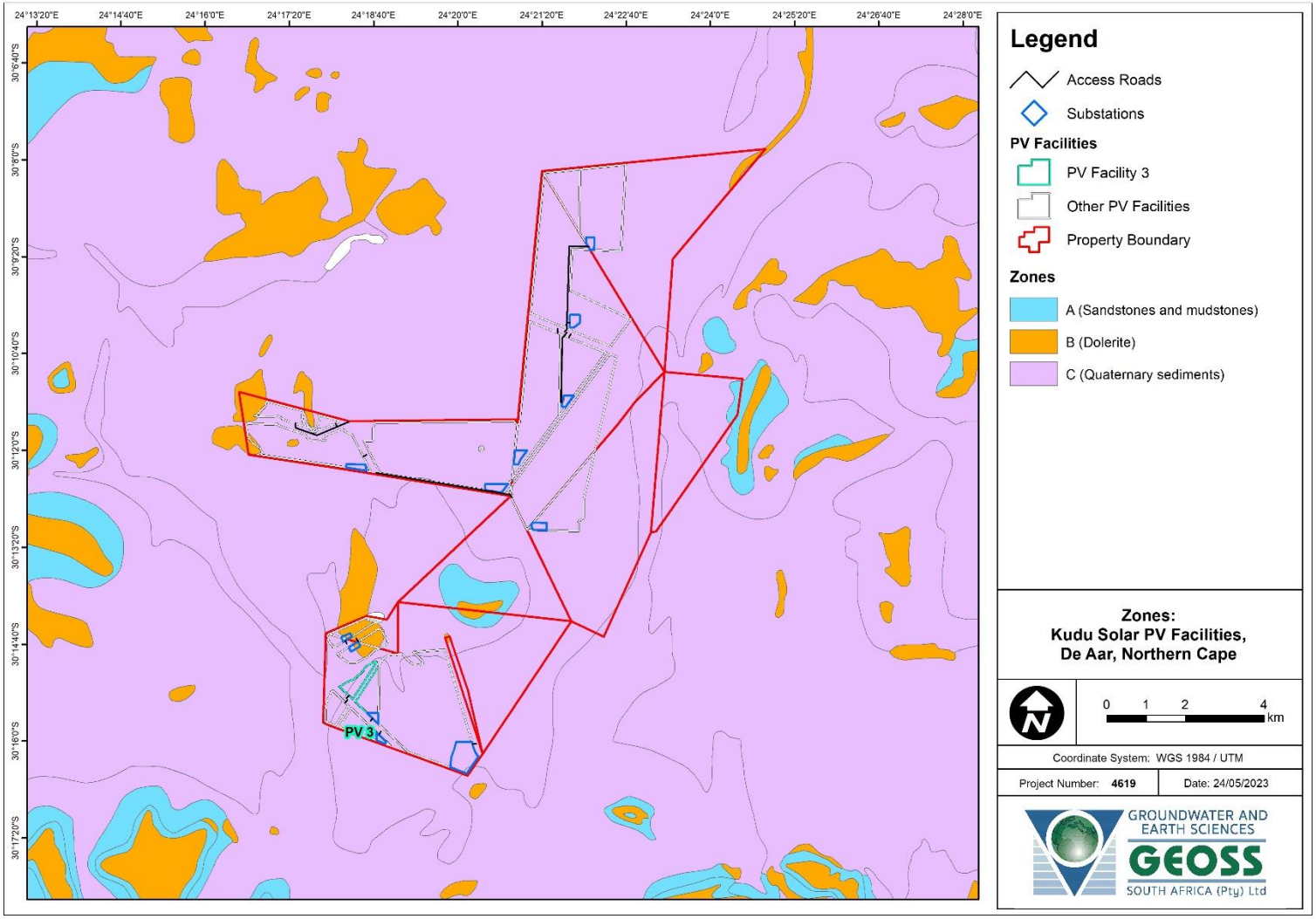
Regional Hydrogeology

The regional aquifer directly underlying the proposed project is classified by the Department of Water Affairs and Forestry (DWAF) (DWAF, 2005) as a fractured aquifer with an average yield potential of 0.5 – 2.0 L/s. However, based on the geological map and the site-specific information, it is known that the Quaternary Deposits of alluvium and calcrete form an intergranular aquifer on top of the fractured bedrock. There is no known published information about this aquifer.

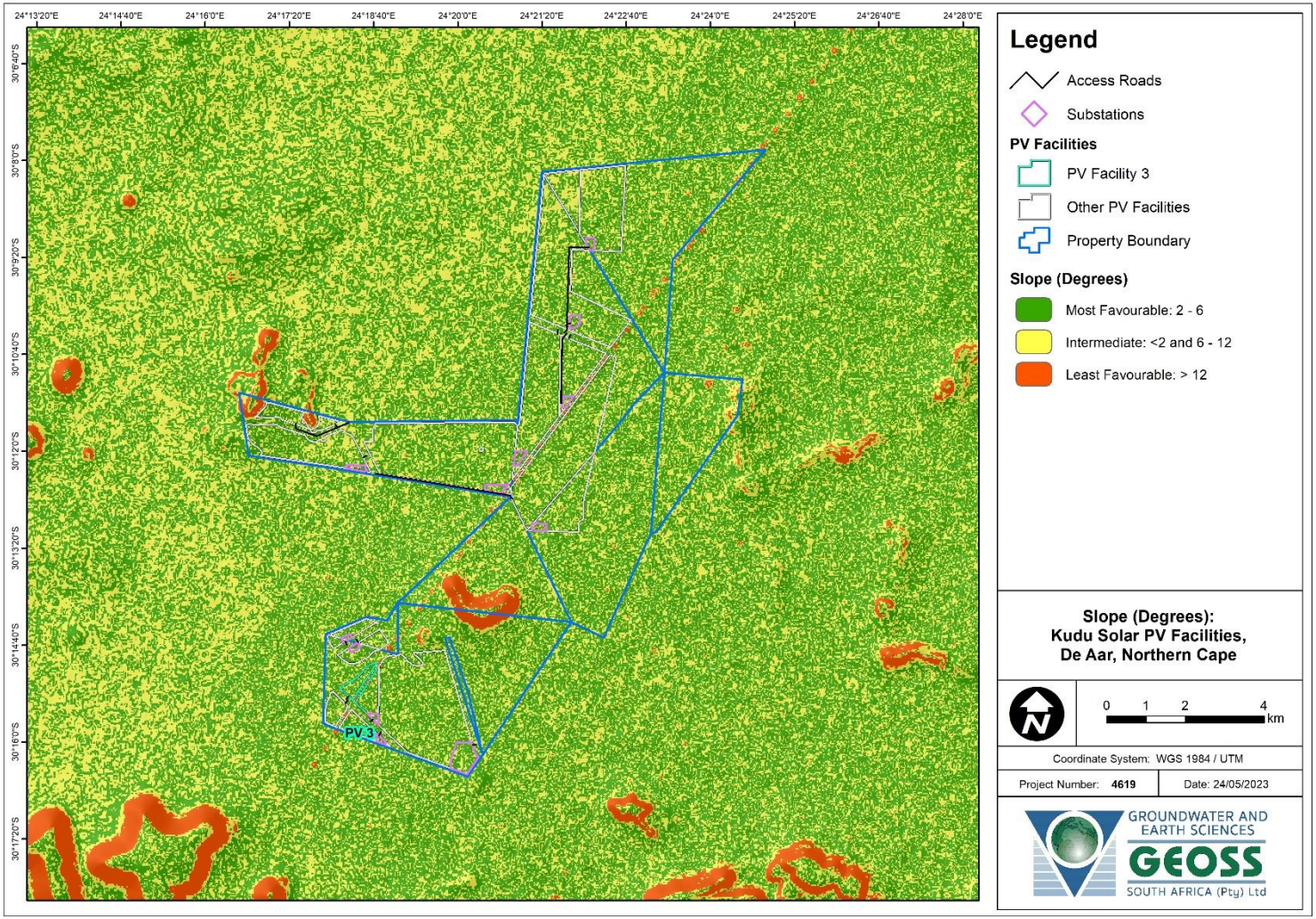
Based on the DWAF (2005) mapping of the regional groundwater quality, as indicated by electrical conductivity (EC), the groundwater underlying the Kudu Solar Facility and the surrounding area is in the range of 70 – 300 mS/m. This is considered to be “good to marginal” quality for water with respect to drinking water standards. Both these classifications are based on regional datasets and therefore only indicate conditions to be expected.



Map 17-3: Geological setting of the study area for the 12 Kudu Solar Facilities. Note that this report is focused on Kudu Solar Facility 3.



Map 17-4: Broad geotechnical zones across the study area. Note that this report is focused on Kudu Solar Facility 3.



Map 17-5: Regional slope classification based on Stiff et al. (1996). Note that this report is focused on Kudu Solar Facility 3.

17.4.4 Identification of Environmental Sensitivities

17.4.4.1 Sensitivities identified by the National Web-Based Environmental Screening Tool

Part of the terms of reference for the Kudu Solar Facility was to identify sensitivities by the National Web-Based Environmental Screening Tool. However, it is important to note that there are no dedicated Geotechnical themes on the National Web-based Environmental Screening Tool (Screening Tool) (as of May 2023); therefore, the environmental sensitivity of the proposed project area as identified by the Screening Tool is not applicable. For this reason, no site sensitivity verification report is required, and no map can be made available. Furthermore, no dedicated assessment protocol is prescribed for conducting a Desktop Geotechnical Assessment. Therefore, this specialist assessment has been undertaken in compliance with Appendix 6 of the NEMA EIA Regulations of 2014.

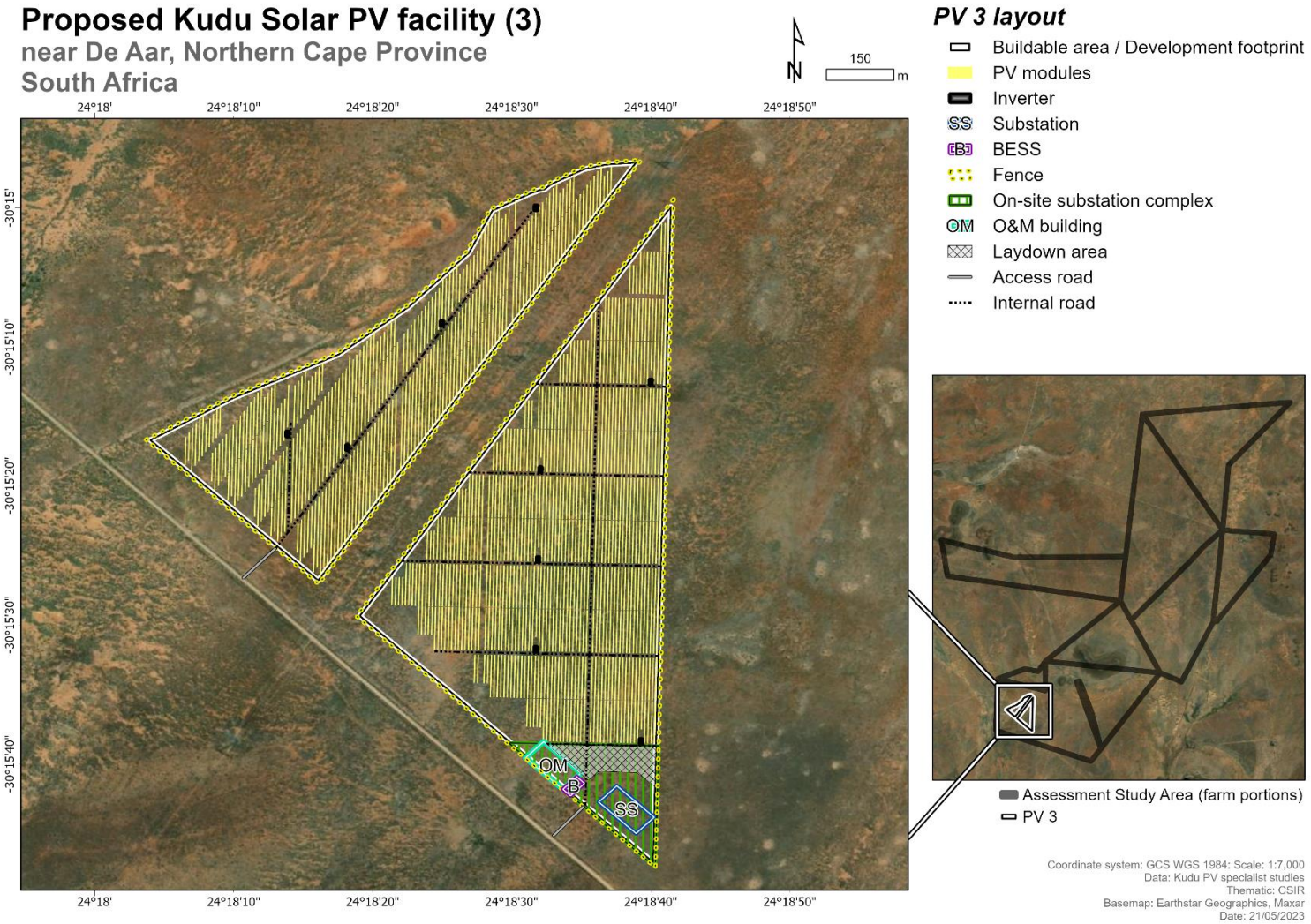
17.4.4.2 Specialist Sensitivity Analysis and Verification

The construction of infrastructure for the proposed solar facility will require several activities, e.g., stripping of vegetation (where required), excavation of foundation trenches etc., to take place (as described in Section 17.1.4 and Section 17.3) which will disturb the soils and rocks underlying the site. In areas of the study area where steeper topography is present, deeper excavations or more extensive site levelling may be required for construction to take place. The boundary of Kudu Solar Facility has been superimposed on the slope classifications and is indicated on (Map 17-5). In areas classed as “least favourable”, steep slopes are expected; these will likely need to be dealt with by excavation where necessary. Here relevant mitigation measures will need to be adopted; these are expanded on in the section “Impact Assessment”.

17.4.4.3 Sensitivity Analysis Summary Statement

No site sensitivity information is available for the study area and there are no areas on site that should be avoided from a geotechnical sensitivity perspective. However, areas of moderate to steep topography would likely render development financially unfeasible. GEOSS had previously undertaken a site sensitivity verification during the groundwater specialist assessment, the details of which are indicated in **Appendix C of this chapter (Site Sensitivity Verification)**. The information collected during the groundwater specialist assessment generally confirms the geotechnical information available for the lithologies in the area.

As indicated above, following the identification of sensitivities during the Scoping Phase, the Project Developer considered such sensitivities and formulated the Revised Scoping Buildable Areas. The Revised Scoping Buildable Areas led to the identification of the development footprints and detailed layouts in the EIA Phase. The development footprint and detailed layout are considered suitable from a geotechnical perspective. The development footprint and detailed layout are shown in Map 17-6. Changes to the detailed layouts are deemed acceptable if the changes remain within the approved buildable areas / development footprints and area assessed during the Scoping and EIA Process with no-go sensitive areas avoided.



Map 17-6: Detailed layout of Kudu Solar Facility 3.

17.5 Issues, Risks and Impacts

17.5.1 Identification of Potential Impacts/Risks

Potential impacts during construction, operational, and decommissioning phases are listed in this section.

Potential impacts on the geotechnical conditions as a consequence of the proposed development are as follows for the construction phase:

- Impact 1: Displacement of geologic materials.
- Impact 2: Contamination of subsoils and loss of topsoil.

Potential impacts on the geotechnical conditions as a consequence of the proposed development are as follows for the operational phase:

- Impact 1: Increased unnatural hard surfaces yielding increased runoff, potentially increasing erosion.
- Impact 2: Contamination of subsoils and loss of topsoil.

Potential impacts on the geotechnical conditions as a consequence of the proposed development are as follows for the decommissioning phase:

- Impact 1: Increased unnatural hard surfaces yielding increased runoff, potentially increasing erosion.
- Impact 2: Contamination of subsoils and loss of topsoil.

It is important to mention that the phases, construction, operation and decommissioning include all infrastructure-related components of the proposed development. The components of the proposed development are elaborated on in the Section 17.1.4 and Section 17.3.

Cumulative Impacts

- Impact 1 - Displacement of geologic materials.
- Impact 2 – Contamination of geologic materials.
- Impact 3 – Increased unnatural hard surfaces yielding increased runoff, potentially increasing erosion.

A possible positive indirect impact could be the accumulation of topsoil in low-lying areas surrounding the site.

17.5.2 Summary of Issues identified during the Public Consultation Phase

No issues were raised during the Scoping Phase regarding geotechnical impacts.

17.6 Impact Assessment

The impact of the proposed project on the geological and/or geotechnical environment will predominantly relate to the impact/effect that the development will have on the soils / rock units beneath the site through topsoil stripping, excavations for foundations (where required), trenching, the construction of access tracks and associated light infrastructure. Bulk earthworks, where required, particularly in areas of steeper topography, for the construction of platforms and access tracks, and may generate a significant impact on the soils and rocks where such construction activities take place. For example, in such areas, removal of large quantities of rock may be required.

A primary concern in terms of potential environmental impacts associated with geotechnical works is displacement of geologic materials, e.g., increased soil erosion on site due to stripping of vegetation during the construction phase of the project. Removal of vegetation reduces infiltration, thereby increasing runoff yielding increased erosion. Further, compaction during earthworks reduces rainwater infiltration and increase surface runoff and increase erosion. The construction of paved and/or hard-surfaced areas increases runoff and often localises discharge of stormwater, which may lead to increased erosion and consequently loss of topsoil. Disturbance of the soil may extend beyond the footprint of the structures should such conditions persist for long periods of time, e.g., more than ten years.

Coupled with the potential for the displacement of geologic materials is the risk of soil contamination from on-site activities. Conventional construction and earthworks make use of construction equipment, which with poor maintenance, cause leakages and result in refuelling spillages during construction and/or decommissioning.

Potential risks associated with the operational phase mainly include erosion and contamination of geologic materials. This could be mitigated and managed by adopting appropriate drainage designs.

The above is discussed in subsequent sections with particular reference to possible activities and phases of development.

17.6.1 Potential Impacts during the Construction Phase

The impact table for the Construction Phase is presented in Table 17-3.

17.6.1.1 Impact 1: Displacement of Geologic Material: Removal of rocks and other geologic materials for site levelling and grading, resulting in loss of geologic materials, e.g., topsoil removal/loss, and potentially the destruction of habitats of endemic species.

Stripping of topsoil, general site levelling, and the removal of rocks is common during the initial stages of the construction phase. The loss of geologic material, the disturbance of naturally intact soil, and the removal of vegetation might all result in soil erosion. The status of this impact is rated as negative with a local spatial extent and a short-term duration (i.e., for the construction phase). The consequence and probability of the impact are respectively rated as moderate and very likely. The reversibility and irreplaceability of the impact are rated as moderate. The significance of the impact without the implementation of mitigation measures is rated as low. With effective implementation of mitigation actions, the impact is predicted to be of very low significance. The mitigation measures are listed in the table below.

17.6.1.2 Impact 2: Contamination of geologic materials as a consequence of the construction activities by earthworks machinery and other apparatus.

Construction involves heavy machinery and apparatus especially during earth work activities. This might include graders, bulldozers, rollers, excavators, water trucks and, concrete mixers. This type of equipment requires regular greasing and operates with hydraulic fluid and diesel which might potentially cause contamination of geological materials. The status of this impact is rated as negative with a local spatial extent and a short-term duration (i.e. for the construction phase). The consequence and probability of the impact are respectively rated as moderate and very likely. The reversibility and irreplaceability of the impact are rated as moderate. The significance of the impact without the implementation of mitigation measures is rated as low. With effective implementation of mitigation actions, the impact is predicted to be of very low significance. The mitigation measures are listed in the table below.

17.6.1.3 Impact Summary Tables: Construction Phase

Table 17-3: Impact Summary Tables: Construction Phase

Impact	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential mitigation measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
CONSTRUCTION PHASE						
Impact 1 *Displacement of geologic materials*	*Status* *Spatial Extent* *Duration* *Consequence* *Probability* *Reversibility* *Irreplaceability*	*Negative* *Local* *Short term* *Moderate* *Very likely* *Moderate* *Moderate*	*Low*	▪ *Favour dolerite as an aggregate (as opposed to Karoo sandstones and mudstones). Subject to investigation.* ▪ *Any road cuttings should be designed by an appropriately qualified professional.* ▪ *Drainage in the region should be designed and managed appropriately.* ▪ *Investigate and confirm the geotechnical suitability of each structure (or other appropriate level of investigation) prior to construction (i.e., determine that soil with an adequate bearing capacity is obtained beneath each footing). Such investigations would not be required to fulfil the requirements of this Environmental Impact Assessment (EIA) process. However, it would be necessary prior to construction.* ▪ *Only strip vegetation necessary for the next phase of construction.* ▪ *Install temporary drainage to divert stormwater away from active construction activities, where required.* ▪ *Stormwater Management Plan must be developed in the preconstruction phase. It should detail the stormwater structures and management interventions that must be installed to manage the increase of surface water flow directly into any natural systems (in consultation with suitably qualified professionals). Effective stormwater management must include effective*	*Very Low*	*Medium*

Impact	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential mitigation measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
				stabilisation (e.g., gabions and Reno mattresses) of exposed soil. ▪ *Suitable stormwater management systems must be installed along roads and other areas and be monitored during the first few months of use. Any erosion/sedimentation must be resolved through any additional interventions that may be necessary (e.g., extension, energy dissipaters, spreaders, etc.).* ▪ *Where impacted through construction-related activities, all sloped areas must be stabilised to ensure proper rehabilitation is affected and erosion is controlled.* ▪ *Sloped areas stabilised using designed structures or vegetation as specified in the design to prevent erosion of embankments. The contract design specifications must be adhered to and implemented strictly.* ▪ *Any rehabilitation should be scheduled to ensure rehabilitation can take place at the optimal time for vegetation establishment.* ▪ *Where earthwork is being undertaken near any watercourses, slopes must be stabilised using suitable materials, e.g., sandbags or geotextile fabric, to prevent sand and rock from entering the channel.* ▪ *Appropriate rehabilitation and re-vegetation measures for any disturbed watercourse banks must be implemented timeously. In this regard, the banks should be appropriately and incrementally stabilised as soon as development allows.*		

Table 17-3: Impact Summary Tables: Construction Phase (cont.)

Impact	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential mitigation measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
CONSTRUCTION PHASE						
Impact 2 *Contamination of geologic materials*	*Status*	*Negative*	*Low*	▪ *During the execution of the works, appropriate measures to prevent pollution and contamination of the riparian environment must be implemented, e.g. including ensuring that construction equipment is well maintained.* ▪ *Provision must be made for refuelling at the storage area by protecting the soil with an impermeable groundcover. Where dispensing equipment is used, a drip tray must be used to ensure small spills are contained.* ▪ *Where refuelling away from the dedicated refuelling station is required, a mobile refuelling unit must be used. Appropriate ground protection such as drip trays must be used.* ▪ *If spillages occur, they should be contained and removed as rapidly as possible, with correct disposal procedures of the spilt material, as reported. Proof of disposal (waste disposal slips or waybills) should be obtained and retained on file for auditing purposes.*	*Very Low*	*Medium*
	Spatial Extent	*Local*				
	Duration	*Short term*				
	Consequence	*Moderate*				
	Probability	*Very likely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Moderate*				

17.6.2 Potential Impacts during the Operational Phase

The impact table for the Operational Phase is presented in Table 17-4.

17.6.2.1 Impact 1: Increased unnatural hard surfaces yielding increased runoff, potentially increasing erosion.

The operational phase will partially consist of access point/s and internal roads. This involves newly constructed road layers effectively creating unnatural hard surfaces. This might also include earth/concrete drains to divert water away from access points/roads. In return this might yield increased runoff effectively increasing erosion. The status of this impact is rated as negative with a local spatial extent and a long-term duration. The consequence and probability of the impact are respectively rated as moderate and likely. The reversibility and irreplaceability of the impact are rated as moderate. The significance of the impact without the implementation of mitigation measures is rated as low. With effective implementation of mitigation actions, the impact is predicted to be of very low significance. The mitigation measures are listed in the table below.

17.6.2.2 Impact 2: Contamination of geologic materials as a consequence of typical maintenance activities, as example, washing of solar panels, or spillages associated with battery energy storage facilities.

During the operational phase, geologic material might potentially be contaminated as a consequence of maintenance activities and/or spillages. For optimal functionality of the solar facility, solar panels must be free from dust deposits and any obstruction from the solar panel face. Washing and maintaining of solar panels might result in chemical contamination of geologic materials. Further chemical contamination may transpire from spillages by the BESS as these facilities potentially contain either flow based batteries or solid state batteries. The status of this impact is rated as negative with a local spatial extent and a short-term duration. The consequence and probability of the impact are respectively rated as moderate and very likely. The reversibility and irreplaceability of the impact are rated as moderate. The significance of the impact without the implementation of mitigation measures is rated as low. With effective implementation of mitigation actions, the impact is predicted to be of very low significance. The mitigation measures are listed in the table below.

17.6.2.3 Impact Summary Tables: Operational Phase

Table 17-4: Impact Summary Tables: Operational Phase

Impact	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential mitigation measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
OPERATIONAL PHASE						
Impact 1 *Increased unnatural hard surfaces*	*Status*	*Negative*	*Low*	▪ *Install drainage to divert stormwater away from activities, roads/tracks, structures, where required.* ▪ *Generic management for typical infrastructure of the proposed development, including:* 1. *Stormwater Management Plan must be developed in the preconstruction phase and should detail the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems, where possible and lawful. Effective stormwater management must include effective stabilisation (e.g., gabions and Reno mattresses) of exposed soil etc.* 2. *Suitable stormwater management systems must be installed along roads and other areas and monitored during the first few months of use. Any erosion / sedimentation must be resolved through any additional interventions that may be necessary (e.g., extension, energy dissipaters, spreaders, etc.).* 3. *Sloped areas stabilised using design structures or vegetation as specified in the design to prevent erosion of embankments.* 4. *No regular maintenance activities to take place outside of the authorised footprint and all vehicles to remain on authorised roads and tracks.*	*Very Low*	*Medium*
	Spatial Extent	*Local*				
	Duration	*Long term*				
	Consequence	*Moderate*				
	Probability	*Likely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Moderate*				

Table 17-4: Impact Summary Tables: Operational Phase (cont.)

Impact	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential mitigation measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
OPERATIONAL PHASE						
Impact 2 *Contamination of geologic materials*	*Status*	*Negative*	*Low*	▪ *During the execution of the operations, appropriate measures to prevent pollution and contamination of the riparian environment must be implemented e.g. including ensuring that construction equipment is well maintained;* ▪ *Provision must be made for refuelling at the storage area by protecting the soil with an impermeable groundcover/bunding. Where dispensing equipment is used, a drip tray must be used to ensure small spills are contained.* ▪ *Where refuelling away from the dedicated refuelling station is required, a mobile refuelling unit must be used. Appropriate ground protection such as drip trays must be used.* ▪ *Electrolyte spillage to be mitigated through leak detection, double containment and suitably designed bunding for the structure, approved by a qualified professional.* ▪ *If spillages occur, they should be contained and removed as rapidly as possible, with correct disposal procedures of the spilled material, as reported. Proof of disposal (waste disposal slips or waybills) should be obtained and retained on file for auditing purposes.*	*Very Low*	*Medium*
	Spatial Extent	*Local*				
	Duration	*Short term*				
	Consequence	*Moderate*				
	Probability	*Very likely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Moderate*				

17.6.3 Potential Impacts during the Decommissioning Phase

The impact table for the Decommissioning Phase is presented in Table 17-5.

17.6.3.1 Impact 1: Increased unnatural hard surfaces yielding increased runoff, potentially increasing erosion.

Access points, internal road and sufficient drainage will continue to form part of the decommissioning phase. Unnatural hard surfaces will potentially be present continuously yielding runoff causing erosion. The status of this impact is rated as negative with a local spatial extent and a short-term duration. The consequence and probability of the impact are respectively rated as slight and likely. The reversibility and irreplaceability of the impact are rated as moderate. The significance of the impact without the implementation of mitigation measures is rated as very low. With effective implementation of mitigation actions, the impact is predicted to be of very low significance. The mitigation measures are listed in the table below.

17.6.3.2 Impact 2: Contamination and disturbance of geologic materials as a consequence of typical decommissioning activities.

Similar to the construction phase, dismantling of the facility will potentially involve the use of heavy machinery. On going maintenance of equipment and refuelling activities increase the risk of spillages which might potentially cause contamination of geological material. The status of this impact is rated as negative with a local spatial extent and a short-term duration. The consequence and probability of the impact are respectively rated as slight and likely. The reversibility and irreplaceability of the impact are rated as moderate. The significance of the impact without the implementation of mitigation measures is rated as very low. With effective implementation of mitigation actions, the impact is predicted to be of very low significance. The mitigation measures are listed in the table below.

17.6.3.3 Impact Summary Tables: Decommissioning Phase

Table 17-5: Impact Summary Tables: Decommissioning Phase

Impact	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential mitigation measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
DECOMMISSIONING PHASE						
Impact 1 *Increased unnatural hard surfaces*	*Status*	*Negative*	*Very low*	▪ *Only drive and park vehicles where necessary.* ▪ *Land rehabilitation to near natural state, i.e., removal of foundations and backfilling of any resultant voids within the soil, as well as removal of hard surfaced areas. Replacement soil should be sourced locally to ensure homogeneity.* ▪ *Reinstate natural topography where cut-to-fill embankments have been constructed.* ▪ *Implement generic environmental management procedures for infrastructure.*	*Very Low*	*Medium*
	Spatial Extent	*Local*				
	Duration	*Short term*				
	Consequence	*Slight*				
	Probability	*Likely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Moderate*				
Impact 2 *Contamination of geologic materials*	*Status*	*Negative*	*Very low*	▪ *During the execution of the decommissioning, appropriate measures to prevent pollution and contamination of the riparian environment must be implemented e.g., including ensuring that equipment is well maintained;* ▪ *Provision must be made for refuelling at the storage area by protecting the soil with an impermeable groundcover. Where dispensing equipment is used, a drip tray must be used to ensure small spills are contained.* ▪ *Where refuelling away from the dedicated refuelling station is required, a mobile refuelling unit must be used. Appropriate ground protection such as drip trays must be used.* ▪ *If spillages occur, they should be contained and removed as rapidly as possible, with correct disposal procedures of the spilled material, as reported. Proof of disposal (waste disposal slips or waybills) should be obtained and retained on file for auditing purposes.*	*Very Low*	*Medium*
	Spatial Extent	*Local*				
	Duration	*Short term*				
	Consequence	*Slight*				
	Probability	*Likely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Moderate*				

17.6.4 Cumulative Impacts

The cumulative impacts of the proposed Kudu Solar Facility and other approved and in process renewable energy facilities and electricity grid infrastructure (EGI) within a 30 km radius from the study area are presented in this section. The cumulative impacts identified include the impacts related to the construction, operational and decommissioning phases across the proposed Kudu Solar Facility. In general, the impacts during the different phases of the project are quite similar therefore, their intensities increase as the project progresses resulting in a higher probability for the impact to occur.

According to information collected by the CSIR from the Renewable Energy EIA Database and the South African Heritage Resources Information System (SAHRIS) (~February 2023), 12 other renewable energy facility clusters and EGI have been approved, or in the process of approval in terms of the NEMA EIA Regulations, that are located within a 30 km radius from the Kudu Solar Facilities Map 17-7. Three of these renewable energy facilities are already existing and operational. In addition, approximately 10 existing Eskom power lines fall within the 30 km radius of the proposed project, with three Eskom planned power line projects, as shown in Map 17-7. Failing to implement effective mitigation measures throughout the lifespan of projects might cause the intensity of different identified impacts to increase. **Appendix F** of this chapter contains APPENDIX F - APPROVED RENEWABLE ENERGY PROJECTS

Table covering the details of approved, existing and in process projects within a 30 km radius of the proposed Kudu Solar Facility as provided by the CSIR.

The types of impacts of these developments are nearly identical to each other, with the main cumulative effect being an increase in impact severity for construction, operational, and decommissioning phase. This increase in cumulative severity will be especially exacerbated for the construction phase, in the case that construction of all the proposed developments within a 30km radius occurs simultaneously. The cumulative impact of all these developments during the operational phase should be quite low as long as the proposed mitigation measures and appropriate erosion monitoring is implemented.

Livestock farming is the main activity in the developable area of the proposed project. It is therefore crucial that the footprint of the proposed Kudu Solar Facility does not exceed its borders and negatively impact neighbouring agricultural activities. However, note that an Agricultural Compliance Statement has been undertaken as part of this EIA Process, which adequately addresses agricultural impact. Refer to Chapter 6 of the EIA Report for the Agricultural Compliance Statement. The intensity of the identified cumulative impacts should be suppressed by implementing effective mitigation measures to minimise (1) the contamination of geological materials and (2) the displacement of geological materials.

The cumulative impacts and mitigation measures for the Construction, Operational and Decommissioning Phases are contained in Table 17-6**,** Table 17-7, and Table 17-8, respectively.

Overall, the risk that impacts associated with removal, displacement, and contamination of geological material beyond this project site is very low as long as the appropriate mitigation measures are

implemented. Furthermore, the risk of this project receiving cumulative impacts from the surrounding developments is also quite low, providing appropriate mitigation measures are followed.

17.6.5 Potential Cumulative Impacts during the Construction Phase

17.6.5.1 Impact 1: Displacement of Geologic Material: Removal of rocks and other geologic materials for site levelling and grading, resulting in loss of geologic materials, e.g., topsoil removal/loss, and potentially the destruction of habitats of endemic species.

Refer to the description of the impact above for the construction phase. The status of this impact is rated as negative with a regional spatial extent and a medium-term duration. The consequence and probability of the impact are respectively rated as substantial and very likely. The reversibility and irreplaceability of the impact are rated as moderate. The significance of the impact without the implementation of mitigation measures is rated as moderate. With effective implementation of mitigation actions, the impact is predicted to be of low significance. The mitigation measures are listed in the table below.

17.6.5.2 Impact 2: Contamination of geologic materials as a consequence of the construction activities by earthworks machinery and other apparatus.

Refer to the description of the impact above for the construction phase. The status of this impact is rated as negative with a regional spatial extent and a medium-term duration. The consequence and probability of the impact are respectively rated as substantial and very likely. The reversibility and irreplaceability of the impact are rated as moderate. The significance of the impact without the implementation of mitigation measures is rated as moderate. With effective implementation of mitigation actions, the impact is predicted to be of low significance. The mitigation measures are listed in the table below.

17.6.6 Potential Impacts during the Operational Phase

17.6.6.1 Impact 1: Increased unnatural hard surfaces yielding increased runoff, potentially increasing erosion.

Refer to the description of the impact above for the operational phase. The status of this impact is rated as negative with a regional spatial extent and a long-term duration. The consequence and probability of the impact are respectively rated as substantial and very likely. The reversibility and irreplaceability of the impact are rated as moderate. The significance of the impact without the implementation of mitigation measures is rated as moderate. With effective implementation of mitigation actions, the impact is predicted to be of low significance. The mitigation measures are listed in the table below.

17.6.6.2 Impact 2: Contamination of geologic materials as a consequence of typical maintenance activities, as example, washing of solar panels, or spillages associated with battery energy storage facilities.

Refer to the description of the impact above for the operational phase. The status of this impact is rated as negative with a regional spatial extent and a medium-term duration. The consequence and probability of the impact are respectively rated as substantial and very likely. The reversibility and irreplaceability of the impact are rated as moderate. The significance of the impact without the

implementation of mitigation measures is rated as moderate. With effective implementation of mitigation actions, the impact is predicted to be of low significance. The mitigation measures are listed in the table below.

17.6.7 Potential Impacts during the Decommissioning Phase

17.6.7.1 Impact 1: Increased unnatural hard surfaces yielding increased runoff, potentially increasing erosion.

Refer to the description of the impact above for the decommissioning phase. The status of this impact is rated as negative with a local spatial extent and a short-term duration. The consequence and probability of the impact are respectively rated as substantial and likely. The reversibility and irreplaceability of the impact are rated as moderate. The significance of the impact without the implementation of mitigation measures is rated as moderate. With effective implementation of mitigation actions, the impact is predicted to be of low significance. The mitigation measures are listed in the table below.

17.6.7.2 Impact 2: Contamination and disturbance of geologic materials as a consequence of typical decommissioning activities.

Refer to the description of the impact above for the decommissioning phase. The status of this impact is rated as negative with a local spatial extent and a short-term duration. The consequence and probability of the impact are respectively rated as substantial and likely. The reversibility and irreplaceability of the impact are rated as moderate. The significance of the impact without the implementation of mitigation measures is rated as moderate. With effective implementation of mitigation actions, the impact is predicted to be of low significance. The mitigation measures are listed in the table below.

17.6.7.3 Impact Summary Tables: Cumulative Impacts

Table 17-6: Cumulative Impact Summary Tables: Construction Phase

Impact	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential mitigation measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
CONSTRUCTION PHASE						
Impact 1 *Displacement of geologic materials*	*Status*	*Negative*	*Moderate*	▪ *Only strip vegetation necessary for the next phase of construction.* ▪ *Install temporary drainage to divert stormwater away from active construction activities, where required.* ▪ *Stormwater Management Plan must be developed in the preconstruction phase. It should detail the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems (in consultation with suitably qualified professionals). Effective stormwater management must include effective stabilisation (e.g., gabions and Reno mattresses) of exposed soil.* ▪ *Suitable stormwater management systems must be installed along roads and other areas and be monitored during the first few months of use. Any erosion/sedimentation must be resolved through any additional interventions that may be necessary (e.g., extension, energy dissipaters, spreaders, etc).* ▪ *Where impacted through construction-related activities, all sloped areas must be stabilised to ensure proper rehabilitation is affected and erosion is controlled.* ▪ *Sloped areas stabilised using designed structures or vegetation as specified in the*	*Low*	*Medium*
	Spatial Extent	*Regional*				
	Duration	*Medium-term*				
	Consequence	*Substantial*				
	Probability	*Very likely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Moderate*				

Impact	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential mitigation measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
				design to prevent erosion of embankments. The contract design specifications must be adhered to and implemented strictly. ▪ *Any rehabilitation should be scheduled to ensure rehabilitation can take place at the optimal time for vegetation establishment.* ▪ *Where earthwork is being undertaken in near any watercourses, slopes must be stabilised using suitable materials, e.g. sandbags or geotextile fabric, to prevent sand and rock from entering the channel.* ▪ *Appropriate rehabilitation and re-vegetation measures for any disturbed watercourse banks must be implemented timeously. In this regard, the banks should be appropriately and incrementally stabilised as soon as development allows.*		

Table 17-6: Cumulative Impact Summary Tables: Construction Phase (cont.)

Impact	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential mitigation measures*	*Significance and Ranking Post-Mitigation)*	*Confidence Level*
CONSTRUCTION PHASE						
Impact 2 *Contamination of geologic materials*	*Status*	*Negative*	*Moderate*	▪ *During the execution of the works, appropriate measures to prevent pollution and contamination of the riparian environment must be implemented, e.g., including ensuring that construction equipment is well maintained.* ▪ *Provision must be made for refuelling at the storage area by protecting the soil with an impermeable groundcover. Where dispensing equipment is used, a drip tray must be used to ensure small spills are contained.* ▪ *Where refuelling away from the dedicated refuelling station is required, a mobile refuelling unit must be used. Appropriate ground protection such as drip trays must be used.* ▪ *If spillages occur, they should be contained and removed as rapidly as possible, with correct disposal procedures of the spilled material, as reported. Proof of disposal (waste disposal slips or waybills) should be obtained and retained on file for auditing purposes.*	*Low*	*Medium*
	Spatial Extent	*Regional*				
	Duration	*Medium-term*				
	Consequence	*Substantial*				
	Probability	*Very likely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Moderate*				

Table 17-7: Cumulative Impact Summary Tables: Operational Phase

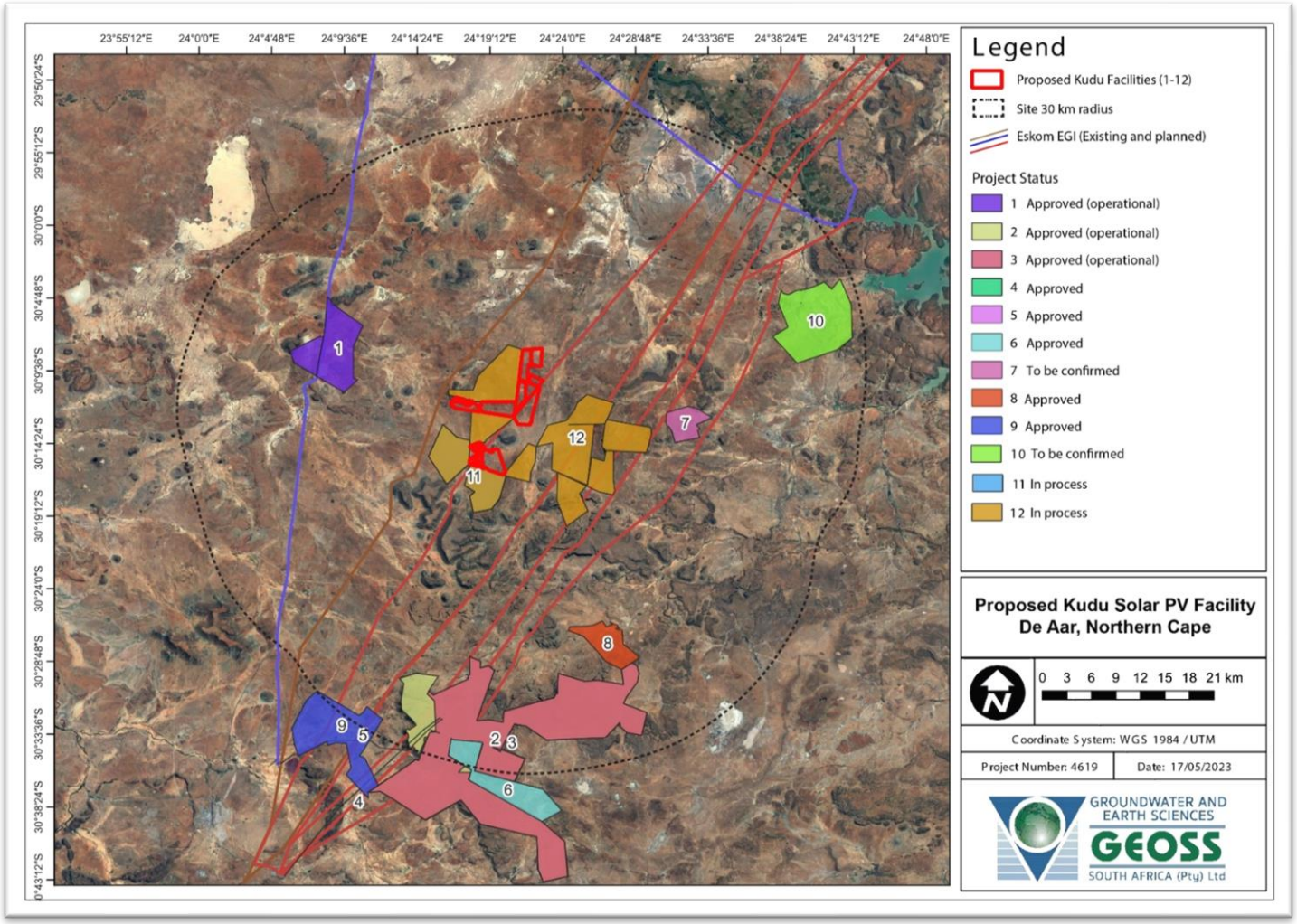
Impact	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential mitigation measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
OPERATIONAL PHASE						
Impact 1 *Increased unnatural hard surfaces*	*Status*	*Negative*	*Moderate*	▪ *Install drainage to divert stormwater away from activities, roads/tracks, structures, where required.* ▪ *Generic management for typical infrastructure of the proposed development, including:* *1. Stormwater Management Plan must be developed in the preconstruction phase and should detail the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems, where possible and lawful. Effective stormwater management must include effective stabilisation (gabions and Reno mattresses) of exposed soil etc.* *2. Suitable stormwater management systems must be installed along roads and other areas and monitored during the first few months of use. Any erosion / sedimentation must be resolved through any additional interventions that may be necessary (e.g., extension, energy dissipaters, spreaders, etc.).* *3. Sloped areas stabilised using design structures or vegetation as specified in the design to prevent erosion of embankments.* *4. No regular maintenance activities to take place outside of the authorised footprint and all vehicles to remain on authorised roads and tracks.*	*Low*	*Medium*
	Spatial Extent	*Regional*				
	Duration	*Long-term*				
	Consequence	*Substantial*				
	Probability	*Very likely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Moderate*				

Table 17-7: Cumulative Impact Summary Tables: Operational Phase (cont.)

Impact	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential mitigation measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
OPERATIONAL PHASE						
Impact 2 *Contamination of geologic materials*	*Status*	*Negative*	*Moderate*	▪ *During the execution of the operations, appropriate measures to prevent pollution and contamination of the riparian environment must be implemented e.g., including ensuring that construction equipment is well maintained.* ▪ *Provision must be made for refuelling at the storage area by protecting the soil with an impermeable groundcover/bunding. Where dispensing equipment is used, a drip tray must be used to ensure small spills are contained.* ▪ *Where refuelling away from the dedicated refuelling station is required, a mobile refuelling unit must be used. Appropriate ground protection such as drip trays must be used.* ▪ *Electrolyte spillage to be mitigated through double containment and suitably designed bunding for the structure, approved by a qualified professional.* ▪ *If spillages occur, they should be contained and removed as rapidly as possible, with correct disposal procedures of the spilled material, as reported. Proof of disposal (waste disposal slips or waybills) should be obtained and retained on file for auditing purposes.*	*Low*	*Medium*
	Spatial Extent	*Regional*				
	Duration	*Medium-term*				
	Consequence	*Substantial*				
	Probability	*Very likely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Moderate*				

Table 17-8: Cumulative Impact Summary Tables: Decommissioning Phase

Impact	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential mitigation measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
DECOMMISSIONING PHASE						
Impact 1 *Increase of unnatural hard surfaces*	*Status* *Spatial Extent* *Duration* *Consequence* *Probability* *Reversibility* *Irreplaceability*	*Negative* *Local* *Short term* *Substantial* *Likely* *Moderate* *Moderate*	*Moderate*	▪ *Only drive and park vehicles where necessary.* ▪ *Land rehabilitation to near natural state, i.e., removal of foundations and backfilling of any resultant voids within the soil, as well as removal of hard surfaced areas. Replacement soil should be sourced locally to ensure homogeneity.* ▪ *Reinstate natural topography where cut-to-fill embankments have been constructed.* ▪ *Implement generic environmental management procedures for infrastructure.*	*Low*	*Medium*
Impact 2 *Contamination of geologic materials*	*Status* *Spatial Extent* *Duration* *Consequence* *Probability* *Reversibility* *Irreplaceability*	*Negative* *Local* *Short term* *Substantial* *Likely* *Moderate* *Moderate*	*Moderate*	▪ *During the execution of the decommissioning, appropriate measures to prevent pollution and contamination of the riparian environment must be implemented e.g., including ensuring that equipment is well maintained;* ▪ *Provision must be made for refuelling at the storage area by protecting the soil with an impermeable ground cover. Where dispensing equipment is used, a drip tray must be used to ensure small spills are contained.* ▪ *Where refuelling away from the dedicated refuelling station is required, a mobile refuelling unit must be used. Appropriate ground protection such as drip trays must be used.* ▪ *If spillages occur, they should be contained and removed as rapidly as possible, with correct disposal procedures of the spilled material, as reported. Proof of disposal (waste disposal slips or waybills) should be obtained and retained on file for auditing purposes.*	*Low*	*Medium*



Map 17-7: Approved renewable energy projects within a 30 km radius from the proposed Kudu Solar Facility.

17.6.8 No-go Alternatives

In terms of the no-go alternative, if the proposed development does not go ahead, there will be no need for displacement and/or loss of topsoil in the area. However, to date, apart from the construction of farmhouses and the erection of boundary and subcamp fences for farming purposes; little disturbance of the subsoils and rocks in the area proposed for development has taken place. For this reason, the no-go alternative is considered of low significance. However, as noted above, the potential impacts of the proposed project from a geotechnical perspective are not considered to be very significant, especially if the recommended mitigation measures are adopted.

17.6.9 Battery Energy Storage System

Lithium-Ion BESS and Redox Flow BESS were both considered for the proposed project. For Redox Flow BESS, various chemical compositions are likely, such as Vanadium. Refer to Chapter 15 of this EIA Report for a High-Level Safety, Health and Environment Risk Assessment, which provides high level information on the safety, health and environmental risks of the BESS technologies.

Both Lithium Ion and Redox Flow BESS technologies have been assessed. It is important to note that the choice of technology will not be influenced by geotechnical factors, thus both options are considered suitable from a geotechnical standpoint.

17.7 Impact Assessment Summary

The overall impact significance findings, following the implementation of the proposed mitigation measures are shown in the Table 17-9.

Table 17-9: Overall Impact Significance (Post Mitigation)

Phase	**Overall Impact Significance**
Construction	Very Low
Operational	Very Low
Decommissioning	Very Low
Nature of Impact	**Overall Impact Significance**
Cumulative - Construction	Low
Cumulative - Operational	Low
Cumulative - Decommissioning	Low

The overall impact significance for all three phases of the Kudu Solar PV 3 Facility is considered very low, with the cumulative impacts for all of the Kudu Facilities and other relevant projects within a 30 km radius rated considered as Low, provided that responsible construction practises are adopted, and the proposed mitigation measures are utilised; for example, correct culvert design.

17.8 Legislative and Permit Requirements

This section has been divided as follows, based on the impacts that may transpire during the construction, operation and decommissioning phases of the proposed development:

- Loss of geological materials.
- Removal of geologic materials.
- Contamination of geologic materials as a consequence of typical maintenance activities.

From a permitting perspective, mining and quarrying on the proposed site is likely seen as a listed activity in terms of the NEMA, as amended. However, existing and permitted borrow pits will be used for the proposed projects, where necessary. Furthermore, where there may be existing services on the proposed development site and an excavation/wayleave permit may be required.

The norms and references given below are not exhaustive.

17.8.1 Loss of geologic materials (soil erosion)

Relevant legislation and guidelines pertaining to soil conservation, particularly soil erosion includes:

- Conservation of Agricultural Resources Act, 1983 (Act No 43 of 1983).
- Environmental Conservation Act, 1998 (Act No 73 of 1989).
- National Forestry Act, 1998 (Act No 84 of 1998, as amended).
- National Environmental Management Act, 1998 (Act No 107 of 1998), as amended.
- The Department of Water Affairs and Forestry, February 2005. Environmental Best Practice Specifications: Construction Integrated Environmental Management Sub-Series No. IEMS 1.6. Third Edition. Pretoria.

17.8.2 Contamination of geologic materials

Relevant literature pertaining to contamination of soil, includes:

- National Environmental Management: Waste Act, 2008 (Act No 59 of 2008).
- National Water Act, 1998 Act No 36 of 1998) Section 19.

17.9 Environmental Management Programme Inputs

From a Geotechnical point of view there are three main impacts caused by the different stages of the proposed development:

1. Displacement of geologic materials
2. The creation of unnatural hard surfaces
3. Contamination of geologic materials

From the impact assessment it can be anticipated that by displacing geological materials the existing soil conditions are disturbed and natural vegetation removed potentially causing soil erosion. Another impact that might further escalate erosion is the creation of unnatural hard surfaces i.e., road surfaces and stormwater drainage. Finally, potential contamination of geological material might be caused by spillages/leakages and maintenance procedures. Mitigating and monitoring of these impacts during the different phases of the project forms a vital part in the success of the development. Failing to implement mitigation and monitoring measures, the intensity of the different impacts may rise. All mitigation measures recommended in this assessment are included in the project EMPr. Listed below are the main EMPr inputs and management actions.

Construction Phase

The development of a stormwater management plan prior to the construction phase by a qualified professional is recommended. Suitable systems must preferably be installed along roads and other areas in order to divert water away from zones where the solar infrastructure is to be constructed. These systems should be monitored throughout the first few months of the construction phase during which any erosion/sedimentation should be resolved. It is recommended that rehabilitation commence soon after construction at the optimal time for vegetation establishment.

Provision should be made during refuelling operations to protect soil by means of impermeable ground cover. If spillages occur, they should be contained and removed as rapidly as possible with the correct disposal procedures. Ideally proof of disposal should be obtained and retained on file for auditing purposes.

Operational Phase

Similarly, to the construction phase it is recommended that a stormwater management plan to be implemented. It should preferably be designed by a qualified professional. This phase will potentially contain unnatural hard surfaces in the form of access roads, road layers, earth/concrete drains and, foundations. Similar to the construction phase, water should preferably be diverted away from road layers and erected structures.

It is recommended that similar mitigations and provisions with regards to spillages/leakages from the construction phase to be implemented during the operational phase. Additionally, proper designed bunding structures and double containment to be implemented at BESS to mitigate potential electrolyte spillage. It is recommended that the design should be approved by a qualified professional. Furthermore, maintenance of solar panels to be closely monitored and the use of hazardous chemical products to be avoided when solar panels are cleaned.

Decommissioning Phase

The main impacts are increased unnatural hard surfaces and the contamination of geological material. It is recommended that the natural topography to be reinstated and that rehabilitation of the land should take place to near natural state which might include but is not limited to the removal of foundations and hard surfaced areas followed by the backfilling of resultant voids. To ensure homogeneity, material utilised for backfilling and reinstating should be locally sourced. Implementation of generic environmental management procedures for infrastructure is highly recommended.

Appropriate measures should be in place to prevent pollution and contamination of the riparian zone e.g., well maintained equipment. Provision should be made during refuelling operations to protect soil by means of impermeable ground cover. If spillages occur, they should be contained and removed as rapidly as possible with the correct disposal procedures. Ideally proof of disposal should be obtained and retained on file for auditing purposes.

17.10 Final Specialist Statement and Authorisation Recommendation

17.10.1 Statement and Reasoned Opinion

Soil and rock conditions vary across the proposed Kudu Solar Facility study area resulting in the likely variation of geotechnical properties that might be encountered. These variations might influence foundation conditions, foundation designs, drainage properties, excavatability of soil and rock mass, and the occurrence of problem soils. It is, therefore, vital that an intrusive geotechnical study be undertaken prior to the development of Kudu Solar Facility to confirm the anticipated geotechnical conditions identified in this report.

The proposed Kudu Solar Facility may impact the environment by means of increased soil erosion and the contamination of geological material. It is understood that the main land use of the proposed development is livestock farming and it is therefore crucial that the potential impacts do not exceed the proposed footprints/buildable areas of Kudu Solar Facility. Although the impacts from neighbouring renewable facilities are notably similar to those of Kudu Solar Facility, cumulatively the intensity of these impacts can potentially increase if proper mitigation measures are not implemented. Proper designed mitigation measures should be implemented at all the Kudu Solar facilities to successfully suppress the intensities of impacts in order to achieve a low post mitigation significance.

Based on the geotechnical analysis conducted, it is recommended that the proposed Kudu Solar Facility be authorized, as no fatal flaws were found during this desktop assessment. However, it is crucial to implement appropriate mitigation measures at every phase of the project to minimize the intensity of the identified impacts.

The following conclusions are made:

1. Based on the findings of this geotechnical desktop study, development should proceed provided the mitigation measures are implemented.
2. Increased soil erosion and contamination may transpire as an impact of the proposed development, and this may persist for the life of the project. However, the impact of this is expected to be very low to low significance.
3. Published data for the area, e.g., geological map, is generally confirmed by fieldwork undertaken by GEOSS in the area. However, variable soil and rock conditions will exist across the site, broadly these have been divided as follows:
   Zone A – Karoo Sandstones and mudstones
   Zone B – Karoo dolerite
   Zone C – Areas of thicker soil cover (generally within drainage channels)
4. It is anticipated that conventional foundations can be employed for all structures. Karoo mudrock and sandstone should be avoided when selecting aggregates for concrete mixes.
5. The footprint of each proposed structure would have to be investigated prior to compilation of final design.
6. Owing to the variable geologic and soil conditions across the proposed development area, the subgrade conditions will vary across the site. Dolerite has been proven to perform well as an aggregate for wearing courses in other areas of the Karoo. Dolerite has also been incorporated as an aggregate in concrete mixes.
7. The excavatability of the stratum on site are anticipated to variable, based on material composition and texture, the degree of weathering, and the nature of discontinuities within the rock and/or soil mass.
8. The seismicity in the region should be considered during design.
9. Road cuttings and drainage systems should be designed by an appropriately qualified professional.
10. Detailed geotechnical investigations will need to be undertaken prior to construction. Such investigations would not be required to fulfil the requirements of the EIA process. However, it would be necessary prior to construction.
11. GEOSS has endeavored to highlight and characterise all potential geotechnical risks that are presented by the site that has been proposed for development. However, due to the anisotropic (variable) nature of earth materials, each point on the site will present results that differ. For this reason, it is considered of the utmost importance that the foundation excavations be inspected prior to casting to ensure that soil with an adequate bearing capacity is obtained beneath each footing, and/or piling conditions be assessed. These works should be carried out by an appropriately qualified individual, during construction of the facility.

17.10.2 EA Condition Recommendations

From the impact assessment it is evident that the development will have a very low to low impact significance on the local soil conditions and geology. As such, the project is authorised to continue from a geotechnical impact perspective with the following recommendations:

- The removal of vegetation should be kept to a minimum and only removed where necessary.
- A stormwater management plan should be developed prior to the construction phase by an accredited professional.
- The management plan should be managed throughout the duration of the project to successfully mitigate potential soil erosion.
- Rehabilitation of soil and geological material to commence during the construction phase, if possible, alternatively following the construction phase to allow successful re-vegetation.
- Authorised vehicles to only use proposed access points and roads and keep within the footprint of the facility.
- The land should be reinstated to natural or near natural conditions following decommissioning.
- Machinery and equipment to be maintained throughout the project.
- Ground protection measures to be implemented during maintenance and refuelling operations.
- Suitably designed bunding structures, double containment and leak detection to be implemented at BESS facilities.
- Spillages to be removed and contained as rapidly as possible.

17.11 References

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APPENDICES

APPENDIX A - SPECIALIST EXPERTISE

CURRICULUM VITAE – HARDY LUTTIG

GENERAL

Nationality:	South African
Profession:	Geotechnical / Engineering Geologist
Specialization:	Soil classification for engineering purposes. Groundwater exploration and sampling.
Date commenced	*09 January 2023*
Year of birth & ID #:	1993 – 930725 514 60 86
Language skills:	Afrikaans (mother tongue, good - speaking, reading and writing), English (good - speaking, reading and writing)

KEY SKILLS

- Geotechnical site investigation and site assessment.
- Field mapping
- Rock & soil profiling
- Material classification and material use determination.
- Hydrocensus studies
- Borehole drilling supervision and analysis
- Groundwater monitoring - development and analysis of groundwater level and quality data.
- ArcGIS, QGIS

EDUCATIONAL AND PROFESSIONAL STATUS

Qualifications

2018	MEng (Geotechnical Engineering)	University of Stellenbosch, South Africa
2015	PDIP (Geotechnical Engineering)	University of Stellenbosch, South Africa
2014	B.Sc Earth Science	University of Stellenbosch, South Africa

EMPLOYMENT RECORD

January 2023 to present	GEOSS South Africa (PTY) Ltd
January 2019 to December 2022	Martin & East (PTY) Ltd
January 2018 to October 2018	Ndodana Consulting Engineers (PTY) Ltd

CURRICULUM VITAE – SHANE TEEK

GENERAL

Nationality:	South African
Profession:	Geotechnical Specialist & Hydrogeologist
Specialization:	Soil classification for engineering purposes. Groundwater exploration and sampling.
Position in firm:	Geotechnical Geologist & Hydrogeologist at GEOSS – South Africa (Pty) Ltd.
Date commenced:	17 July 2021
Year of birth & ID #:	1994 – 9404135162084
Language skills:	English (good – speaking, reading, and writing) Afrikaans (good - speaking, reading, and writing).

KEY SKILLS

- Geotechnical investigations
- Compilation of factual reports.
- Field mapping.
- Soil and rock profiling.
- Material classification and material use determination.
- Supervision of geotechnical contractors.
- Groundwater geophysics and conducting hydrocensus studies.
- Groundwater development - borehole drilling and test pumping supervision and analysis.
- Groundwater monitoring - development and analysis of groundwater level and quality data.
- Groundwater management - sustainable aquifer development and management.
- Groundwater contamination assessments.
- ArcGIS, QGIS, Python, FLAC/SLOPE, Midas GTS NX.

EDUCATIONAL AND PROFESSIONAL STATUS

Qualifications

2021	M.Eng. (Civil Engineering – Cum Laude)	University of the Stellenbosch, South Africa
2016	B.Sc. Hons. (Earth Science)	University of the Stellenbosch, South Africa
2015	B.Sc. (Geology: Earth Science)	University of the Stellenbosch, South Africa

Memberships

- Geological Society of South Africa – Member No. 970413
- South African Council for National Scientific Professions (SACNASP) Mem. No. 126397/20
- Founding member of the UNESCO Groundwater Youth Network (GWYN)

EMPLOYMENT RECORD

July 2021 to present	GEOSS South Africa (Pty) Ltd, South Africa
Jan 2020 to June 2021	Geotechnics Africa Western Cape, South Africa
Feb 2019 to July 2019	Polytechnique Montréal, Canada
Jan 2017 to Dec 2017	Remote Exploration Services, South Africa.

CURRICULUM VITAE – DALE BARROW

GENERAL

Nationality:	South African
Profession:	Hydrogeologist
Firm:	GEOSS South Africa (Pty) Ltd
Position:	Director and Hydrogeologist
Specialization:	Groundwater exploration, development, management and monitoring including numerical modeling. Hydrogeological impact studies and assessment of groundwater – surface water interaction.
Date commenced:	February 2008
Year of birth & ID #:	1985 – 851205 5227 082
Language skills:	English (mother tongue), Afrikaans (average)

KEY SKILLS

- Project Management
- Hydrogeological technical input on projects
- Groundwater surface water interaction assessment
- Groundwater exploration - (aerial photo interpretation, resistivity, magnetic and EM34 geophysical surveys for borehole siting purposes, geological conceptualization)
- Groundwater development - borehole drilling and test pumping supervision and analysis.
- Groundwater monitoring –development and analysis of groundwater level and quality data.
- Groundwater management – sustainable aquifer development and management.
- Numerical modelling of groundwater flow and mass transport.
- Groundwater component of Catchment Management Strategies and other Groundwater Resource Directed Measures.
- Groundwater contamination assessments.
- GIS / WISH and GW Vistas and typical software skills.

EDUCATIONAL AND PROFESSIONAL STATUS

Qualifications

2017	MBA (Cum Laude)	University of Stellenbosch, South Africa
2010	M.Sc. (Geohydrology)	University of the Free State, South Africa
2007	B.Sc (Hons) Structural Geology	University of Stellenbosch, South Africa
2006	B.Sc Geology – Applied Earth Science	University of Stellenbosch, South Africa

Courses

2019 Water Governance in South Africa: IWRM, the NWA, and water use authorizations, focusing on WULAs and IWWMPs. WISA accredited. Carin Bosman (CBSS)
2016 SPRING Software Modelling Course
2015 European Management Residency in Economics and Business (Maastricht University School of Business and Economics)
2013 Aquifer Firm Yield; Wellfield Design; Wellfield costing
2010 Introduction to QGIS (GISSA)
2010 Presentation Skills (Elsabé Daneel productions cc)
2009 Introduction to Isotope Hydrology in Southern Africa (GSSA)
2009 Aquifer Mechanics (IGS-UOFS)
2009 Groundwater Chemistry (IGS-UOFS)

2009 Groundwater Geophysics (IGS-UOFS)
2009 Groundwater Modelling (IGS-UOFS)
2009 Groundwater Management (IGS-UOFS)

Memberships

- Groundwater Division of the Geological Society of South Africa
- South African Council for National Scientific Professions (SACNASP) Mem. No. 400289/13

EMPLOYMENT RECORD

1 February 2008 to present:	GEOSS – Geohydrological and Spatial Solutions International (Pty) Ltd, Stellenbosch
23 July 2018 - November 2019	Design and part time lecturing of the Hydrogeology course for 3rd year students at Stellenbosch University

APPENDIX B - SPECIALIST STATEMENT OF INDEPENDENCE

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Scoping and Environmental Impact Assessment Processes for the Proposed Development of 12 Solar Photovoltaic (PV) Facilities and associated infrastructure (i.e. Kudu Solar Facility 1 - 12), near De Aar, Northern Cape

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
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5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

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Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

Details of Specialist, Declaration and Undertaking Under Oath

Page 1 of 3

1. SPECIALIST INFORMATION

Specialist Company Name:	GEOSS South Africa (Pty) Ltd.			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	3	Percentage Procurement recognition	110%
Specialist name:	**Hardy Luttig**			
Specialist Qualifications:	B.Sc. Earth Sciences; MEng Civil (Geotechnical Engineering)			
Professional affiliation/registration:	SACNASP (Pending)			
Physical address:	Unit 12, Techno Stell Bldg, 09 Quantum Street, Techno Park, Stellenbosch			
Postal address:	PO Box 12412, Die Boord, Stellenbosch			
Postal code:	7613	Cell:	082 397 7182	
Telephone:	021 880 1079	Fax:	n/a	
E-mail:	hluttig@geoss.co.za			

2. DECLARATION BY THE SPECIALIST

I, **Hardy Luttig**, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist

GEOSS SOUTH AFRICA (PTY) LTD

Name of Company:

07 July 2023

Details of Specialist, Declaration and Undertaking Under Oath

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, **Hardy Luttig**, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the Specialist

GEOSS SOUTH AFRICA (PTY) LTD
Name of Company

07 July 2023
Date

Signature of the Commissioner of Oaths

07 July 2023
Date

7/7/23
Ex officio COMMISSIONER OF OATHS (RSA)
Samantha Schoeman ACMA – 1-7FUWGN
The Boulevard Office Park, Block B
Ground Floor, Searle Street, Woodstock, 7925

Details of Specialist, Declaration and Undertaking Under Oath

Page 3 of 3

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

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Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Scoping and Environmental Impact Assessment Processes for the Proposed Development of 12 Solar Photovoltaic (PV) Facilities and associated infrastructure (i.e. Kudu Solar Facility 1 - 12), near De Aar, Northern Cape

Kindly note the following:

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Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

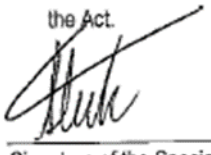
1. SPECIALIST INFORMATION

Specialist Company Name:	GEOSS SOUTH AFRICA (PTY) LTD			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	3	Percentage Procurement recognition	110%
Specialist name:	SHANE TEEK			
Specialist Qualifications:	MEng – Civil Engineering			
Professional affiliation/registration:	SACNASP: 126397			
Physical address:	Unit 12, Techno Stell Bldg, 09 Quantum Street, Techno Park, Stellenbosch			
Postal address:	PO Bo12412, Die Boord, Stellenbosch			
Postal code:	7613	Cell:	079 183 7782	
Telephone:	021 880 1079	Fax:	n/a	
E-mail:				

2. DECLARATION BY THE SPECIALIST

I, SHANE TEEK, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.



Signature of the Specialist

GEOSS SOUTH AFRICA (PTY) LTD

Name of Company:

28 November 2022

Date

Details of Specialist, Declaration and Undertaking Under Oath

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, SHANE TEEK, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the Specialist

GEOSS SOUTH AFRICA (PTY) LTD

Name of Company

28 November 222

Date

Samantha Schoeman
ACMA 1-7 FUNGN
17 Schoongezicht Ste, Heldervue, 7130

Signature of the Commissioner of Oaths

29/11/2022

Date

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

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1. SPECIALIST INFORMATION

Specialist Company Name:	**GEOSS SOUTH AFRICA (PTY) LTD**			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	**3**	Percentage Procurement recognition	**110%**
Specialist name:	**DALE BARROW**			
Specialist Qualifications:	MSc in Hydrogeology			
Professional affiliation/registration:	SACNASP: 400289/13			
Physical address:	Unit 12, Techno Stell Bldg, 09 Quantum Street, Techno Park, Stellenbosch			
Postal address:	PO Box 12412, Die Boord, Stellenbosch			
Postal code:	7613	Cell:	074 172 2862	
Telephone:	021 880 1079	Fax:	n/a	
E-mail:	dbarrow@geoss.co.za			

2. DECLARATION BY THE SPECIALIST

I, **Dale Barrow,** declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist

GEOSS SOUTH AFRICA (PTY) LTD

Name of Company:

07 July 2023

Date

Details of Specialist, Declaration and Undertaking Under Oath

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, Dale Barrow, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the Specialist

GEOSS SOUTH AFRICA (PTY) LTD

Name of Company

07 July 2023

Date

Signature of the Commissioner of Oaths

07 July 2023

Date

Ex officio COMMISSIONER OF OATHS (RSA)
Samantha Schoaman ACMA - 1-7FUWGN
The Boulevard Office Park, Block B
Ground Floor, Searle Street, Woodstock, 7925

Details of Specialist, Declaration and Undertaking Under Oath

APPENDIX C - SITE SENSITIVITY VERIFICATION

Geotechnical themes do not exist on the National Web-based Environmental Screening Tool (Screening Tool) (as of May 2023); therefore, the environmental sensitivity of the proposed project area as identified by the Screening Tool is not applicable. For this reason, no site sensitivity verification report is required. Furthermore, there is no dedicated assessment protocol prescribed for conducting a Desktop Geotechnical Assessment. Therefore, this specialist assessment has been undertaken in compliance with Appendix 6 of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) Environmental Impact Assessment (EIA) Regulations of 2014. However, GEOSS had previously undertaken a site visit during the undertaking of the separate groundwater specialist assessment (Chapter 16 of this EIA Report), the details of which are indicated below:

Date of Site Visit	23-24 March 2022
Specialist Name	Christel van Staden and Dale Barrow
Professional Registration Number	Cand.Sci.Nat: 122591 and Pr.Sci.Nat: 400289/13
Specialist Affiliation / Company	GEOSS

The relevant data collected during the hydrogeological site visit have been considered in this report. For example, no additional/unmapped rock types or sedimentary deposits were identified. Therefore, the desktop analysis of the geotechnical conditions is considered to be appropriate for the scope of the present investigation.

All relevant desktop information, consultation with landowners, and previous assessments undertaken by the author in the study area have been taken into consideration during the undertaking of this specialist desktop geotechnical assessment.

The hydrogeological site visit was undertaken using the following means:

(a) desk top analysis, using satellite imagery; geological maps and hydrogeological and geotechnical reports and databases where possible and applicable.
(b) preliminary on-site inspection; and drive over.
(c) collected water samples, field chemistry and water levels where possible and relevant; assessed site conditions to determine whether literature information is generally confirmed.

APPENDIX D - IMPACT ASSESSMENT METHODOLOGY

The impact assessment includes:

- *the nature, status, significance and consequences of the impact and risk;*
- *the extent and duration of the impact and risk;*
- *the probability of the impact and risk occurring;*
- *the degree to which impacts and risks can be mitigated;*
- *the degree to which the impacts and risks can be reversed; and*
- *the degree to which the impacts and risks can cause loss of irreplaceable resources.*

Terminology used in impact assessment can overlap. To avoid ambiguity, please note the following clarifications (that are based on NEMA and the EIA Regulations):

- *The term environment is understood to have a broad interpretation that includes both the natural (biophysical) environment and the socio-economic environment. The term socio-ecological system is also used to describe the natural and socio-economic environment and the interactions amongst these components.*
- *Significance = Consequence x Probability, which means that significance is equivalent to risk.*
- *The impact can have a positive or negative status. The significance of a negative impact may be called a risk, and the significance of a positive impact may be called an opportunity.*

The following principles are to underpin the application of this methodology:

- *Transparent and repeatable process - specialists are to describe the thresholds and limits they apply in their assessment, wherever possible.*
- *Adapt parameters to context (where justified) – the methodology proposes some thresholds (e.g. for spatial extent, in Step 3 below), however, if the nature of the impact requires a different definition of the categories of spatial extent, then this can be provided and described.*
- *Combination of a quantitative and qualitative assessment – where possible, specialists are to provide quantitative assessments (e.g. areas of habitat affected, decibels of noise, number of jobs), however, it is recognised that not all impacts can be quantified, and then qualitative assessments are to be provided.*

As per the DFFE Guideline 5: Assessment of Alternatives and Impacts, the following methodology is applied to the prediction and assessment of impacts and risks. Potential impacts and risks have been rated in terms of the direct, indirect and cumulative:

- *Direct impacts are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.*
- *Indirect impacts of an activity are indirect or induced changes that may occur as a result of the activity. These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.*
- *Cumulative impacts are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities. Cumulative impacts can occur from the collective*

impacts of individual minor actions over a period of time and can include both direct and indirect impacts.

The impact assessment methodology includes the aspects described below.

- ***Step 1**: **Nature** of impact/risk - The type of effect that a proposed activity will have on the environment.*

- ***Step 2**: **Status** - Whether the impact/risk on the overall environment will be:*
  - *Positive - environment overall will benefit from the impact/risk;*
  - *Negative - environment overall will be adversely affected by the impact/risk; or*
  - *Neutral - environment overall not be affected.*

- ***Step 3**: **Qualitatively** determine the **consequence** of the impact/risk by identifying the **a) SPATIAL EXTENT; b) DURATION; c) REVERSIBILITY; AND d) IRREPLACEABILITY**.*

  - ***A) Spatial extent** – The size of the area that will be affected by the impact/risk:*
    - *Site specific;*
    - *Local (<10 km from site);*
    - *Regional (<100 km of site);*
    - *National; or*
    - *International (e.g., Greenhouse Gas emissions or migrant birds).*

  - ***B) Duration** – The timeframe during which the impact/risk will be experienced:*
    - *Very short term (instantaneous);*
    - *Short term (less than 1 year);*
    - *Medium term (1 to 10 years);*
    - *Long term (the impact will cease after the operational life of the activity (i.e., the impact or risk will occur for the project duration)); or*
    - *Permanent (mitigation will not occur in such a way or in such a time span that the impact can be considered transient (i.e., the impact will occur beyond the project decommissioning)).*

  - ***C) Reversibility** of the Impacts - the extent to which the impacts/risks are reversible assuming that the project has reached the end of its life cycle (decommissioning phase):*
    - *High reversibility of impacts (impact is highly reversible at end of project life i.e., this is the most favourable assessment for the environment);*
    - *Moderate reversibility of impacts;*
    - *Low reversibility of impacts; or*
    - *Impacts are non-reversible (impact is permanent, i.e., this is the least favourable assessment for the environment).*

  - ***D) Irreplaceability** of Receiving Environment/Resource Loss caused by impacts/risks – the degree to which the impact causes irreplaceable loss of resources assuming that the project has reached the end of its life cycle (decommissioning phase):*

- *High irreplaceability of resources (project will destroy unique resources that cannot be replaced, i.e., this is the least favourable assessment for the environment);*
- *Moderate irreplaceability of resources;*
- *Low irreplaceability of resources; or*
- *Resources are replaceable (the affected resource is easy to replace/rehabilitate, i.e., this is the most favourable assessment for the environment).*

Some of the criteria are quantitative (e.g., spatial extent and duration) and some may be described in a quantitative or qualitative manner (e.g., reversibility and irreplaceability). The specialist then combines these criteria in a qualitative manner to determine the ***consequence****.*

The consequence terms ranging from slight to extreme must be calibrated per Specialist Study so that there is transparency and consistency in the way a risk/impact is measured. For example, from a biodiversity and ecology perspective, the consequence ratings could be defined according to a reduction in population or occupied area in relation to Species of Conservation Concern (SCC) status, ranging from slight consequence for defined areas of Least Concern, to extreme consequence for defined areas that are Critically Endangered. For example, from a social perspective, a slight consequence could refer to small and manageable impacts, or impacts on small sections of the community; a moderate consequence could refer to impacts which affect the bulk of the local population negatively or may produce a net negative impact on the community; and an extreme consequence could refer to impacts which could result in social or political violence or institutional collapse.

- ***Consequence*** *– The anticipated consequence of the risk/impact is generally defined as follows:*
  - *Extreme (extreme alteration of natural or socio-economic systems, patterns or processes, i.e., where environmental or socio-economic functions and processes are altered such that they permanently cease*);
  - *Severe (severe alteration of natural or socio-economic systems, patterns or processes, i.e., where environmental or socio-economic functions and processes are altered such that they temporarily or permanently cease);*
  - *Substantial (substantial alteration of natural or socio-economic systems, patterns or processes, i.e., where environmental or socio-economic functions and processes are altered such that they temporarily or permanently cease;*
  - *Moderate (notable alteration of natural or socio-economic systems, patterns or processes, i.e., where the natural or socio-economic environment continues to function but in a modified manner; or*
  - *Slight (negligible and transient alteration of natural or socio-economic systems, patterns or processes, i.e., where natural systems/environmental or socio-economic functions, patterns, or processes are not affected in a measurable manner, or if affected, that effect is transient and the system recovers).*

- ***Step 4****: Rate the* ***probability*** *of the impact/risk using the criteria below:*

  - ***Probability*** *– The probability of the impact/risk occurring:*
    - *Extremely unlikely (little to no chance of occurring);*
    - *Very unlikely (<30% chance of occurring);*

- *Unlikely (30-50% chance of occurring)*
- *Likely (51 – 90% chance of occurring); or*
- *Very Likely (>90% chance of occurring regardless of prevention measures).*

- ***Step 5**: Use both the **consequence** and **probability** to determine the **significance** of the identified impact/risk (qualitatively as shown in* Figure 17-6*). Significance definitions and rankings are provided below:*

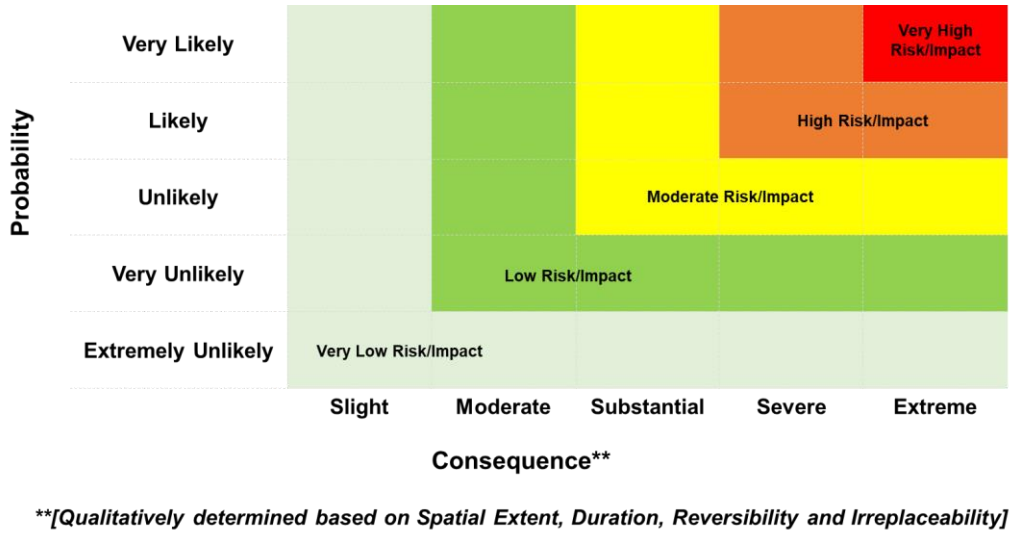


Figure 17-6: Guide to assessing risk/impact significance as a result of consequence and probability.

- ***Significance** – Will the impact cause a notable alteration of the environment?*
  - *Very low (the risk/impact may result in very minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making);*
  - *Low (the risk/impact may result in minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making);*
  - *Moderate (the risk/impact will result in moderate alteration of the environment and can be reduced or avoided by implementing the appropriate mitigation measures, and will only have an influence on the decision-making if not mitigated);*
  - *High (the risk/impact will result in major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making); and*
  - *Very high (the risk/impact will result in very major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making (i.e., the project cannot be authorised unless major changes to the engineering design are carried out to reduce the significance rating)).*

With the implementation of mitigation measures, the residual impacts/risks are ranked as follows in terms of significance:

- *Very low = 5;*
- *Low = 4;*
- *Moderate = 3;*
- *High = 2; and*
- *Very high = 1.*

The specialists must provide a written supporting motivation of the assessment ratings provided.

- ***Step 6**: Determine the **Confidence Level** – The degree of confidence in predictions based on available information and specialist knowledge:*
    - *Low;*
    - *Medium; or*
    - *High.*

APPENDIX E - COMPLIANCE WITH THE APPENDIX 6 OF THE 2014 EIA REGULATIONS (AS AMENDED)

Requirements of Appendix 6 (Specialist Reports) of Government Notice R326 (Environmental Impact Assessment (EIA) Regulations of 2014, as amended)	***Section where this has been addressed in the Specialist Report***
1. (1) A specialist report prepared in terms of these Regulations must contain - *a) details of -* *i. the specialist who prepared the report; and* *ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;*	*Section 17.1.2* *Appendix A*
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	*Appendix B*
c) an indication of the scope of, and the purpose for which, the report was prepared;	*Section 17.1.1 and Section 17.1.3*
(car) an indication of the quality and age of base data used for the specialist report;	*Section 17.2.1*
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	*Section 17.4, Section 17.6*
d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	*Section 17.1, Section 17.2 and Appendix C*
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	*Section 17.2*
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	*Sections 17.2, Section 17.4 and 17.6*
g) an identification of any areas to be avoided, including buffers;	*Sections 17.4 & 17.6*
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	*Section 17.4 and Section 17.6*
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	*Section 17.2*
j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	*Section 17.6*
k) any mitigation measures for inclusion in the EMPr;	*Section 17.6 and Section 17.9*
l) any conditions for inclusion in the environmental authorisation;	*Sections 17.6 and 17.10*
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	*Sections 17.6, Section 17.9 and 17.10*
n) a reasoned opinion- *i. whether the proposed activity, activities or portions thereof should be authorised;* *(iA) regarding the acceptability of the proposed activity or activities; and* *ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;*	*Section 17.10*
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	*Section 17.2*
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	*Section 17.2 and Section 17.5*
q) any other information requested by the competent authority.	*n/a*
(2) Where a government notice by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	*There is no specific Assessment Protocol devised for Geotechnical Assessments. Therefore, Part*

Requirements of Appendix 6 (Specialist Reports) of Government Notice R326 (Environmental Impact Assessment (EIA) Regulations of 2014, as amended)	***Section where this has been addressed in the Specialist Report***
	A of the March 2020 Assessment Protocol (GN 320) applies, which refers to Appendix 6 of the 2014 NEMA EIA Regulations (as amended).

APPENDIX F - APPROVED RENEWABLE ENERGY PROJECTS

Table 17-10: Approved renewable energy projects, located within 30 km of the proposed Kudu Solar Facility.

CSIR NUMBER	DFFE REFERENCE	TECHNOLOGY	MW/ KV	STATUS	PROJECT TITLE	EIA REGULATIONS	ASSESSMENT PROCESS	APPLICANT	EAP
1	12/12/20/2258 12/12/20/2258/1	Solar PV	75	Approved and Preferred Bidder (Operational)	The Proposed Establishment of Photovoltaic (Solar Power) Farms in the Northern Cape Province - Kalkbult	2010	Scoping and EIA	Scatec Solar SA Pty Ltd	Sustainable Development Projects cc
2	12/12/20/2463/1 12/12/20/2463/1/2 12/12/20/2463/1/A2 12/12/20/2463/1/AM3 12/12/20/2463/1/AM4 12/12/20/2463/1/AM5	Onshore Wind	140	Approved and Preferred Bidder (Operational)	Longyuan Mulilo De Aar 2 North Wind Energy Facility Longyuan Mulilo De Aar Maanhaarberg Wind Energy Facility The Wind Energy Facility (North and South) situated on the Plateau Near De Aar, Northern Cape Province	2010 and 2014	Scoping and EIA and Amendment	Longyuan Mulilo De Aar 2 South (Pty)	Aurecon South Africa (Pty) Ltd and Holland and Associates Environmental Consultants
3	12/12/20/2463/2 12/12/20/2463/2/AM2	Onshore Wind	100	Approved and Preferred Bidder (Operational)	Longyuan Mulilo De Aar Maanhaarberg Wind Energy Facility The Wind Energy Facility (North and South) Situated On The Plateau Near De Aar, Northern Cape Province	2010 and 2014	Scoping and EIA and Amendment	Mulilo Renewable Energy (Pty) Ltd	Aurecon South Africa (Pty) Ltd
4	14/12/16/3/3/1/1166 14/12/16/3/3/1/1166/AM3 14/12/16/3/3/1/1166/AM4	Transmission line	132	Approved	Basic Assessment for the proposed construction of a 132 kV transmission line corridor adjacent to the existing Eskom transmission line from	2010 and 2014	Basic Assessment	Longyuan Mulilo De Aar 2 North (Pty) Ltd	Aurecon South Africa (Pty) Ltd

CSIR NUMBER	DFFE REFERENCE	TECHNOLOGY	MW/ KV	STATUS	PROJECT TITLE	EIA REGULATIONS	ASSESSMENT PROCESS	APPLICANT	EAP
					Longyuan Mulilo De Aar 2 North Wind Energy Facility (WEF) to the Hydra Substation in De Aar, Northern Cape				
5	14/12/16/3/3/1/785	Transmission line	132	Approved	Proposed construction of two 132kV transmission lines from the South & North Wind Energy Facilities on the Eastern Plateau (De Aar 2) near De Aar, Northern Cape.	2010	Basic Assessment	Mulilo Renewable Energy (Pty) Ltd	Aurecon South Africa (Pty) Ltd
6	14/12/16/3/3/2/278 14/12/16/3/3/2/278/1 14/12/16/3/3/2/278/2	Onshore Wind	118	Approved	Proposed Castle Wind Energy Facility Project, located near De Aar, Northern Cape	2010 and 2014	Scoping and EIA	Castle Wind Farm (Pty) Ltd	Aurecon South Africa (Pty) Ltd; and Savannah Environmental Consultants (Pty) Ltd
7	14/12/16/3/3/2/564 14/12/16/3/3/2/564/AM1 14/12/16/3/3/2/564/AM2	Solar PV	75	To be confirmed	Proposed Swartwater 75MW solar PV power facility in Petrusville within Renosterburg Local Municipality, Northern Cape	2010 and 2014	Scoping and EIA and Amendment	AE-AMD Renewable Energy (Pty) Ltd	USK Environmental and Waste Engineering (Pty) Ltd
8	14/12/16/3/3/2/740	Solar PV	300	Approved	Proposed 300MW Solar Power Plant in Phillipstown area in Renosterberg Local Municipality	2010	Scoping and EIA	To be confirmed	Tshikovha Environmental and Communication Consultants
9	14/12/16/3/3/2/744	Solar PV	0	Approved	Proposed PV facility on farm Jakhalsfontein near De Aar	2010	Scoping and EIA	Solar Capital (Pty) Ltd	Eco Compliance (Pty) Ltd
10	14/12/16/3/3/2/739	Solar PV	70 - 100	To be confirmed	Proposed 70 - 100 MW Solar Power Plant in Petrusville	2010	Scoping and EIA	To be confirmed	Tshikovha Environmental and Communication Consultants

CSIR NUMBER	DFFE REFERENCE	TECHNOLOGY	MW/ KV	STATUS	PROJECT TITLE	EIA REGULATIONS	ASSESSMENT PROCESS	APPLICANT	EAP
11	Not issued yet (it is understood that the project is still within the pre-application stage)	Solar PV	800 (Maximum)	Pre-Application	The Proposed Keren Energy Odyssey Solar PV Facilities (Odyssey Solar 1, Odyssey Solar 2, Odyssey Solar 3, Odyssey Solar 4, Odyssey Solar 5, Odyssey Solar 6, Odyssey Solar 7 And Odyssey Solar 8)	2014	Scoping and EIA	Keren Energy Group Holdings	EnviroAfrica cc
12	To be confirmed	Solar PV	3050	Scoping	The Proposed Development of the Crossroads (formally referred to as the Hydra B) Green Energy Cluster of Renewable Energy Facilities and Grid Connection Infrastructure, Pixley Ka Seme District Municipality, Northern Cape Province. The Cluster entails the development of up to 21 solar energy facilities, with the Scoping and EIA Processes consisting of three phases. Phases 1, 2 and 3 consist of 9, 6 and 6 solar facilities, respectively. The Phase 1 Scoping and EIA Processes were launched in January 2023.	2014	Scoping and EIA	Akuo Energy Afrique	Savannah Environmental Consultants (Pty) Ltd
Study area shown on map	14/12/16/3/3/2/2244 14/12/16/3/3/2/2245 14/12/16/3/3/2/2246 14/12/16/3/3/2/2247 14/12/16/3/3/2/2248 14/12/16/3/3/2/2249	Solar PV	2180	Scoping and EIA Process underway	Proposed Development of 12 Solar Photovoltaic (PV) Facilities (Kudu Solar Facility 1 to 12) and associated infrastructure, near De Aar, Northern Cape Province	2014	Scoping and EIA	Kudu Solar Facility 1 (Pty) Ltd to Kudu Solar Facility 12 (Pty) Ltd	CSIR

CSIR NUMBER	DFFE REFERENCE	TECHNOLOGY	MW/ KV	STATUS	PROJECT TITLE	EIA REGULATIONS	ASSESSMENT PROCESS	APPLICANT	EAP
	14/12/16/3/3/2/2250 14/12/16/3/3/2/2251 14/12/16/3/3/2/2252 14/12/16/3/3/2/2253 14/12/16/3/3/2/2254 14/12/16/3/3/2/2255								
Shown on map as Existing HV Lines	N/A	Transmission Line	220	Existing Power Line	HYDRA ROODEKUIL 2	-	-	-	-
Shown on map as Existing HV Lines	N/A	Transmission Line	132	Existing Power Line	HYDRA ROODEKUIL 1	-	-	-	-
Shown on map as Existing HV Lines	N/A	Transmission Line	765	Existing Power Line	BETA HYDRA 2	-	-	-	-
Shown on map as Existing HV Lines	N/A	Transmission Line	400	Existing Power Line	HYDRA PERSEUS 3	-	-	-	-
Shown on map as Existing HV Lines	N/A	Transmission Line	220	Existing Power Line	VAN DER KLOOF ROODEKUIL 2	-	-	-	-
Shown on map as Existing HV Lines	N/A	Transmission Line	220	Existing Power Line	VAN DER KLOOF ROODEKUIL 1	-	-	-	-
Shown on map as	N/A	Transmission Line	400	Existing Power Line	BETA HYDRA 1	-	-	-	-

CSIR NUMBER	DFFE REFERENCE	TECHNOLOGY	MW/ KV	STATUS	PROJECT TITLE	EIA REGULATIONS	ASSESSMENT PROCESS	APPLICANT	EAP
Existing HV Lines									
Shown on map as Existing HV Lines	N/A	Transmission Line	400	Existing Power Line	HYDRA PERSEUS 2	-	-	-	-
Shown on map as Existing HV Lines	N/A	Transmission Line	132	Existing Power Line	KALKBULT/KAREEBOSCHPAN 1	-	-	-	-
Shown on map as Existing HV Lines	N/A	Transmission Line	132	Existing Power Line	ROODEKUIL/ORANIA 1	-	-	-	-
Shown on map as Planned HV Lines	N/A	Transmission Line	765	Planned Power Line	Perseus to Gamma 2nd 765 kV line Cape Corridor Phase 4: 2nd Zeus-Per-Gam-Ome 765kV Line	-	-	-	-
Shown on map as Planned HV Lines	N/A	Transmission Line	765	Planned Power Line	Relocate Beta-Hydra 765kV line to form Perseus-Hydra 1st 765kV line Cape Corridor Phase 2: Zeus - Hydra 765kV Integration	-	-	-	-
Shown on map as Planned HV Lines	N/A	Transmission Line	765	Planned Power Line	Perseus to Gamma 2nd 765 kV line Cape Corridor Phase 4: 2nd Zeus-Per-Gam-Ome 765kV Line	-	-	-	-

APPENDIX G - RELEVANT GEOTECHNICAL LITERATURE & INFORMATION

G.1 Sandstones and mudstones (Zone A)

Karoo sandstone is often not desirable in construction, e.g. as an aggregate, as it may cause concrete to deteriorate over time (Brink, 1977). In this regard, the following has been observed when making use of Karoo sandstones in construction (after Brink, 1983):

1. Deflection and shrinkage of reinforced members.
2. Corrosion of reinforcing steel.
3. Coincident cracking of concrete and reinforcement.
4. Surface crazing or pattern cracking.
5. Premature distress of roads constructed using aggregates derived from Karoo sandstones.

Control of material properties is required when making use of Karoo sandstones in construction.

Table 17-11: Strength and deformation characteristics of some Karoo Sandstones (Brink, 1983).

		Vryheid Formation*			Estcourt Formation			
		UCS (MPa)	E_t (GPa)	Bulk density (kg/m³)	UCS (MPa)	$E_{t(50)}$ (GPa)	Poisson's ratio ν	Bulk density (kg/m³)
Maximum	x_m	44,7	11,364	2 493	271	13,4	0,28	2 660
Minimum	x_m	8,6	0,621	2 356	57	5,9	0,06	2 350
Mean	$\bar{x}$	27,0	2,426	2 421	116	9,9	0,14	2 473
Number of tests	n	17	17	17	20	9	9	3
Standard deviation	S	12,3	2,9	43,6	56,5	2,43	0,08	164
Coefficient of variation	S/$\bar{x}$	0,45	1,18	0,02	0,49	0,25	0,57	0,07

UCS = Unconfined compressive strength
E_t = Tangent modulus
$E_{t(50)}$ = Tangent modulus at 50 per cent ultimate strength
*Data provided by W. J. Neely.

Table 17-12: Geotechnical properties of Ecca Group sandstone at Matimba Power Station (Brink, 1983).

		Density (kg/m³)	UCS (MPa)	Secant modulus (GPa)	Poisson's ratio ν	Point load index (MPa)
Maximum	x_M	2 452,0	83,2	49,7	0,21	7,2
Minimum	x_m	2 332,8	46,6	19,6	0,11	0,1
Mean	$\bar{x}$	2 394,6	69,1	36,1	0,16	2,9
Number of tests	n	19	19	19	19	20
Standard deviation	S	31,7	8,9	10	0,04	1,9
Coefficient of variation	$S/\bar{x}$	0,01	0,13	0,28	0,25	0,66

Table 17-13: Drying and shrinkage determinations on some sandstones of the Beaufort Group (Brink, 1983).

Subgroup	Locality	Reference	Depths below surface	Linear shrinkage per cent	
				Specimen cut parallel to bedding	Specimen cut 90° to bedding
Adelaide	Graaff-Reinet municipal quarry	Stutterheim (1954)	Quarry face near surface	0,038	0,058
Adelaide	Adendorp quarry (near Graaff-Reinet)	Stutterheim (1954)	Quarry face near surface	0,23	0,84
Tarkastad	Cores from borehole situated at: x = 324,300 y = 1 235,350 approx. lat. 31° 15′ S approx. long. 25° 30′ E (cores supplied by Orange–Fish Tunnel Consultants; tests by NBRI–CSIR	Pienaar (1966)	7 m 48 m 116 m 156 m 222 m 311 m		0,12 0,12 0,07 0,16 0,095 0,11
Adelaide	Aberdeen	Roper (1959)	Near surface	0,024	
Tarkastad	Queenstown	Roper (1959)	Near surface	0,12	
Adelaide	Beaufort West	Roper (1959)	Near surface	0,04*	

* Quartzitic sandstone.

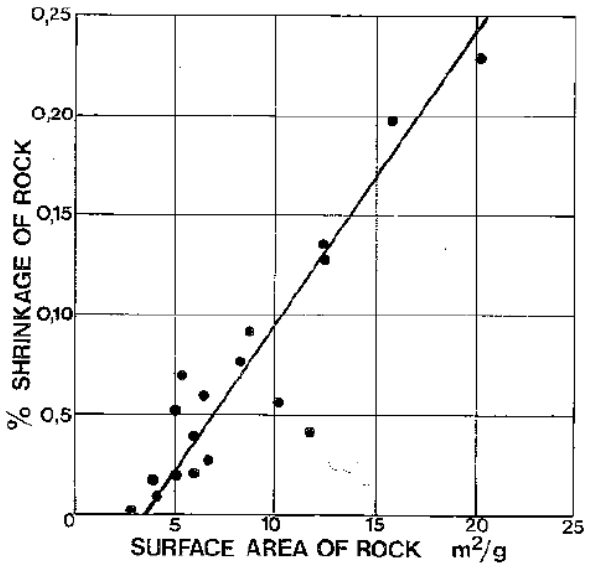


Figure 17-7: Relation between shrinkage and surface area for a variety of rocks including Karoo sandstone (Brink, 1983).

Table 17-14: Road construction characteristics of some Karoo sandstones (Brink, 1983).

		Molteno, Elliot and Clarens Formations*			Laingsburg Formation**		
		CBR (%)	CBR +3% cement (%)	10% FACT (kN)	ACV (%)	10% FACT (kN)	Treton (%)
Maximum	x_M	125	417	136	46	410	72,9
Minimum	x_m	24	157	7	9,7	160	16,4
Mean	$\bar{x}$	68	234	46	17,3	282	31,4
No. of tests	n	10	7	10	21	10	21
Standard deviation	S	38	86	35,4	7,7	84,4	13,7
Coefficient of variation	$S/\bar{x}$	0,56	0,37	0,77	0,45	0,23	0,44

* Partly after Holleman (1975)
**Data provided by Ninham Shand inc

Table 17-15: Changes in engineering properties of Adelaide Subgroup sandstone aggregates under traffic (Brink, 1983).

		PI		Percentage coarse sand (cs) 0,425mm <cs<2mm		Percentage smaller than 75μm		10% FACT wet/dry ratio
		(a)*	(b)†	(a)	(b)	(a)	(b)	(b)
1. Road in vicinity of East London								
Maximum	x_M	6	8	50	39	12	13	
Minimum	x_m	2	4	24	26	2	7	
Mean	$\bar{x}$	4,3	6,0	33,2	31,0	7,9	9,3	
Number of tests	n	156	32	158	32	158	32	
Standard deviation	S	0,94	1,20	4,14	3,0	1,30	2,53	
Coefficient of variation	S/x	0,22	0,20	0,12	0,10	0,16	0,27	
2. Road in vicinity of Richmond								(115/215) (53%)
Maximum	x_M	6	9	42	35	11	13	
Minimum	x_m	3	7	26	25	6	7	
Mean	$\bar{x}$	5,2	7,6	31,9	30,6	8,3	9,2	
Number of tests	n	10	5	10	5	10	5	
Standard deviation	S	1,0	1,3	4,4	4,5	1,5	2,4	
Coefficient of variation	S/$\bar{x}$	0,19	0,17	0,14	0,15	0,18	0,26	
3. Road in vicinity of Colesberg								(75/185) (40%)
Maximum	x_M	7	10	47	39	14	19	
Minimum	x_m	5	7	24	18	5	9	
Mean	$\bar{x}$	6,0	9,0	35,5	29,9	8,6	14,0	
Number of tests	n	28	7	28	14	28	7	
Standard deviation	S	0,79	1,15	5,98	5,07	1,93	3,65	
Coefficient of variation	S/$\bar{x}$	0,13	0,13	0,17	0,17	0,22	0,26	
4. Road in vicinity of Noupoort								
Maximum	x_M	6	13	48	56	9	13	
Minimum	x_m	3	6	33	30	5	6	
Mean	$\bar{x}$	4,2	9,8	40,5	38,6	6,6	10,2	
Number of tests	n	13	12	13	12	13	12	
Standard deviation	S	1,07	1,76	3,86	7,3	1,12	2,25	
Coefficient of variation	S/$\bar{x}$	0,25	0,18	0,10	0,19	0,17	0,22	

* (a) Construction control data
†(b) Data obtained during later investigations after distress occurred

G.2 Dolerite (Zone B)

Dolerite has been used extensively in road construction; however, material from chill zones (surrounding metamorphosed rocks) are usually undesirable due to low adhesion properties (Brink, 1983). Dolerite has also been used successfully as a concrete aggregate (Brink, 1983).

Table 17-16: Engineering properties of very hard rock dolerite from various locations (Brink, 1983).

Locality	Percussion drill-bit penetration rate (minutes/ 200 mm)	Loss of drill-bit length (mm/10 minutes)	Loss of drill-bit gauge (mm/10 minutes)	Abrasive-ness (mass loss) (g)	Energy consumed during rod-milling (kWh/kg)	Proto-dyakonov strength (MPa)
1. Hilton, Pietermaritzburg	—	—	—	53,47	$4,87 \times 10^{-3}$	—
2. Mountain Rise, Pietermaritzburg	—	—	—	67,59	$3,33 \times 10^{-3}$	31,66
3. Kinross	—	—	—	74,71	$2,45 \times 10^{-3}$	34,53
4. Standerton	15,4	0,15	0,22	69,32	$4,87 \times 10^{-3}$	30,95
5. Cradock	—	—	—	64,87	$2,20 \times 10^{-3}$	23,39
6. Beaufort West	12,2	0,26	0,15	61,25	$3,40 \times 10^{-3}$	35,88
7. Bloemfontein	16,2	0,22	0,17	71,20	$3,28 \times 10^{-3}$	32,92
8. Hendrik Ver-woerd dam site	13,7	0,19	0,20	61,26	$3,75 \times 10^{-3}$	33,51
9. P.K. le Roux dam site	12,1	0,10	0,13	65,94	$3,10 \times 10^{-3}$	29,92

Table 17-17: Strength properties of fresh dolerite from various locations (Brink, 1983).

			Site 1 Hilton quarry, Pietermaritz-burg	Site 2 Mountain Rise quarry, Pietermaritz-burg	Site 3 Kinross road cutting	Site 4 Borchards Crushers quarry, Standerton	Site 5 South African Railways quarry, Cradock	Site 6 South African Railways National Roads quarry, Beaufort West
Unconfined Compressive Strength (MPa)	Maximum	x_M	540	368	285	489	363	497
	Minimum	x_m	426	269	233	222	173	298
	Mean	$\bar{x}$	472	336	267	370	293	406
	Number of tests	n	6	9	6	6	15	27
	Standard deviation	S	42,32	33,77	21,34	119,04	53,51	57,66
	Coefficient of variation	S/$\bar{x}$	0,090	0,100	0,080	0,322	0,183	0,142
Tensile Strength (MPa)	Maximum	x_M	38,9	29,8	25,9	35,2	30,6	42,5
	Minimum	x_m	34,9	16,3	22,7	28,2	15,3	22,5
	Mean	$\bar{x}$	37,6	26,3	23,8	30,4	24,4	31,4
	Number of tests	n	6	9	6	6	15	34
	Standard deviation	S	1,47	4,36	1,40	4,12	4,12	4,20
	Coefficient of variation	S/$\bar{x}$	0,039	0,166	0,059	0,136	0,169	0,134
Shear box Strength (MPa)	Maximum	x_M	34,2	33,1	32,2	37,9	36,0	47,2
	Minimum	x_m	14,5	25,6	14,2	25,2	19,2	18,6
	Mean	$\bar{x}$	28,1	29,8	25,0	32,4	26,6	30,3
	Number of tests	n	7	9	6	6	15	27
	Standard deviation	S	8,02	2,59	6,24	4,80	4,50	7,13
	Coefficient of variation	S/$\bar{x}$	0,285	0,087	0,250	0,148	0,157	0,235

			Site 7 Olive Hill quarry, Bloemfontein	Site 8 Hendrik Verwoerd dam			Site 9 P.K. le Roux dam	
				A Excavations for wall and abutments	B Quarry A	C Quarry B	A Lower quarry	B Left flank
Unconfined Compressive Strength (MPa)	Maximum	x_M	386	551	527	485	360	479
	Minimum	x_m	254	133	164	285	238	326
	Mean	$\bar{x}$	303	388	382	391	321	392
	Number of tests	n	15	82	49	28	15	18
	Standard deviation	S	42,50	66,56	67,68	45,28	29,10	56,80
	Coefficient of variation	S/$\bar{x}$	0,140	0,172	0,177	0,116	0,091	0,145
Tensile Strength (MPa)	Maximum	x_M	31,6	46,3	43,5	39,1	31,9	32,7
	Minimum	x_m	23,1	9,5	19,5	26,9	11,9	26,3
	Mean	$\bar{x}$	27,0	30,5	31,7	31,9	25,9	29,9
	Number of tests	n	15	81	50	28	15	18
	Standard deviation	S	2,24	5,67	4,29	2,60	5,12	1,83
	Coefficient of variation	S/$\bar{x}$	0,083	0,186	0,135	0,081	0,198	0,061
Shear box Strength (MPa)	Maximum	x_M	30,5	66,3	49,7	59,2	34,8	24,3
	Minimum	x_m	18,0	15,5	14,3	16,6	16,8	18,8
	Mean	$\bar{x}$	22,7	32,1	32,1	35,9	24,2	21,4
	Number of tests	n	15	81	49	28	15	18
	Standard deviation	S	3,26	9,39	7,95	9,71	4,60	1,76
	Coefficient of variation	S/$\bar{x}$	0,144	0,292	0,248	0,270	0,190	0,082

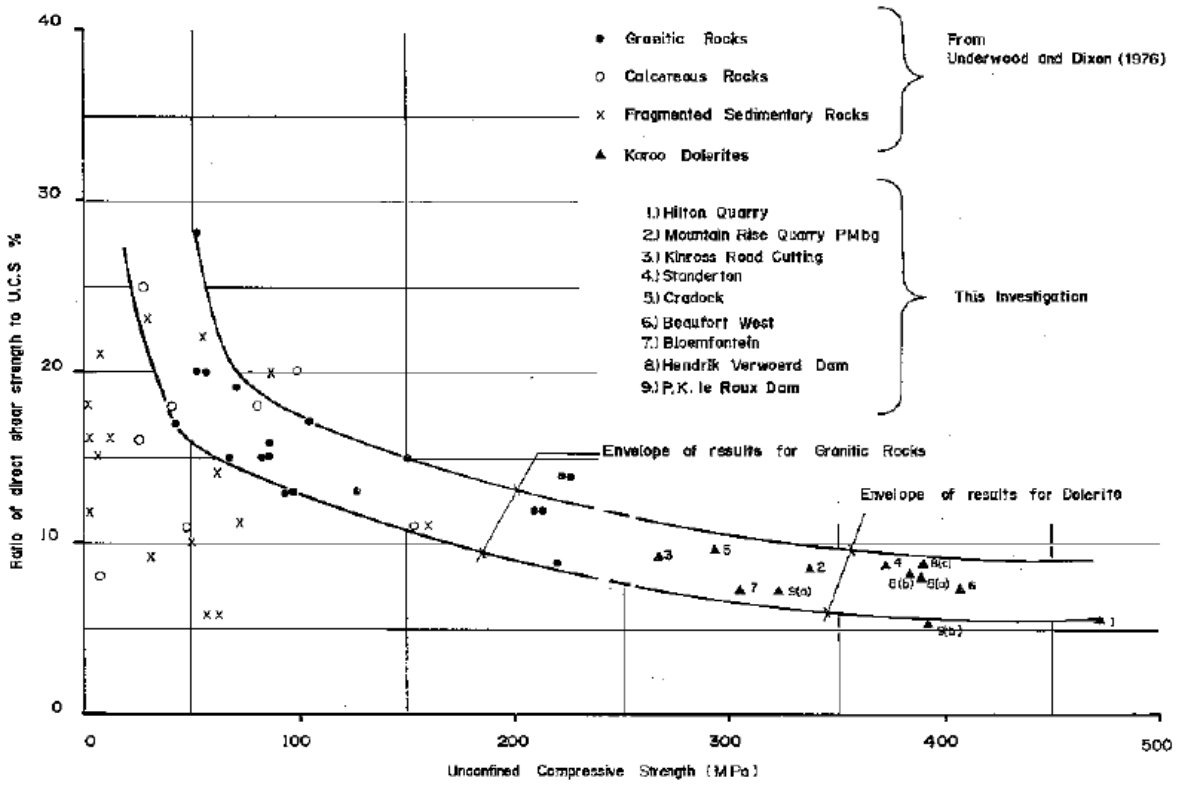


Figure 17-8: Variations of the shear strength to unconfined compressive strength ratio with the Unconfined Compressive Strength (UCS) for dolerite compared with other rock types (Brink, 1983).

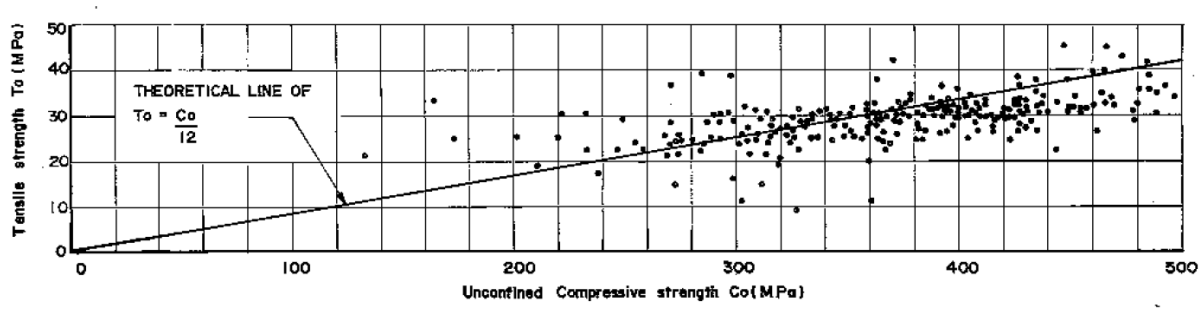


Figure 17-9: Relation between tensile strength and Unconfined Compressive Strength (UCS) of fresh dolerite specimen from South Africa (Brink, 1983).

Table 17-18: Weathering classes and characteristics of dolerite in South Africa (Brink, 1983).

Proposed class	Characteristics	Excavation	Grade of weathering according to AEG (1978)	Grade of weathering according to Weinert (1964, 1980)
Solid dolerite	Fresh rock: hard to extremely hard, variably jointed; <15% weathered material in whole rock mass	Blasting	W1 or W2	Fresh
Fractured dolerite	Fresh angular boulders of <0,5 m diameter, moderately thick zones of weathered material in joint spaces	Blasting or very heavy ripping depending on mass and type of joint fillings	W1 or W2 for boulders, otherwise W3 or W4	Boulders fresh, joint fillings weathered or highly weathered
Boulder dolerite	Boulders with rounded edges and corners and >0,5 m diameter are fresh and strong; up to 1 m thick zones of intensely weathered material between boulders. 'Stacks' of loose boulders to be included in this class	Blasting for boulders, otherwise rippable; bulldozing for 'stacks' of loose boulders	Boulders W1, otherwise W4 or W5	Boulders fresh, otherwise highly weathered (mostly highly decomposed)
Gravel dolerite	Gravelly with solid particles <75 mm diameter. Particles vary from fresh to very weathered material	Can usually be ripped or even picked; blasting rarely required	W4	Highly weathered (mostly highly disintegrated)
Granular (sugar) dolerite	Fine gravelly to occasionally clayey; remnants of boulders with weathered 'onion' shells. May include calcrete where N>5 and ferricrete where N<5	Normally picking, bulldozing or shovelling, occasionally ripping	W4 or W5	Highly weathered (highly disintegrated where N>5, highly decomposed where N<5)
Residual dolerite soil	Soft, homogeneous sandy to clayey soil	Shovelling, bulldozing or picking	W5	Residual soil (sand where N>5, clay where N<5), occasionally highly weathered

Table 17-19: Influence of climate on selected physical properties of weathering classes of dolerites (Brink, 1983).

Climatic N-value			N = <2			N = 2–5			N = ~5		
			%<0,075 mm	PI	Mod AASHO Max. dens. (kg/m³)	%<0,075 mm	PI	Mod AASHO Max. dens. (kg/m³)	%<0,075 mm	PI	Mod AASHO Max. dens. (kg/m³)
Gravel dolerite	Maximum	x_M	32	28	—	15	19	—	23	17	2 220
	Minimum	x_m	6	8	—	5	1	—	9	6	1 719
	Mean	$\bar{x}$	25	15	—	9	13	—	16	12	2 098
	Number of tests	n	6	6	—	3	12	—	15	15	7
	Standard deviation	s	13,4	6,3	—	4,3	8,3	—	3,6	1,8	176
	Coefficient of variation	$s/\bar{x}$	0,53	0,42	—	0,48	0,64	—	0,23	0,15	0,06
Granular dolerite	Maximum	x_M	85	42	2 008	60	21	2 098	49	22	2 254
	Minimum	x_m	10	8	1 573	10	3	1 970	14	3	1 767
	Mean	$\bar{x}$	37	18	1 790	27	13	1 986	31	9	2 026
	Number of tests	n	23	21	6	15	21	5	54	53	22
	Standard deviation	s	16,9	8,2	159	10,9	4,5	140	11,4	4,2	131
	Coefficient of variation	$s/\bar{x}$	0,46	0,45	0,09	0,40	0,34	0,07	0,37	0,47	0,06
Residual dolerite soil	Maximum	x_M	95	50	—	94	33	1 914	74	33	1 978
	Minimum	x_m	50	11	—	48	3	1 514	44	8	1 621
	Mean	$\bar{x}$	64	23	1 620	71	18	1 673	59	18	1 831
	Number of tests	n	59	23	1	33	33	7	37	37	11
	Standard deviation	s	12,1	10,36	—	17,5	4,4	136	7,7	7,2	105
	Coefficient of variation	$s/\bar{x}$	0,19	0,46	—	0,25	0,25	0,08	0,13	0,40	0,06

Climatic N-value			N = 5–10			N = ~10			N = >10		
			%<0,075 mm	PI	Mod AASHO Max. dens. (kg/m³)	%<0,075 mm	PI	Mod AASHO Max. dens. (kg/m³)	%<0,075 mm	PI	Mod AASHO Max. dens. (kg/m³)
Gravel dolerite	Maximum	x_M	16	32	2 275	21	18	2 323			
	Minimum	x_m	1	2	2 034	3	0	2 066			
	Mean	$\bar{x}$	7	12	2 146	6	8	2 211		No Results	
	Number of tests	n	35	35	5	33	33	12			
	Standard deviation	s	3,1	6,2	88	3,51	4,21	91			
	Coefficient of variation	$s/\bar{x}$	0,44	0,52	0,04	0,55	0,51	0,04			
Granular dolerite	Maximum	x_M	51	29	2 227	24	10	2 195	15	14	2 370
	Minimum	x_m	2	1	1 810	2	0	1 970	1	1	1 842
	Mean	$\bar{x}$	13	9	2 082	9	4	2 082	4	4	2 163
	Number of tests	n	80	80	13	61	61	16	218	216	80
	Standard deviation	s	12,8	6,7	142	5,48	2,82	57	1,59	3,06	114
	Coefficient of variation	$s/\bar{x}$	0,98	0,74	0,07	0,06	0,07	0,03	0,40	0,77	0,05
Residual dolerite soil	Maximum	x_M	56	29	2 291	39	26	2 370	35	18	2 355
	Minimum	x_m	5	1	1 826	4	1	1 810	2	1	1 954
	Mean	$\bar{x}$	25	12	2 066	18	11	2 082	15	6	2 243
	Number of tests	n	103	103	11	52	51	13	261	261	89
	Standard deviation	s	10,2	6,2	121	8,90	5,60	140	5,81	2,91	87
	Coefficient of variation	$s/\bar{x}$	0,41	0,52	0,06	0,11	0,30	0,07	0,39	0,49	0,04

Table 17-20: Concrete making properties of dolerite (Brink, 1983).

		Specific gravity (or relative density)	Loose bulk density (coarse) (kg/m³)	Loose bulk density (fine) (kg/m³)	Mortar shrinkage (%)	10% FACT (kN)
Maximum	x_M	3,05	1 500	1 700	0,070	340
Minimum	x_m	2,85	1 350	1 350	0,037	180
Mean	$\bar{x}$	2,94	1 420	1 520	0,053	300
Number of tests	n	210	120	46	31	37
Standard deviation	S	0,037	29,24	79,19	0,008	37,65
Coefficient of variation	$S/\bar{x}$	0,013	0,021	0,052	0,152	0,125

Table 17-21: Deformation characteristics (expressed in MPa) for different weathering classes of dolerite from South Africa as determined by a GB Menard pressure meter and jacking tests (Brink, 1983).

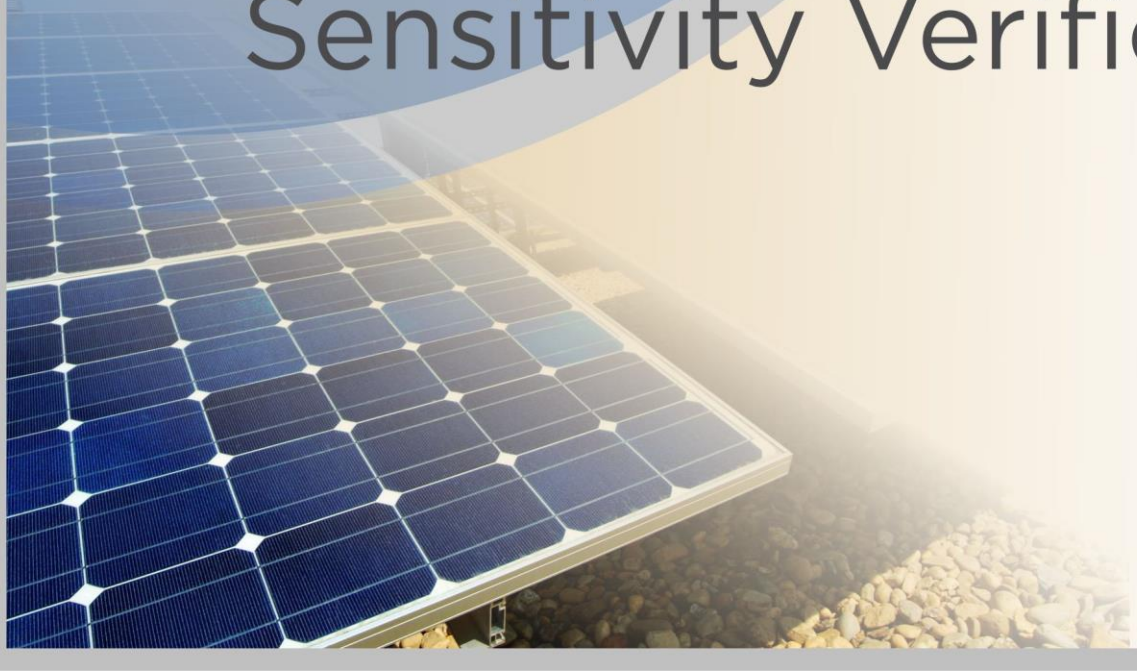
		Residual dolerite soil	Granular dolerite	Gravel dolerite	Boulder dolerite	Fractured dolerite	Fresh dolerite	
							From H.F. Verwoerd dam	From P.K. le Roux dam
Degree of weathering		W5	W4/W5	W4	W3	W2	W1	W1
Maximum	x_M	11,7	200,7	923,3	1 302,0	3 215,5	9 076	19 760
Minimum	x_m	7,3	89,4	404,7	1 071,6	2 034,9	5 615	9 062
Mean	$\bar{x}$	9,2	158,3	593,2	1 156,5	2 625,2	7 692	12 587
Number of tests	n	3	4	3	3	2	18	15

G.3 Quaternary Sediments (Zone C)

Quaternary sediments overlying the Karoo Supergroup are variable in nature based on various case studies presented by Brink (1985). Potential geotechnical problems arising from such sediments include expansive and collapsible soils. Based on investigations previously undertaken in the region, some 30 km south of the site, such soils may be encountered. Transported materials are often thin to non-existent, and where present in natural drainage depressions often become more clayey and often exhibit desiccation cracks (Van Rooyen, 2012). Laboratory test results revealed that transported sediments (sheetwash and alluvium/gulleywash in this case) in the region have been described as “worse than G10” and the materials have ‘low’ to ‘high’ potential.

CHAPTER 18:

Civil Aviation Site Sensitivity Verification



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TABLES

FIGURES

ABBREVIATIONS

Abbreviations	
ATNS	Air Traffic and Navigation Services SOC Limited
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
DEA	Department of Environmental Affairs
DFFE	Department of Forestry, Fisheries and the Environment
DSR	Draft Scoping Report
ICAO	International Civil Aviation Organisation Code
NEMA	National Environmental Management Act
PV	Photovoltaic
REDZ	Renewable Energy Development Zones
SACAA	South African Civil Aviation Authority
SEA	Strategic Environmental Assessment

18. CIVIL AVIATION SITE SENSITIVITY VERIFICATION

18.1 Introduction

This report serves as the Site Sensitivity Verification for Civil Aviation for the Scoping and Environmental Impact Assessment (EIA) Process for the proposed development of the Kudu Solar Facility 3 and associated infrastructure near De Aar in the Northern Cape. The proposed project forms part of a cluster of 12 Solar Photovoltaic (PV) facilities and associated infrastructure. This report deals with Kudu Solar Facility 3 (hereafter referred to as the "Kudu Solar Facility" or "proposed project").

18.2 Need for the Site Sensitivity Verification

On 20 March 2020, in Government Gazette 43110, Government Notice (GN) R320, the Department of Environment, Forestry and Fisheries (DEFF) [now operating as the Department of Forestry, Fisheries and the Environment (DFFE)] published procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) when applying for an Environmental Authorisation (EA). GN R320 prescribes general requirements for undertaking Site Sensitivity Verification, as well as protocols for assessment and minimum report content requirements of environmental impacts associated with specified environmental themes for relevant activities requiring EA. GN R320 was enforced within 50 days of publication of the notice i.e. on 9 May 2020.

GN R320 specifically includes a protocol that provides the criteria for the specialist assessment and minimum report content requirements for impacts on civil aviation installations for relevant activities requiring EA. This protocol replaces the requirements of Appendix 6 of the 2014 NEMA EIA Regulations (as amended).

This specific protocol states that proposed developments (where relevant) that occur on sites identified as Very High, High or Medium sensitivity, as depicted on the National Web-Based Environmental Screening Tool (Screening Tool), must include a Civil Aviation Compliance Statement. It further states that there are no requirements if the proposed developments occur on sites identified as Low sensitivity on the Screening Tool. However, a Site Sensitivity Verification is required for the Civil Aviation Protocol for all sensitivity levels.

Therefore, since the proposed projects require an EA in terms of the 2014 NEMA EIA Regulations (as amended), and Civil Aviation was identified as a relevant theme in the Screening Tool Report, GN R320 must be complied with.

18.3 Methodology

The Site Sensitivity Verification Process and Report has been compiled based on the following methodology:

- Existing spatial databases were used to determine the location of civil aviation installations in relation to the proposed project study area, and to identify preliminary areas of concern in terms of impacts to civil aviation installations;
- The proposed project study area was plotted on the Screening Tool to identify the sensitivity allocated;
- A site visit was undertaken to confirm the current land use and the environmental sensitivity as it relates to Civil Aviation;
- Additional research was undertaken to substantiate the Site Sensitivity Verification process; and
- A Site Sensitivity Verification Report was compiled (i.e. this report).

The information sources listed in Table 18-1 were used in the Site Sensitivity Verification process.

Table 18-1: Information Sources used for the Site Sensitivity Verification process

Data / Information	Source	Date	Type	Description
National Web-Based Environmental Screening Tool (Screening Tool)	Department of Forestry, Fisheries, and the Environment (DFFE)	2022-2023	Spatial / Online Assessment	The Screening Tool is a geographically based web-enabled application which allows a proponent intending to submit an Application for EA in terms of the 2014 NEMA EIA Regulations (as amended) to screen the proposed site for any environmental sensitivity[1].
RSA Airspaces in 3D	Air Traffic and Navigation Services SOC Limited (ATNS)	2022	Google Earth KMZ File	The RSA Airspaces in 3D data KMZ file is an initiative undertaken by the ATNS to illustrate the definitions and complexities of airspace, routes, aerodromes and navigational facilities within South Africa to the public in the interest of safety[2].
Wind and Solar PV Phase 1 Strategic Environmental Assessment (SEA)	Department of Environmental Affairs (DEA) [now operating as the DFFE]	2015	Report	SEA commissioned by the DEA (now operating as the DFFE) in 2013 for an assessment of wind and solar PV energy in South Africa, with an aim of identifying eight Renewable Energy Development Zones (REDZs) to focus and incentivize such development (i.e. Phase 1 REDZs SEA: CSIR Report Number: CSIR/CAS/EMS/ER/2015/0001/B).
Wind and Solar PV Phase 2 SEA	Department of Environment, Forestry, and Fisheries (DEFF) [now operating as the DFFE]	2019	Report	SEA commissioned by the DEFF (now operating as the DFFE) in 2016 for an assessment of wind and solar PV energy in South Africa, with an aim of identifying three additional REDZs to focus and incentivize such development (i.e. Phase 2 REDZ SEA. CSIR Report Number: CSIR/SPLA/SECO/ER/2019/0085).
Scoping Level and EIA Phase Visual Impact Assessments for the proposed project	Quinton Lawson and Bernard Oberholzer, QARC and BOLA	2022, 2023	Report	This Visual Impact Assessment was commissioned for the proposed project.

Therefore, the Site Sensitivity Verification was undertaken using desktop analysis, satellite imagery, on-site inspection, and other available and relevant information.

[1] https://screening.environment.gov.za/screeningtool/index.html#/pages/welcome
[2] https://www.atns.co.za/rsakmz.php

18.4 Proposed Project Location

The proposed Kudu Solar Facility is located within the Renosterberg Local Municipality, which falls within the Pixley Ka Seme District Municipality. The proposed project is not located within any of the gazetted Renewable Energy Development Zones (REDZs); however is located within the Central Strategic Transmission Corridor that was gazetted in GN 113 on 16 February 2018. The proposed solar facility and its associated infrastructure will be constructed on a selection of the farm portions indicated in the table below, which also served as the study area for this EIA.

Table 18-2: Farm portions associated with the Kudu Solar Facilities

Farm Portion	SG code
Remaining Extent of the Farm Bas Berg No. 88	C05700000000008800000
Remaining Extent of Portion 3 of the Farm Bas Berg No. 88	C05700000000008800003
Portion 4 (Portion of Portion 3) of the Farm Bas Berg No. 88	C05700000000008800004
Remaining Extent of Portion 2 (Middel Plaats) (a Portion of Portion 1) of the Farm Grasspan No. 40	C05700000000004000002
Remaining Extent of the Farm Annex Wolve Kuil No. 41	C05700000000004100000
Portion 1 (Wolve Kuil West) of the Farm Annex Wolve Kuil No. 41	C05700000000004100001
Portion 2 of the Farm Wolve Kuil No. 43	C05700000000004300002
Remaining Extent of the Farm Wolve Kuilen No. 42	C05700000000004200000

Refer to Chapter 2 of the EIA Report for a list of affected farm properties for each proposed solar facility.

18.5 Details of the EIA Team

GN R320 states that prior to commencing with a specialist assessment, the current use of the land and the potential environmental sensitivity of the site under consideration as identified by the Screening Tool must be confirmed by undertaking a Site Sensitivity Verification.

This Site Sensitivity Verification was undertaken by Lizande Kellerman and Helen Antonopoulos. Lizande Kellerman is registered with the South African Council for Natural and Scientific Professions (SACNASP), with Registration Number 400076/10 in the field of Botanical Sciences. Helen Antonopoulos is an intern Environmental Scientist in the Environmental Management Services (EMS) group of the CSIR and holds BSc, BSc Honours, and MSc degrees in Environmental and Geographical Science from the University of Cape Town.

Inputs to the Site Sensitivity Verification Report were provided by Lizande Kellerman, Helen Antonopoulos, Rohaida Abed and Luanita Snyman-Van der Walt of the CSIR. Refer to Appendix A of the EIA Report for Curriculum Vitae of the project team.

18.6 Findings of the Screening Tool

Screening Tool Reports and/or maps were generated for the proposed projects using the following classifications:

- **Solar PV:** Utilities Infrastructure → Electricity → Generation → Renewable → Solar → PV → Solar PV; and
- **Substations:** Utilities Infrastructure → Electricity → Distribution and Transmission → Substation.

The Solar PV classification results in the use of the Solar PV methodology, whilst the substations classification results in the use of the general methodology on the Screening Tool.

The civil aviation theme (for Solar PV developments) on the Screening Tool depicted that the entire study area is located in a low sensitivity area from a civil aviation perspective i.e. there are no major or other types of civil aviation aerodromes or buffers that intersect with the study area or the Original and Revised Scoping Buildable Areas. Figure 18-1 illustrates the civil aviation sensitivity in relation to the entire study area and the development footprints. The development footprints were identified following the analysis of the Original and Revised Scoping Buildable Areas in the Scoping Phase.

In line with the above, the civil aviation theme (for substation developments) on the Screening Tool depicted that the entire study area is located in a low sensitivity area from a civil aviation perspective (Figure 18-2). However, the civil aviation theme for substation developments also depicted the following features, which are outside of the study area, and a significant distance away:

- De Aar Aerodrome (classified as “Other Civil Aviation Aerodrome”) located approximately 54 km south-west of the study area. High and medium sensitivity are respectively allocated to the area that extends 8 km from the De Aar Aerodrome; and between 8 and 15 km of the aerodrome;
- Petrusville Aerodrome (classified as “Other Civil Aviation Aerodrome”) located approximately 25 km north-east of the study area. High and medium sensitivity are respectively allocated to the area that extends 8 km from the Petrusville Aerodrome; and between 8 and 15 km of the aerodrome;
- Dangerous and restricted airspace demarcated as high sensitivity, which is located more than 50 km to the south-west of the study area;
- Civil Aviation Radar, which is located at point 30° 27' 51.4" S and 23° 59' 19.1" E; approximately 37 km south-west of the study area. The area within 15 km of the civil aviation radar is demarcated with a high sensitivity; and the area between 15 and 35 km of the civil aviation radar is rated with a medium sensitivity. This same facility is highlighted under the RFI theme as a Sentech High Power Terrestrial Broadcasting Facility and a Telecommunication Facility; and
- The same area above overlaps with a medium sensitivity area allocated to 5 km from an air traffic control or navigation site.

In terms of GN R320, this means that no further requirements are applicable i.e. a Compliance Statement is not required, if the site is indeed found to be of low sensitivity during the site visit.

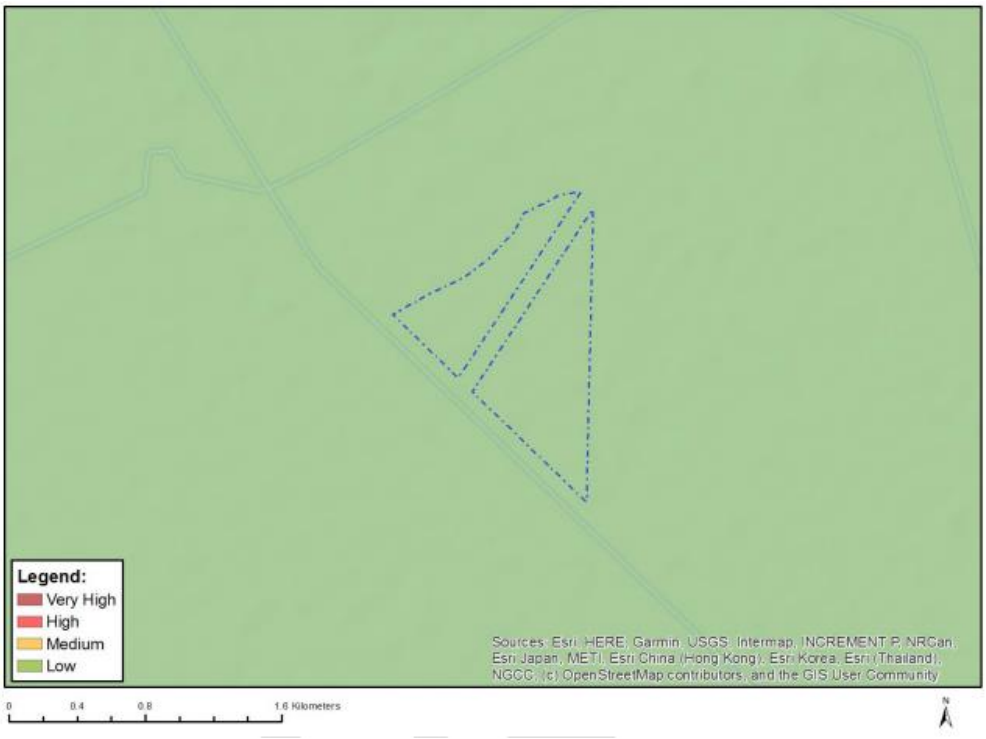

Figure 18-1: Screening Tool Map showing the buildable area for the proposed Kudu Solar Facility in terms of Civil Aviation Sensitivity (Source: DFFE Screening Tool, 2023).

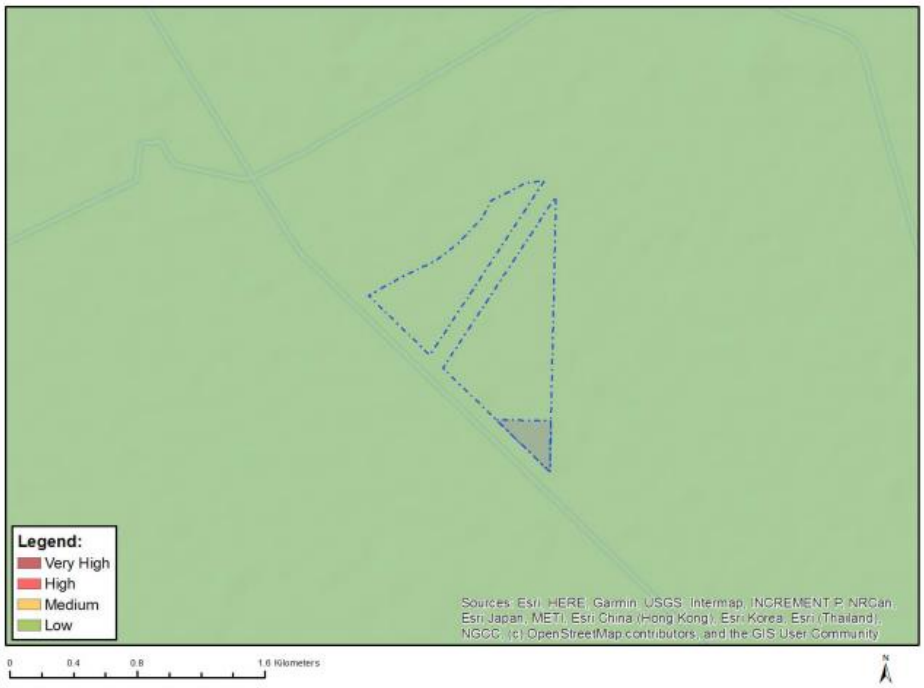

Figure 18-2: Screening Tool Map showing the buildable area for the proposed Solar Facility, as well as the on-site substation complex, in terms of Civil Aviation Sensitivity (Source: DFFE Screening Tool, 2023).

18.7 Details of the Site Visit

The details of the site visit are noted below:

Date of Site Visit	29 – 31 August 2022
Specialist Name	Lizande Kellerman
Professional Registration Number	SACNASP Registration Number 400076/10
Specialist Affiliation / Company	CSIR

18.8 Findings

The site visit confirmed that the land within the study area is used for livestock grazing, and that there are structures such as farm steads, livestock pens, waterpoints, farm roads and fences, and existing high voltage power lines within the area. This is corroborated by the Agricultural Compliance Statement (Chapter 6 of the EIA Report) which states that moisture availability is insufficient for crop production without irrigation and the potential agricultural land use of the study area is therefore limited to grazing. As noted in the Terrestrial Biodiversity and Species Assessment (Chapter 7 of the EIA Report), the study area is located in the Northern Upper Karoo (NKu3), Eastern Upper Karoo (NKu4) and the Besemkaree Koppies Shrubland vegetation types. The habitat is homogenous and consists of extensive plains with low shrubs and grasses. **No civil aviation installations were found within the proposed project study area.** Refer to Figure 18-3 and Figure 18-4 for views of the farm portion on which the proposed project will take place.

Figure 18-3: Panoramic (180°) view from a main gravel road towards Remaining Extent of Portion 3 of the Farm Bas Berg No. 88 (NW to SE direction). This photo pertains to PV3 (Photo: L. Kellerman)

Figure 18-4: View from a main gravel road towards Remaining Extent of Portion 3 of the Farm Bas Berg No. 88 (SE direction). This photo pertains to PV3 (Photo: L. Kellerman)

The Air Traffic and Navigation Services SOC Limited (ATNS) data has confirmed that there is an unlicensed aerodrome outside of the 30 km radius of the proposed project site. The Petrusville Airfield (International Civil Aviation Organisation Code (ICAO): FAPV) (30° 5' 0.69" S; 24° 40' 48.16" E) is located approximately 26 km north-east of the entire study area. During the site visit it was concluded that the airfield is out of use, as indicated by the dilapidated condition of the runway and lack of civil aviation infrastructure, such as windsocks. Figure 18-5 and Figure 18-6 show the airfield and its lack of maintenance. The location of the Petrusville Airfield, which is approximately 1.4 km long and is oriented SE to NW, is indicated on the Screening Tool as medium sensitivity for solar PV developments; and high sensitivity within 8 km of the aerodrome for substation developments (based on the general methodology); however, the actual aerodrome will not be impacted on by the proposed solar facility and associated infrastructure due to its distance from the study area.

Figure 18-5: Petrusville Airfield (FAPV) (view in NW direction) (*Photo*: L. Kellerman)

Figure 18-6: Petrusville Airfield (FAPV) (view in SE direction). Note the lack of aviation infrastructure, such as a windsock (*Photo*: L. Kellerman)

Research indicates that the Department of Defence Ammunition Depot and School of Ammunition is located approximately 5 km north-west of De Aar (ArchaeoMaps Archaeological Consultancy, 2009)[3]. The ATNS data classifies this facility as restricted airspace, which is located more than 50 km to the south-west of the study area. The Screening Tool shows this area as dangerous and restricted airspace (high sensitivity) based on the general methodology for substations; however, it is not identified for the Solar PV methodology. The De Aar Airport (International Civil Aviation Organisation Code: FADA) (30°41'29.51"S; and 24°1'27.13" E) lies roughly 4 km east of the Department of Defence Ammunition Depot and School of Ammunition; and approximately 55 km south-west of the study area (at its closest point), thus falling outside of the 30 km radius around the study area. Based on their locations, neither the restricted airspace nor the De Aar Airport will be impacted on by the proposed project.

The ATNS data also notes that both Conventional (Upper and Lower ATS) and Area Navigation Routes associated with the Johannesburg Area Central Airspace fall within the 30 km radius of the study area. However, the proposed solar panels will range to a maximum height of 3.5 m, and the substation complex is estimated to extend up to 10 m from ground level and are thus not likely to impact negatively on civil aviation installations or air traffic associated with the Johannesburg Area Central Airspace. Most of the features noted above are in line with the findings of the Phase 1 and Phase 2 Wind and Solar SEA Reports.

Figure 18-7 indicates the location of the civil aviation features noted above, which informed this Site Sensitivity Verification.

[3] ArchaeoMaps Archaeological Consultancy (2009). Archaeological Impact Assessment: Establishment of an Ammunition Disposal Plant, Sinclair's Dam 133, De Aar, Northern Cape, South Africa. Date: 2009-03-23. Available online: https://sahris.sahra.org.za/sites/default/files/heritagereports/AIA%20-%20ADP,%20Sinclairs%20Dam,%20De%20Aar,%20NC.pdf, Accessed October 2022.

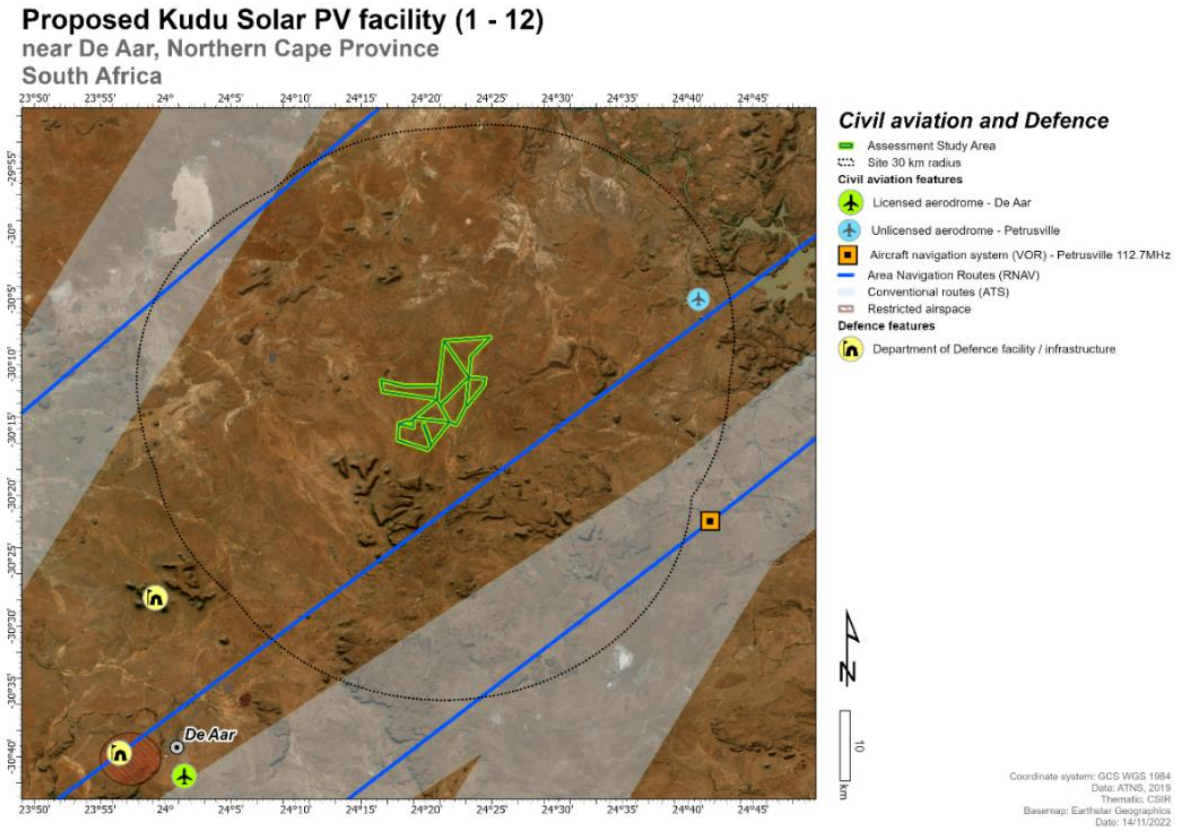

Figure 18-7: Civil Aviation features relative to the proposed project study area based on the site visit and existing databases.

18.9 Review of the Scoping and EIA Reports

The Draft EIA Reports were made available to all registered Interested and/or Affected Parties (I&APs), Organs of State and other relevant key stakeholders for a 30-day comment period which extended from 2 June to 3 July 2023, excluding public holidays, whereas the Draft Scoping Reports (DSRs) were made available to all registered I&APs Organs of State and other relevant key stakeholders for a 30-day comment period which extended from 09 December 2022 to 30 January 2023, excluding public holidays and the regulated shutdown period.

The South African Civil Aviation Authority (SACAA) and the ATNS are included as key stakeholders on the project stakeholder database and were afforded the opportunity to comment on the DSRs and Draft EIA Reports, including this Site Sensitivity Verification Report for the Civil Aviation (Solar) Theme applicable to the proposed project.

The SACAA provided written comment during the Background Information Document phase, acknowledging the acceptance of the Final Scoping Report, and EIA Phase, in which it was noted that ATNS is responsible for Solar Obstacle Applications, as published on the SACAA website[4]. The Project Applicant has lodged the necessary documents for the Obstacle Application and approval in

[4] https://www.caa.co.za/

May 2023 (outside of the NEMA process). Moreover, during the EIA Phase, the SACAA confirmed that they have no objection against the proposed development. Refer to Appendix H.6 of this EIA Report for a copy of this correspondence.

18.10 Concluding Statement

The proposed project study area was determined and verified to be of low sensitivity (as it relates to civil aviation). This was determined through a site visit and based on existing databases, and confirms the sensitivity allocated on the Screening Tool. Based on the above, in terms of GN R320, no further requirements are applicable i.e. a Compliance Statement is not required.

SACNASP

South African Council for Natural Scientific Professions

herewith certifies that

Millicent Johanna Susanna Kellerman

Registration Number: 400076/10

is a registered scientist

in terms of section 20(3) of the Natural Scientific Professions Act, 2003
(Act 27 of 2003)
in the following fields(s) of practice (Schedule 1 of the Act)

Botanical Science (Professional Natural Scientist)

Effective **4 August 2010** Expires **31 March 2024**

Chairperson

Chief Executive Officer

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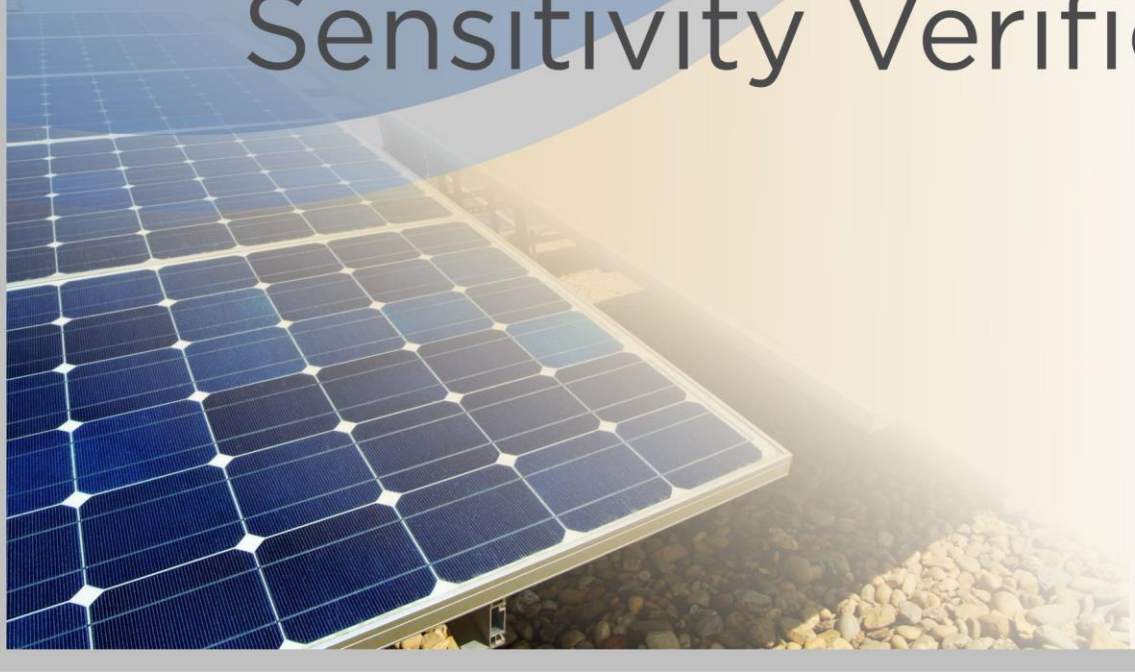
CHAPTER 19:

Defence Site Sensitivity Verification



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ABBREVIATIONS

Abbreviations	
ATNS	Air Traffic and Navigation Services SOC Limited
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
DEA	Department of Environmental Affairs
DFFE	Department of Forestry, Fisheries and the Environment
DoD	Department of Defence
DSR	Draft Scoping Report
NEMA	National Environmental Management Act
PV	Photovoltaic
REDZ	Renewable Energy Development Zone
SANDF	South African National Defence Force
SEA	Strategic Environmental Assessment

19. DEFENCE SITE SENSITIVITY VERIFICATION

19.1 Introduction

This report serves as the Site Sensitivity Verification for Defence for the Scoping and Environmental Impact Assessment (EIA) Process for the proposed development of the Kudu Solar Facility 3 and associated infrastructure near De Aar in the Northern Cape. The proposed project forms part of a cluster of 12 Solar Photovoltaic (PV) facilities and associated infrastructure. This report deals with Kudu Solar Facility 3 (hereafter referred to as the "Kudu Solar Facility" or "proposed project").

19.2 Need for the Site Sensitivity Verification

On 20 March 2020, in Government Gazette 43110, Government Notice (GN) R320, the Department of Environment, Forestry and Fisheries (DEFF) [now operating as the Department of Forestry, Fisheries and the Environment (DFFE)] published procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) when applying for an Environmental Authorisation (EA). GN R320 prescribes general requirements for undertaking Site Sensitivity Verification, as well as protocols for assessment and minimum report content requirements of environmental impacts associated with specified environmental themes for relevant activities requiring EA. GN R320 was enforced within 50 days of publication of the notice i.e. on 9 May 2020.

GN R320 specifically includes a protocol that provides the criteria for the specialist assessment and minimum report content requirements for impacts on defence installations for relevant activities requiring EA. This protocol replaces the requirements of Appendix 6 of the 2014 NEMA EIA Regulations (as amended).

This specific protocol states that proposed developments (where relevant) that occur on sites identified as Very High, High or Medium sensitivity, as depicted on the National Web-Based Environmental Screening Tool (Screening Tool), must include a Defence Compliance Statement. It further states that there are no requirements if the proposed developments occur on sites identified as Low sensitivity on the Screening Tool. However, a Site Sensitivity Verification is required for the Defence Protocol for all sensitivity levels.

Therefore, since the proposed projects require an EA in terms of the 2014 NEMA EIA Regulations (as amended), and Defence was identified as a relevant theme in the Screening Tool Report, GN R320 must be complied with.

19.3 Methodology

The Site Sensitivity Verification Process and Report has been compiled based on the following methodology:

- Existing spatial databases were used to determine the location of defence installations in relation to the proposed project study area, and to identify preliminary areas of concern in terms of potential impacts to defence installations;
- The proposed project study area was plotted on the Screening Tool to identify the sensitivity allocated;
- A site visit was undertaken to confirm the current land use and the environmental sensitivity as it relates to Defence;
- Additional research was undertaken to substantiate the Site Sensitivity Verification process; and
- A Site Sensitivity Verification Report was compiled (i.e. this report).

The information sources listed in Table 19-1 were used in the Site Sensitivity Verification process.

Table 19-1: Information Sources used for the Site Sensitivity Verification process

Data / Information	Source	Date	Type	Description
National Web-Based Environmental Screening Tool (Screening Tool)	Department of Forestry, Fisheries and the Environment (DFFE)	2022 - 2023	Spatial / Online Assessment	The Screening Tool is a geographically based web-enabled application which allows a proponent intending to submit an Application for EA in terms of the 2014 NEMA EIA Regulations (as amended) to screen the proposed site for any environmental sensitivity[1].
Republic of South Africa (RSA) Airspaces in 3D	Air Traffic and Navigation Services SOC Limited (ATNS)	2022	Google Earth KMZ File	The RSA Airspaces in 3D data KMZ file is an initiative undertaken by the ATNS to illustrate the definitions and complexities of airspace, routes, aerodromes and navigational facilities within South Africa to the public in the interest of safety[2].
Wind and Solar PV Phase 1 Strategic Environmental Assessment (SEA)	Department of Environmental Affairs (DEA)	2015	Report	SEA commissioned by the DEA [now operating as the DFFE) in 2013 for an assessment of wind and solar PV energy in South Africa, with an aim of identifying eight Renewable Energy Development Zones (REDZs) to focus and incentivize such development (i.e. Phase 1 REDZs SEA: CSIR Report Number: CSIR/CAS/EMS/ER/2015/0001/B).
Wind and Solar PV Phase 2 SEA	Department of Environment, Forestry and Fisheries (DEFF)	2019	Report	SEA commissioned by the DEFF in 2016 for an assessment of wind and solar PV energy in South Africa, with an aim of identifying three additional REDZs to focus and incentivize such development (i.e. Phase 2 REDZ SEA. CSIR Report Number: CSIR/SPLA/SECO/ER/2019/0085).

Therefore, the Site Sensitivity Verification was undertaken using desktop analysis, satellite imagery, on-site inspection, and other available and relevant information.

[1] https://screening.environment.gov.za/screeningtool/index.html#/pages/welcome
[2] https://www.atns.co.za/rsakmz.php

19.4 Proposed Project Location

The proposed Kudu Solar Facility is located within the Renosterberg Local Municipality, which falls within the Pixley Ka Seme District Municipality. The proposed project is not located within any of the gazetted Renewable Energy Development Zones (REDZs); however is located within the Central Strategic Transmission Corridor that was gazetted in GN 113 on 16 February 2018. The proposed solar facility and its associated infrastructure will be constructed on a selection of the farm portions indicated in the table below, which also served as the study area for this EIA:

Table 19-2: Farm portions associated with the Kudu Solar Facilities

Farm Portion	SG Code
Remaining Extent of the Farm Bas Berg No. 88	C05700000000008800000
Remaining Extent of Portion 3 of the Farm Bas Berg No. 88	C05700000000008800003
Portion 4 (Portion of Portion 3) of the Farm Bas Berg No. 88	C05700000000008800004
Remaining Extent of Portion 2 (Middel Plaats) (a Portion of Portion 1) of the Farm Grasspan No. 40	C05700000000004000002
Remaining Extent of the Farm Annex Wolve Kuil No. 41	C05700000000004100000
Portion 1 (Wolve Kuil West) of the Farm Annex Wolve Kuil No. 41	C05700000000004100001
Portion 2 of the Farm Wolve Kuil No. 43	C05700000000004300002
Remaining Extent of the Farm Wolve Kuilen No. 42	C05700000000004200000

Refer to Chapter 2 of the EIA Report for a list of affected farm properties for each proposed solar facility.

19.5 Details of the EIA Team

GN R320 states that prior to commencing with a specialist assessment, the current use of the land and the potential environmental sensitivity of the site under consideration as identified by the Screening Tool must be confirmed by undertaking a Site Sensitivity Verification.

This Site Sensitivity Verification was undertaken by Lizande Kellerman and Helen Antonopoulos. Lizande Kellerman is registered with the South African Council for Natural and Scientific Professions (SACNASP), with Registration Number 400076/10 in the field of Botanical Sciences. Helen Antonopoulos is an intern Environmental Scientist in the Environmental Management Services (EMS) group of the CSIR and holds BSc, BSc Honours, and MSc degrees in Environmental and Geographical Science from the University of Cape Town.

Inputs to the Site Sensitivity Verification Report were provided by Lizande Kellerman, Helen Antonopoulos, Rohaida Abed and Luanita Snyman-Van der Walt of the CSIR. Refer to Appendix A of the EIA Report for Curriculum Vitae of the project team.

19.6 Findings of the Screening Tool

Screening Tool Reports and/or maps were generated for the proposed projects using the following classifications:

- **Solar PV:** Utilities Infrastructure → Electricity → Generation → Renewable → Solar → PV; and
- **Substations:** Utilities Infrastructure → Electricity → Distribution and Transmission → Substation.

The Solar PV classification results in the use of the Solar PV methodology, whilst the substations classification results in the use of the general methodology on the Screening Tool.

The defence theme (for Solar PV developments) on the Screening Tool depicted that the entire study area is located in a low sensitivity area from a defence perspective i.e. there are no major or other types of defence installations or buffers that intersect with the study area or the Original and Revised Scoping Buildable Areas. Figure 19-1 illustrates the defence sensitivity in relation to the entire study area and the development footprints. The development footprints were identified following the analysis of the Original and Revised Scoping Buildable Areas in the Scoping Phase.

In line with the above, the defence theme (for substation developments) on the Screening Tool depicted that the entire study area is located in a low sensitivity area from a defence perspective (Figure 19-2).

In terms of GN R320, this means that no further requirements are applicable i.e. a Compliance Statement is not required, if the site is indeed found to be of low sensitivity during the site visit.

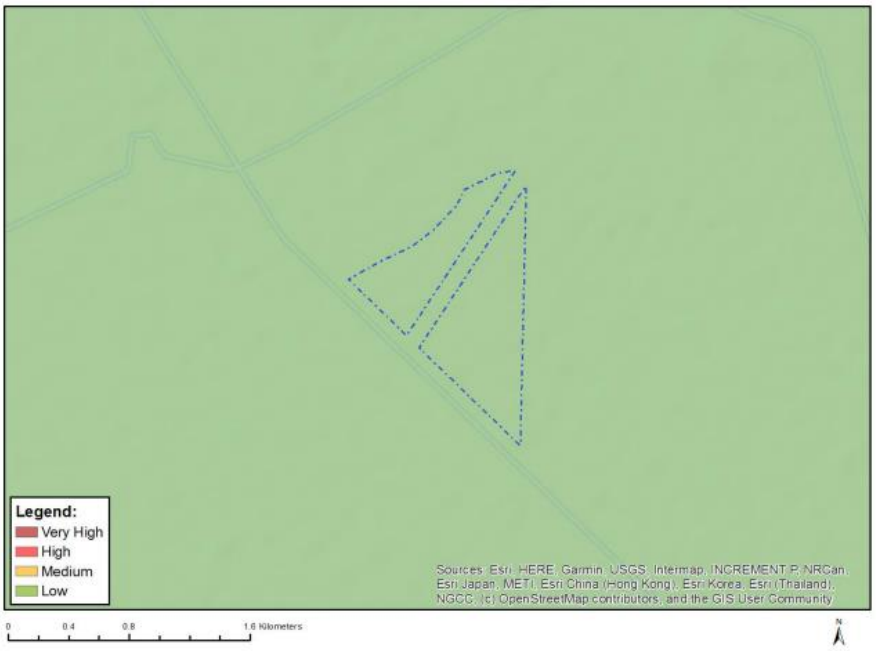

Figure 19-1: Screening Tool Map showing the buildable area for the proposed Kudu Solar Facility in terms of Defence Sensitivity (Source: DFFE Screening Tool, 2023).

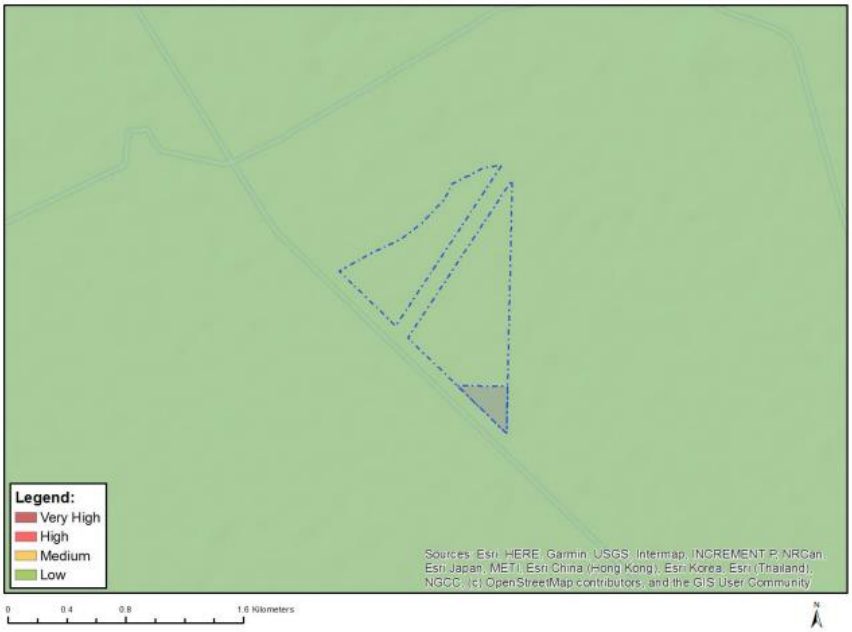

Figure 19-2: Screening Tool Map showing the buildable area for the proposed Solar Facility, as well as the on-site substation complex, in terms of Defence Sensitivity (Source: DFFE Screening Tool, 2023).

19.7 Details of the Site Visit

The details of the site visit are noted below:

Date of Site Visit	29 – 31 August 2022
Specialist Name	Lizande Kellerman
Professional Registration Number	SACNASP Registration Number 400076/10
Specialist Affiliation / Company	CSIR

19.8 Findings

The site visit confirmed that the land within the study area is used for livestock grazing, and that there are structures such as farm steads, livestock pens, waterpoints, farm roads and fences, and existing high voltage power lines within the area. This is corroborated by the Agricultural Compliance Statement (Chapter 6 of the EIA Report) which states that moisture availability is insufficient for crop production without irrigation and the potential agricultural land use of the study area is therefore limited to grazing. As noted in the Terrestrial Biodiversity and Species Assessment (Chapter 7 of the EIA Report), the study area is located in the Northern Upper Karoo (NKu3), Eastern Upper Karoo (NKu4) and the Besemkaree Koppies Shrubland vegetation types. The habitat is homogenous and consists of extensive plains with low shrubs and grasses. **No defence installations were found within the study area.** Refer to Figure 19-3 and Figure 19-4 for views of the farm portion on which the proposed project will take place.

Figure 19-3: Panoramic (180°) view from a main gravel road towards Remaining Extent of Portion 3 of the Farm Bas Berg No. 88 (NW to SE direction). This photo pertains to PV3

Figure 19-4: View from a main gravel road towards Remaining Extent of Portion 3 of the Farm Bas Berg No. 88 (SE direction). This photo pertains to PV3 (*Photo*: L. Kellerman)

Research indicates that the Department of Defence Ammunition Depot and School of Ammunition is located approximately 5 km north-west of De Aar (ArchaeoMaps Archaeological Consultancy, 2009)[3].

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The Air Traffic and Navigation Services SOC Limited (ATNS) data classifies this facility as restricted airspace, which is located more than 50 km to the south-west of the study area. The Screening Tool shows this area as low sensitivity in relation to the solar methodology; however based on the general methodology for substations, this area is indicated as medium and very high sensitivity (for a military and defence site). The Screening Tool also shows another military and defence site as very high sensitivity located approximately 25 km north-west of De Aar and 37 km south-west of the study area. This same facility is highlighted under the RFI theme as a Sentech High Power Terrestrial Broadcasting Facility and a Telecommunication Facility. However, based on its location and vast distance from the study area, it will not be impacted on by the proposed project.

The features noted above are in line with the findings of the Phase 1 and Phase 2 Wind and Solar Strategic Environmental Assessment (SEA) Reports.

Figure 19-5 indicates the location of the defence features noted above, which informed this Site Sensitivity Verification.

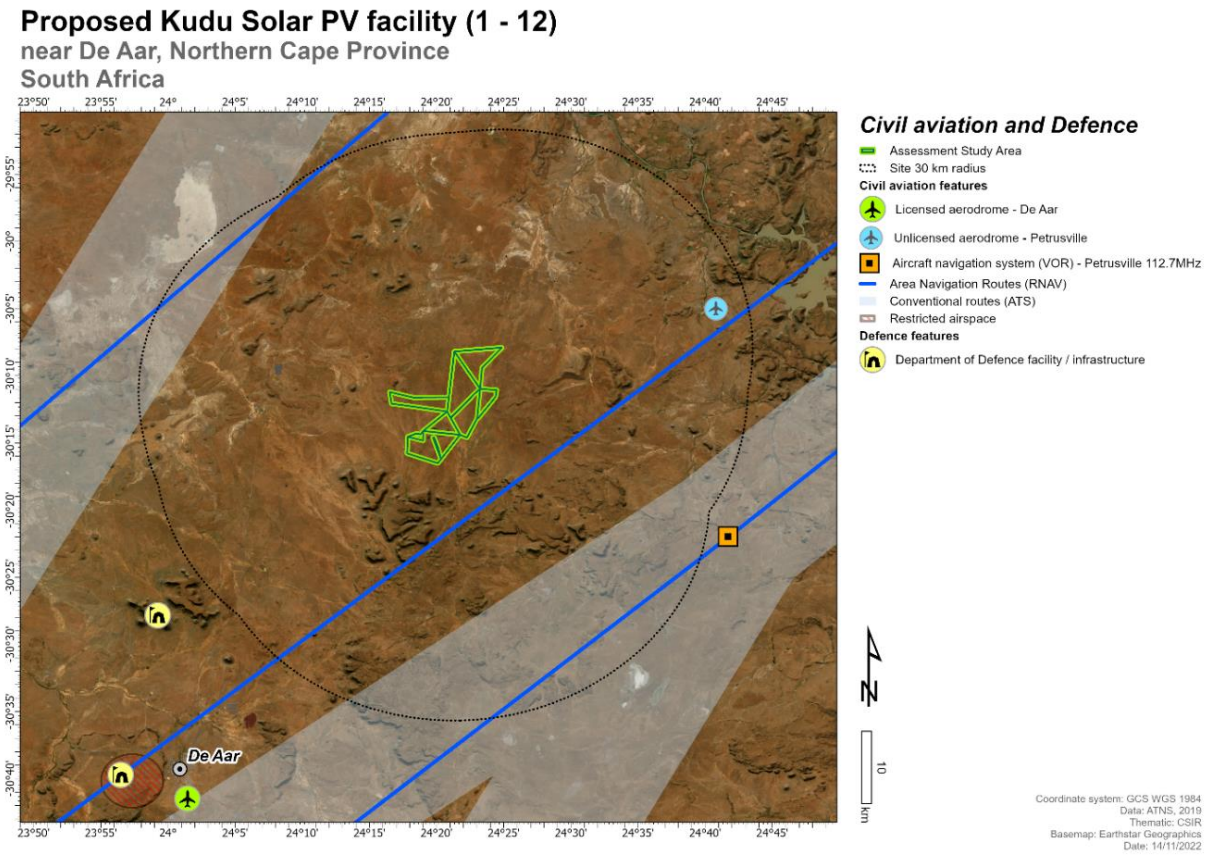

Figure 19-5: Defence features relative to the proposed project study area based on the site visit and existing databases.

19.9 Review of the Scoping and EIA Reports

The Draft EIA Reports were made available to all registered Interested and/or Affected Parties (I&APs), Organs of State and other relevant key stakeholders for a 30-day comment period which extended from 2 June to 3 July 2023, excluding public holidays, whereas the DSRs were made available to all registered I&APs Organs of State and other relevant key stakeholders for a 30-day comment period which extended from 09 December 2022 to 30 January 2023, excluding public holidays and the regulated shutdown period.

The Department of Defence (DoD) is included as a key stakeholder on the project stakeholder database and was afforded the opportunity to comment on the DSRs and Draft EIA Reports, including this Site Sensitivity Verification Report for the Defence (Solar) Theme applicable to the proposed project. Note that no comments were received from the SANDF or the DoD on the DSRs or Draft EIA Reports, apart from a request for a KMZ file of the proposed project. Refer to Appendix H.6 of this EIA Report for a copy of this email request.

19.10 Concluding Statement

The proposed project study area was determined and verified to be of low sensitivity (as it relates to defence installations). This was determined through a site visit and based on existing databases, and confirms the sensitivity allocated on the Screening Tool. Based on the above, in terms of GN R320, no further requirements are applicable i.e. a Compliance Statement is not required.

SACNASP

South African Council for Natural Scientific Professions

herewith certifies that

Millicent Johanna Susanna Kellerman

Registration Number: 400076/10

is a registered scientist

in terms of section 20(3) of the Natural Scientific Professions Act, 2003
(Act 27 of 2003)
in the following fields(s) of practice (Schedule 1 of the Act)

Botanical Science (Professional Natural Scientist)

Effective **4 August 2010** Expires **31 March 2024**

Chairperson

Chief Executive Officer

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CHAPTER 20:

Conclusions and Recommendations

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20. CONCLUSIONS AND RECOMMENDATIONS

This chapter contains the main conclusions and recommendations from the Environmental Impact Assessment (EIA) Process, provides the key findings of the specialist assessments (i.e., outlines the most significant impacts identified, together with the key mitigation and management actions required to avoid or mitigate the negative impacts or enhance positive benefits), and an integrated summary of factors that will inform decision-making by the Competent Authority (i.e., the Department of Forestry, Fisheries and the Environment (DFFE)). In addition, the chapter also includes the recommendation of the Environmental Assessment Practitioner (EAP) on the environmental suitability of the project and whether the project should receive Environmental Authorisation (EA).

This EIA Report has investigated and assessed the significance of potential positive and negative direct, indirect and cumulative impacts associated with the proposed Kudu Solar Facility 3 project (hereafter referred to as the "proposed project" or "Kudu Solar Facility"). Detailed assessments of the potential impacts identified and assessed by the specialists during the EIA Phase are included in Chapter 6 to 17 of this EIA Report. **Following the exclusion of all "no-go" areas as shown in Figure 20.2, no negative residual impacts have been identified within this EIA that, in the opinion of the EAP who has conducted this Scoping and EIA Process, should be considered "fatal flaws" from an environmental perspective, and thereby necessitate substantial re-design or termination of the project.**

This chapter constitutes an **Environmental Impact Statement**, as required in terms of Appendix 3 of the 2014 NEMA EIA Regulations (as amended), which includes the following:

- a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted Scoping Report indicating any areas that should be avoided, including buffers (Section 20.1);
- a summary of the identified project alternatives (Sections 20.2);
- a summary of the key findings of the environmental impact assessment (Section 20.4 and Section 20.5); and
- a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives (Section 20.4 and Section 20.5).

20.1 Environmental Sensitivity Mapping and Development Footprint for Approval

During the Scoping Phase, detailed specialist assessments were conducted for the 8150 ha study area, including further desktop analysis and field surveys, where relevant. The farm portions forming part of the study area are listed in the previous chapters of this EIA Report. The assessment of the study area led to the identification of environmental features, which were assigned relevant sensitivities by the specialists, as described in Table 20.1 below. The sensitivities identified were taken into consideration and the Revised Scoping Buildable Areas were formulated, which avoid all no-go areas. During the EIA Phase, the development footprint and layout plan were developed based on the acceptable buildable areas.

Table 20-1: Key Environmental Features and Sensitivities identified by the Specialists

Specialist Assessment / Technical Study	Environmental Features and Sensitivities Identified
Chapter 6: Agriculture Compliance Statement	▪ The Site Sensitivity Verification (SSV) verified that the entire study area is of less than high agricultural sensitivity with a land capability value of 5 to 6. There are no areas that need to be avoided from an agricultural perspective. The layout has no relevance to agricultural impact in this case. ▪ **Project specific description**: The development footprint for the PV Facility is mainly medium and low sensitivity.
Chapter 7: Terrestrial Biodiversity, Terrestrial Plant Species, and Terrestrial Animal Species Assessment	**High Sensitivity:** ▪ The Koppies habitat is considered highly sensitive which must be avoided. No buffers are allocated. Note that this is applicable to Kudu Solar Facility 6, but it is important to mention from a contextual perspective for the study area. ▪ Linear infrastructure such as roads and overhead powerlines should not cross the Koppies, and pylons should not be constructed in this habitat. ▪ Linear infrastructure such as roads and overhead powerlines can cross the Watercourse, but it is advised to construct pylons outside the buffer areas. **Medium Sensitivity:** ▪ The White and Shrubby Grasslands are considered of medium sensitivity owing to its pristine nature with limited major impacts. ▪ The Watercourse sensitivity is medium as per the findings of the Aquatic Specialist. Refer to the feedback below. **Very Low Sensitivity:** ▪ Existing transformed areas. ▪ **Project specific description**: The development footprint for the PV Facility is entirely medium sensitivity due to White Grassland and Shrubby Grassland. The medium and low sensitivity watercourse features are avoided and do not intersect with the layout for the development footprint of the PV Facility.
Chapter 8: Aquatic Biodiversity	▪ The recommended buffer area between the aquatic features and the project components to ensure these aquatic ecosystems are not impacted by the proposed activities is as follows: o The larger tributary: The delineated edge of the surrounding floodplain wetland features (medium sensitivity). No buffer area is deemed to be required. o Smaller streams and drainage features that are indicated to be of medium sensitivity: At least 35 m for the watercourse or the delineated edge of wetland features.

Specialist Assessment / Technical Study	Environmental Features and Sensitivities Identified
	▪ The Battery Energy Storage System (BESS) should be preferably not be placed within 100 m of major rivers, watercourses and wetlands. ▪ Pans: One pan was found within the study area on Remaining Extent of the farm Wolve Kuilen No. 42. A 50 m buffer around this pan has been recommended. It does not intersect with the development footprint. ▪ Features that have been allocated a low sensitivity (smaller feeder streams, dams and minor drainage features) do not need to be avoided by the proposed development. ▪ Some access roads do cross water courses, which would be acceptable provided the recommended mitigation is implemented. For road crossings, the sensitivities are not regarded as no-go. ▪ **Project specific description**: The development footprint for the PV Facility is entirely low sensitivity. The nearby medium sensitivity watercourse features are avoided and do not intersect with the layout for the development footprint of the PV Facility.
Chapter 9: Avifauna Assessment	▪ **All infrastructure exclusion zones**: Verreaux's Eagle nest: A 1 km all infrastructure exclusion zone is recommended to prevent the displacement of the breeding pair during the construction phase due to disturbance. ▪ **Solar panel exclusion zones (other infrastructure allowed)**: **Water points (e.g. water troughs, dams, boreholes)**: Surface water in this semi-arid habitat is important for priority avifauna and many non-priority species. The surrounding area contains several boreholes which are sources of surface water. It is preferable to leave some open space where possible with no solar panels, for birds to access and leave the surface water area unhindered. Some water points have been buffered by a minimum of 50 m, and some may be removed. ▪ **High sensitivity areas**: The entire Study Area is a high sensitivity zone due to the potential presence of several SCC including Ludwig's Bustard, Secretarybird, Martial Eagle, Cape Vulture and White-backed Vulture which could utilise the whole Study Area for foraging. However, these species do not require specific avoidance because there is still adequate habitat available outside the Study Area. Therefore, the high sensitivity is not a no-go and does not need to be avoided. ▪ **Project specific description**: The entire development footprint is High Sensitivity (not a no-go and does not need to be avoided, as described above). The development footprint does not overlap with any waterpoint solar panel exclusion zones. Verreaux's Eagle nest is more than 2 km away from the development footprint.

Specialist Assessment / Technical Study	Environmental Features and Sensitivities Identified
Chapter 10: Visual Impact Assessment	The following features are assigned Very High sensitivity (i.e. no-go) and need to be avoided for the proposed solar PV Facility itself (i.e. not for associated infrastructure such as substations, BESS, internal power lines and access roads; which would have minor buffers): ▪ Scenic Resources: o Topographic features: Feature. o Steep slopes: Slopes > 1:4. o Drainage courses: Feature. o Cultural landscapes within 250 m. ▪ Protected Landscapes / Sensitive Receptors: o Nature reserves / game farms within 500 m. o Farmsteads outside study area within 500 m. o Farmsteads inside study area within 250 m. o Arterial routes within 250 m (not applicable). ▪ District roads within 50 m. Note that the area of high sensitivity to the northern end of the development footprint / buildable area is due to a 50 m buffer from a drainage course as per the Visual Impact Assessment, however this is not a no-go area, as confirmed by the specialist and explained in the study, and the layout as currently proposed succeeds in avoiding visually sensitive areas. Note that all aquatic no-go areas have also been considered in the layout planning (discussed above). ▪ **Project specific description**: The proposed solar PV borders on a drainage feature and local road but outside the no-go buffer areas. The nearest surrounding farmstead, Vrede, is about 2.9 km away, and well outside the buffer area. The development footprint is low sensitivity from a visual perspective.
Chapter 11: Heritage Impact Assessment (Archaeology and Cultural Landscape)	▪ Most resources located within the study area are cultural landscape components and are of low cultural significance and hence sensitivity. The site visit confirmed that the study area is of low sensitivity but with several pockets of higher sensitivity being present in the surrounding landscape (where archaeological and other heritage resources were found). Some of these areas outside of the project development footprint are considered to be archaeologically sensitive (i.e. of high sensitivity), but those sites marked as low cultural significance can be seen as medium sensitivity. The remaining land in between is of low sensitivity. A minimum 50 m buffer has been placed around relevant features. ▪ There are no significant concerns for the proposed project. The facility layout has been designed to avoid all known culturally significant heritage resources with the exception of the cultural landscape which will not be significantly impacted. There are no areas requiring avoidance and no further protective buffers are needed.

Specialist Assessment / Technical Study	Environmental Features and Sensitivities Identified
	▪ **Project specific description**: The development footprint is low sensitivity from a heritage perspective.
Chapter 12: Palaeontology Site Sensitivity Verification Report	▪ There are no areas that need to be avoided from a palaeontology perspective. The site visit undertaken by the specialist found very low bedrock exposure and concluded that the site is of low to very low palaeo-sensitivity. ▪ **Project specific description**: The development footprint has a low desktop and field-based palaeo-sensitivity. No fossils were recorded within the footprint.
Chapter 13: Socio-Economic Assessment	▪ Not applicable. There are no sensitivities of this nature that can be mapped and that would influence the layout of the proposed project. ▪ **Project specific description**: Not applicable.
Chapter 14: Traffic Impact Assessment	▪ Not applicable. There are no sensitivities of this nature that can be mapped and that would influence the layout of the proposed project. ▪ **Project specific description**: Not applicable.
Chapter 15: Battery Energy Storage System High Level Safety, Health and Environment Risk Assessment	▪ The BESS should be placed at least 50 m away from known boreholes and water points, and 100 m away from major surface water features, such as major rivers and wetlands. ▪ Due to the possibility of noxious smoke from potential fires, any lithium-ion BESS should be located over 500 m from residential areas, in this case isolated farm houses that are occupied. If this is not possible, it is noted that the risks are low and advice of mitigative measures should be provided to the farm occupants, e.g. shelter in place indoors. ▪ **Project specific description:** The BESS is located 50 m away from known water points and boreholes; 100 m away from major surface water features identified by the Aquatic Biodiversity Specialist; and more than 500 m away from the nearest farmstead.
Chapter 16: Geohydrology Assessment	▪ It is recommended that all BESS are placed a minimum of 50 m from any borehole. ▪ **Project specific description:** The BESS is located 50 m away from known boreholes.
Chapter 17: Geotechnical Assessment	▪ There are no areas within the study area that should be avoided from a geotechnical sensitivity perspective. However, areas of moderate to steep topography would likely render development financially unfeasible. ▪ **Project specific description**: No areas identified for avoidance in the development footprint.

Specialist Assessment / Technical Study	Environmental Features and Sensitivities Identified
Chapter 18: Civil Aviation	▪ No sensitive civil aviation features have been identified within the study area. ▪ **Project specific description**: The development footprint is low sensitivity from a civil aviation perspective.
Chapter 19: Defence	▪ No sensitive defence features have been identified within the study area. ▪ **Project specific description**: The development footprint is low sensitivity from a defence perspective.

Based on the environmental sensitivities identified and verified by the specialists on site, an overall combined environmental feature map and environmental sensitivity map have been compiled for the study area. The comments received from the DFFE on the requirements for the sensitivity maps have been considered and incorporated as best as possible.

Figure 20.1 shows the identified and assessed environmental features present within the study area and allocated buffers; whereas Figure 20.2 shows the environmental sensitivity that has been allocated to these features. These maps indicate that the inherent environmental sensitivity of the proposed project study area is generally medium to low, with some very high and high sensitivity areas. The study area is suited for the development of the proposed project based on the understanding that measures have been taken to firstly avoid the sensitive features as best as possible, and all aspects to manage or mitigate potential impacts have been taken into consideration and detailed during the EIA Phase.

The buildable areas and development footprints are overlain onto these maps to show how they relate to the environmental features and sensitivities, and how the no-go areas have been avoided. Figure 20.3 shows a detailed layout map indicating the development footprint and buildable area; and Figure 20.4 indicates a combined layout and sensitivity map. Figure 20.5 is a combined cumulative impacts and environmental sensitivity map (based on the sensitivities identified by the specialists). Key maps are also included in Appendix C of this EIA Report.

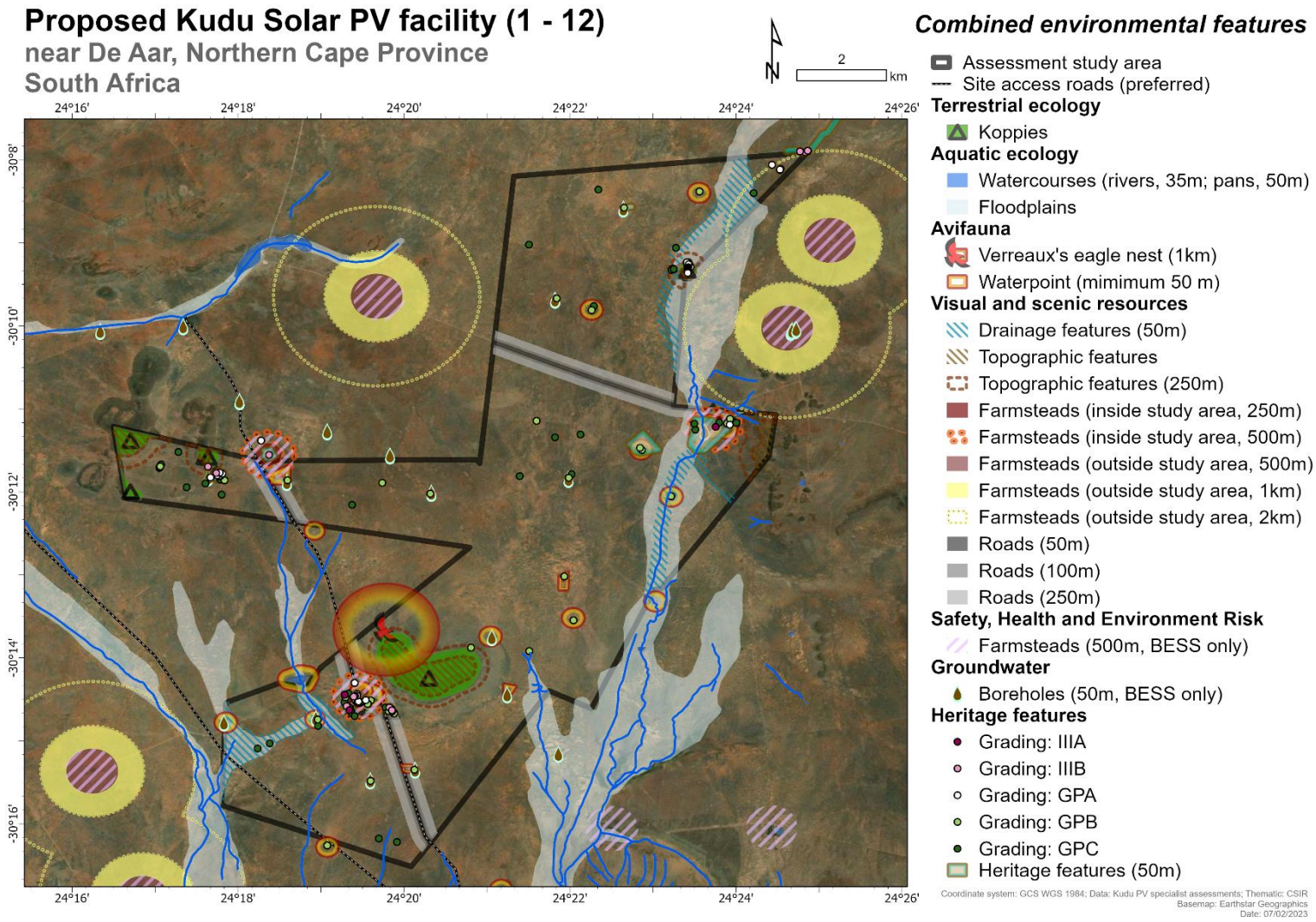

Figure 20-1: Combined environmental feature map for the proposed project study area based on specialist inputs.

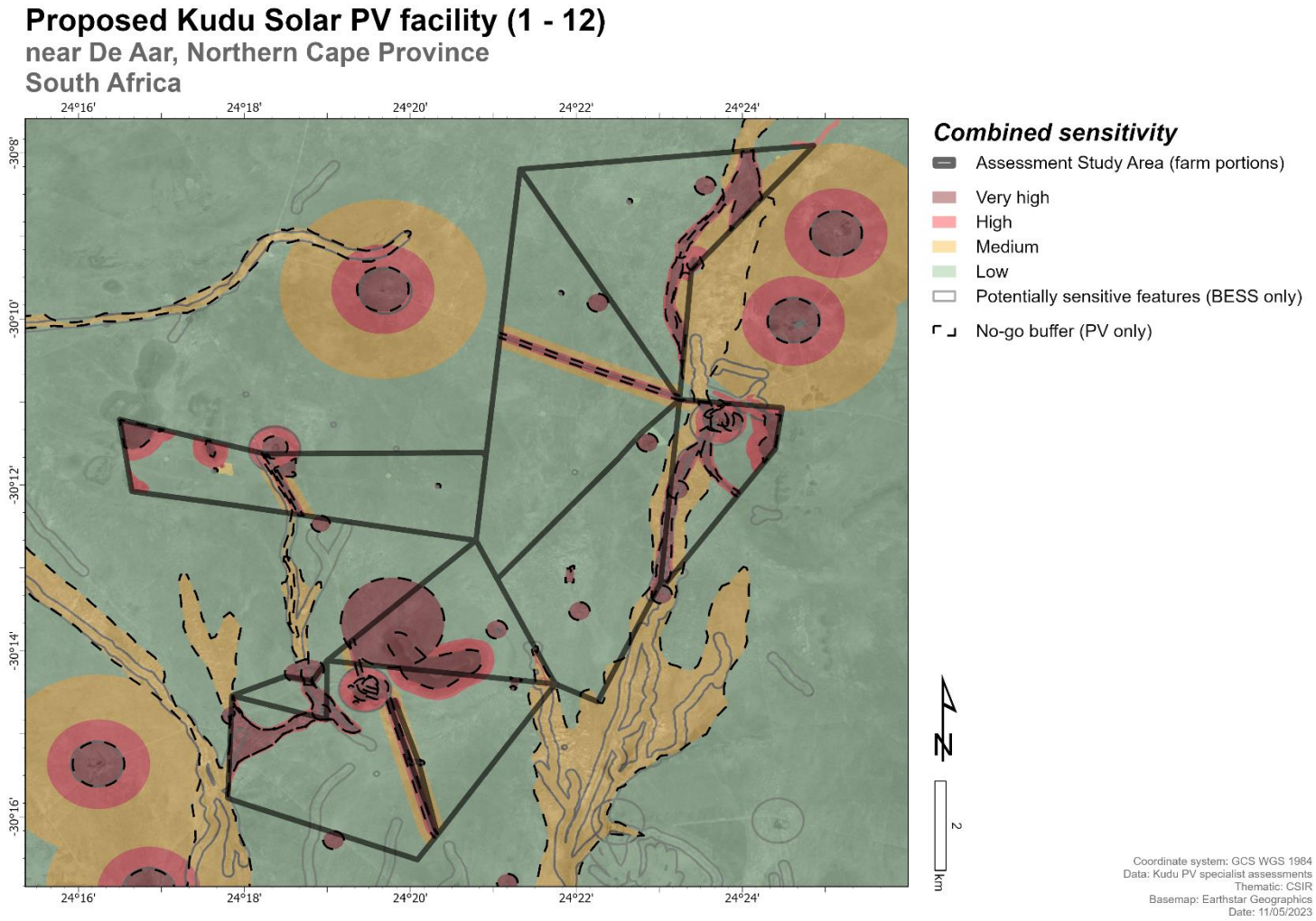

Figure 20-2: Combined environmental sensitivity map for the proposed project study area based on specialist inputs.

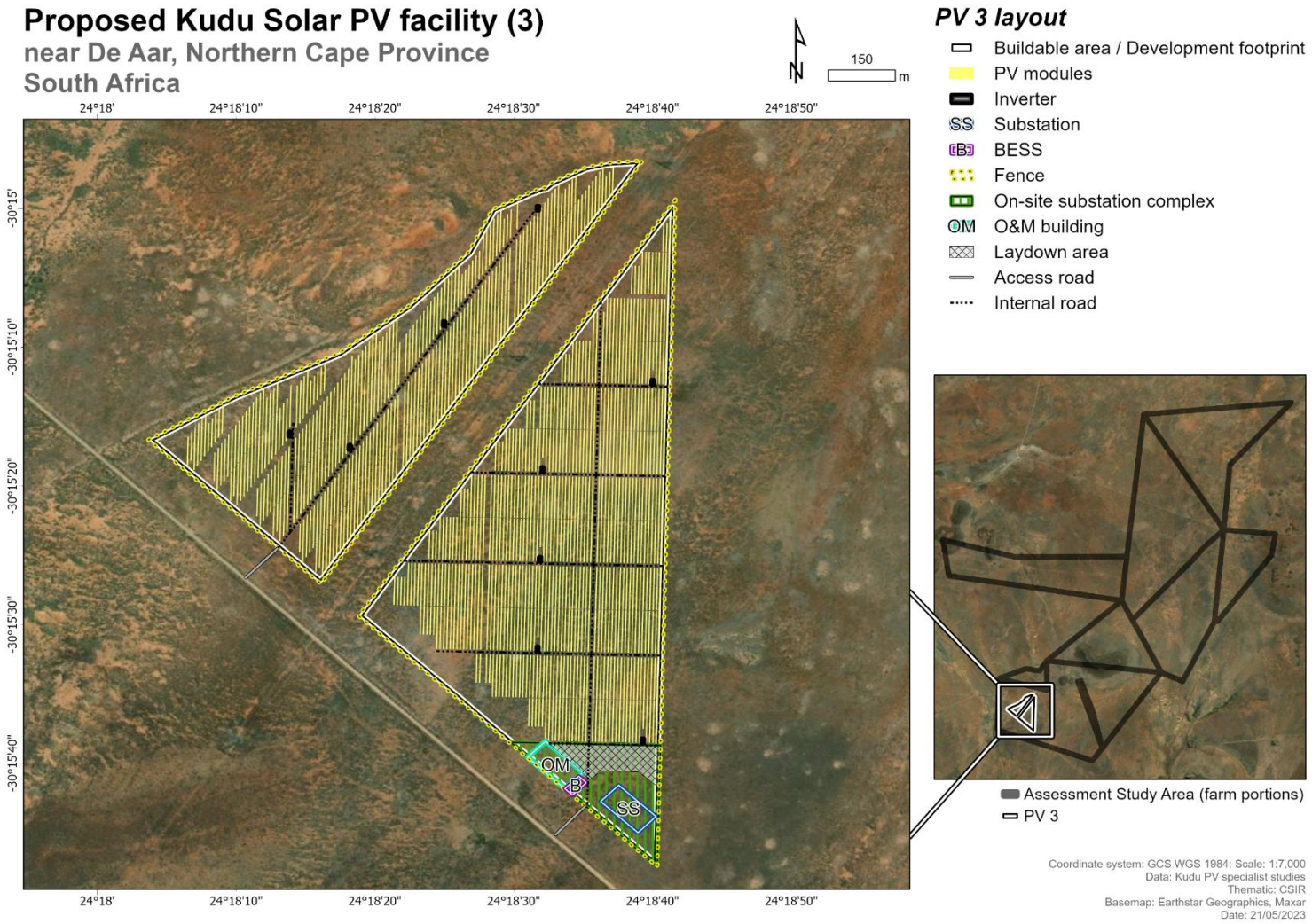

Figure 20-3: Project Layout Map showing the detailed infrastructure, buildable area and development footprints.

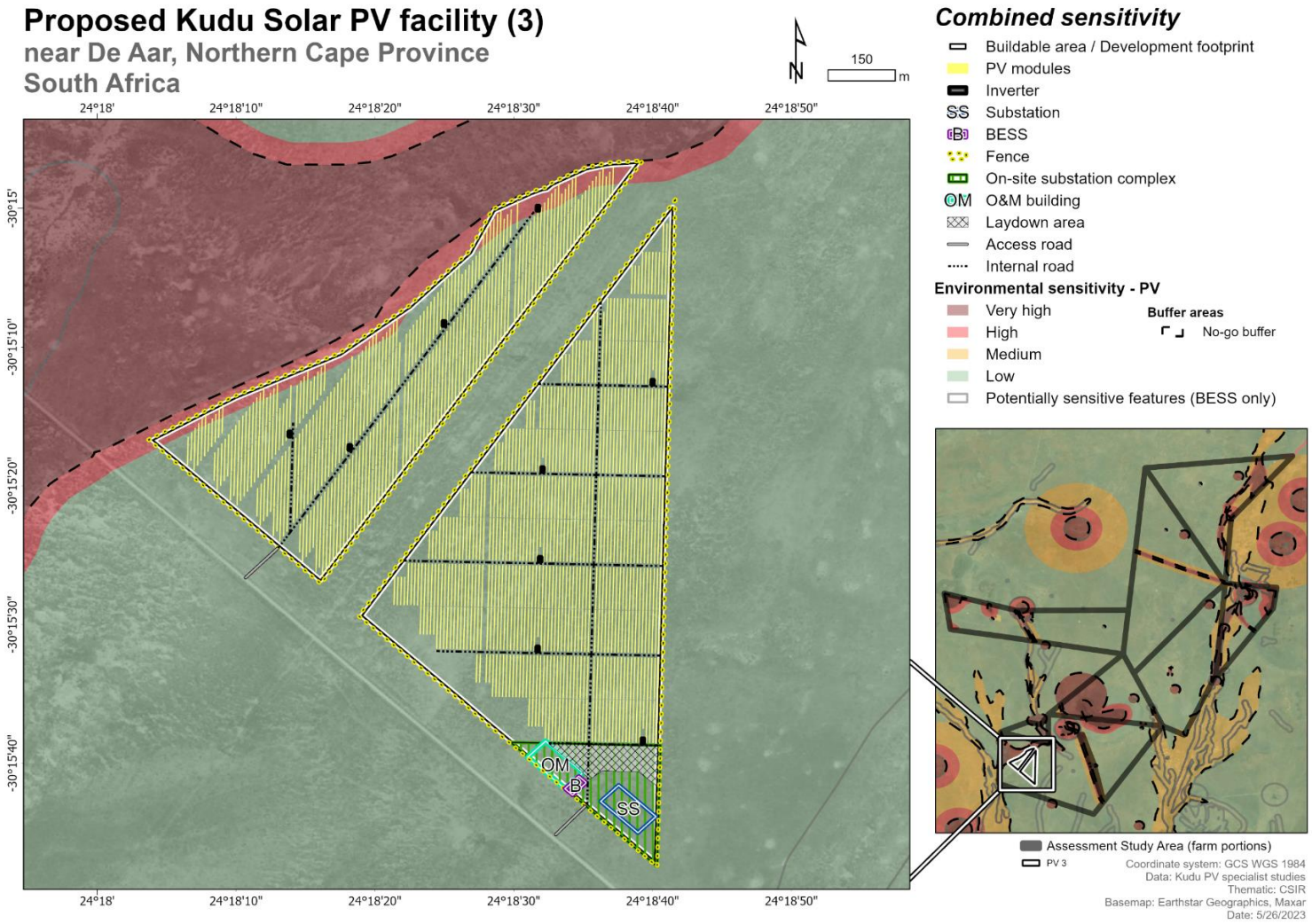

Figure 20-4: Combined Project Layout and Sensitivity Map.

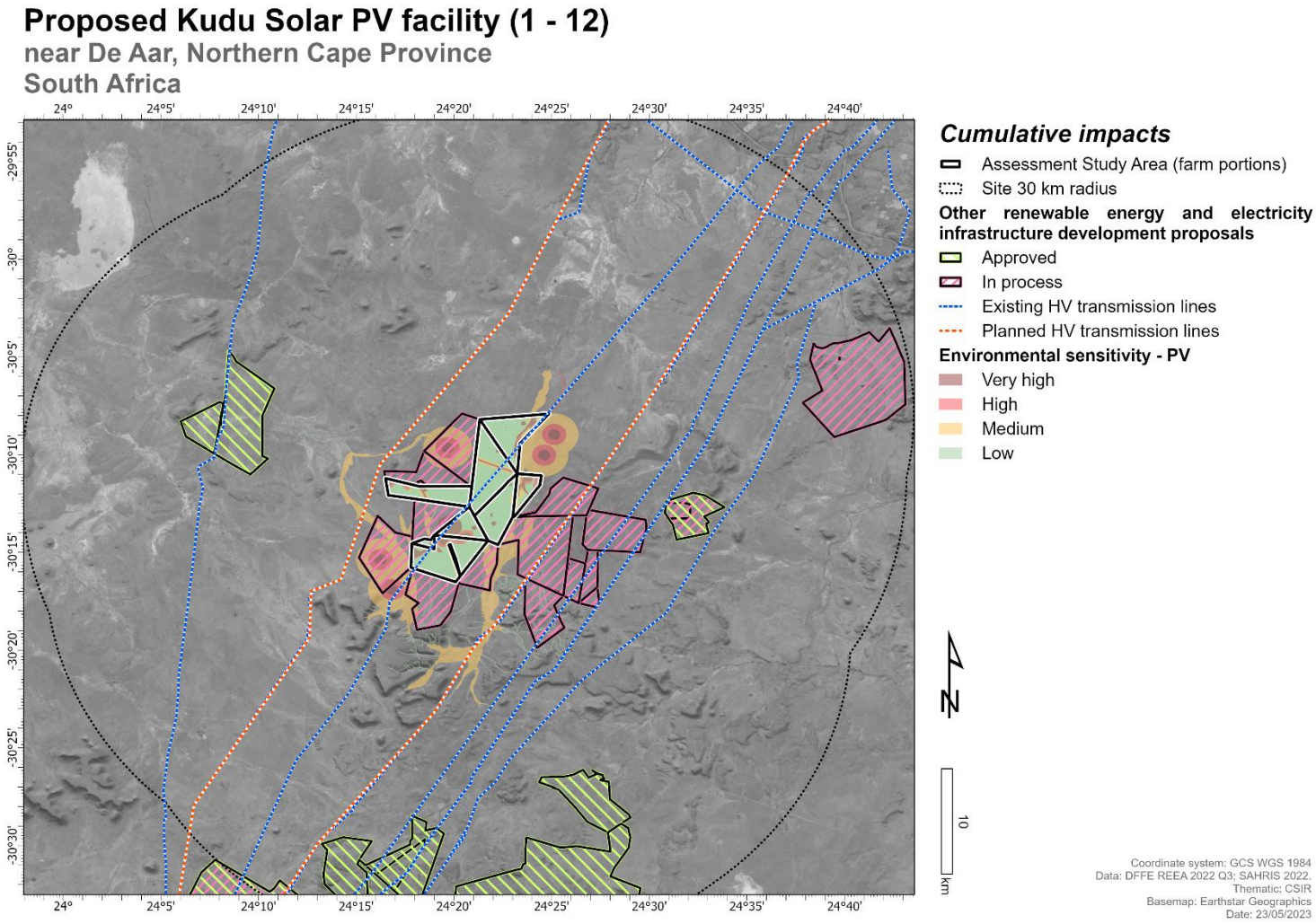

Figure 20-5: Combined Environmental Sensitivity and Cumulative Impact Map.

20.2 Summary of Project Alternatives

As discussed in Chapter 5 of this EIA Report, various alternatives have been considered and assessed as part of the EIA Phase.

- **Land-Use Alternative:**
  - The current land-use is agriculture, specifically low density small stock grazing. There is no cultivation in the area. The study area has low to medium agricultural sensitivity. The Solar PV facility is regarded as the preferred land-use.

- **Type of Activity Alternative:**
  - This relates to the generation of electricity from a renewable energy source, and in this particular case, from solar resources. The **generation of electricity from a renewable energy source was the only activity considered**, and thus considered in this Scoping and EIA Process. **No other activity types were considered or deemed appropriate** based on the expertise of the Project Developer.

- **Renewable Energy Alternatives:**
  - Given the above, the development of Solar PV is the preferred and only renewable energy technology to be developed on site because the site has a **very good solar resource availability** (i.e. GHI of 2 000 to 2 200 kWh/m^2 in terms of the long-term yearly total) and the **local conditions are favourable**.

- **Preferred Site and Development Footprint within the site:**
  - The preferred site for all the proposed Kudu Solar Facilities comprises eight farm portions which cover a combined footprint of 8 150 ha, which serves as the study area for this Scoping and EIA Process. This is the approved site as per the accepted Final Scoping Report.
  - This led to the identification of the buildable areas and development footprints within the preferred site that avoids no-go environmental sensitivities identified by the specialists. The combined layout and environmental sensitivity map is shown in Figure 20.4.
  - The approach followed was to use environmental and social constraints to avoid sensitive features, thus applying mitigation hierarchy thinking. This approach replaces the need to rank alternative sites and locations, as it leads to the selection of the least sensitive development footprint.

- **No-Go Alternative:**
  - The no-go alternative assumes that the proposed project will not go ahead i.e. it is the option of not constructing the proposed Kudu Solar Facility. This alternative would result in no environmental impacts (positive and negative) on the preferred site or surrounding local area, as a result of the proposed project. The no-go alternative has been assessed by all relevant specialists during the EIA Phase. Table 20.2 is a summary of the findings of the no-go alternative consideration.

Table 20-2: Summary of the No-Go Alternative based on Specialist Assessments

Specialist Assessment	No-Go Alternative
Chapter 6: Agriculture Compliance Statement	▪ The no-go alternative considers impacts that will occur to the agricultural environment in the absence of the proposed development. There are no agricultural impacts of the no-go alternative. ▪ The development offers an alternative income source to agriculture, but it excludes agriculture from a proportion of the land. Therefore, even though the excluded land has no crop production potential, the negative agricultural impact of the development is more significant than that of the no-go alternative, and so, purely from an agricultural impact perspective, the no-go alternative is the preferred alternative between the development and the no-go. However, the no-go option would prevent the proposed development from contributing to the environmental, social and economic benefits associated with the development of renewable energy in South Africa.
Chapter 7: Terrestrial Biodiversity, Terrestrial Plant Species, and Terrestrial Animal Species Assessment	▪ The no-go alternative means the project does not get developed and no transformation or disturbance of topsoil and vegetation takes place, and no removal of provincially protected species are required. The baseline conditions signify the two grasslands, the Northern Upper Karoo and the Eastern Upper Karoo, remain as is with all current impacts still present, including livestock pens, waterpoints, windpumps, alien invasive species, fences and existing overhead powerlines. Furthermore, impacts on ecosystem functions including biodiversity protection, water regulation, quantity and quality, protection of medicinal plants, and climate refugia habitats will not be impacted on, and will continue as normal. ▪ Should the development not proceed, the landowners will continue to utilise the grassland (baseline - dominant land use) for grazing purposes and creates an opportunity for the land to be used for other means, should the landowner, for example, wish to do other developments on site. Any development considered for this site, should result in a net benefit to society and should avoid undesirable negative impacts. ▪ It must be noted however, that not approving this project does not exclude other renewable energy projects from being developed in this area. ▪ Accordingly, since this area is not considered an exclusion zone for development, multiple applications for renewable energy has and is being submitted to the competent authority for approval. ▪ Therefore, the no-go alternative cannot be looked in isolation and must take into account the regional land use and other developments to determine the 'sense of place' and whether this development will significantly impact on the baseline conditions in a regional context.
Chapter 8: Aquatic Biodiversity	▪ The watercourses and associated wetlands and floodplains are in a largely natural to moderate condition due to the low level of impact in the area. ▪ The no-go option will thus result in no additional impacts on aquatic biodiversity and will result in the ecological status quo being maintained, which will be to the advantage of aquatic systems and biodiversity. ▪ However, with that being said, no fatal flaws were discovered in the course of the investigations for the proposed Kudu Solar Facility. The potential aquatic ecosystem impact significance for the proposed activities, with mitigation, is rated as very low.
Chapter 9: Avifauna Assessment	▪ The no-go option will result in no additional impacts on avifauna and will result in the ecological status quo being maintained, which will be to the advantage of the avifauna. However, with that being said, no fatal flaws were discovered in the course of the investigations for the proposed Kudu Solar Facilities, and with mitigation the potential impact significance is rated as mainly low.
Chapter 10: Visual Impact Assessment	▪ The 'no-go' alternative is the option of not constructing the project in which case the status quo of the current landscape character would prevail, the disadvantage being that no solar energy would be produced for export to the national grid. The potential visual impact would be neutral where the status quo is maintained, with neither impacts or benefits occurring.

Specialist Assessment	No-Go Alternative
Chapter 11: Heritage Impact Assessment (Archaeology and Cultural Landscape)	▪ If the project were not implemented, then the site would stay as it currently is (impact significance of negligible for archaeology and graves and very low negative for the landscape). ▪ Although the heritage impacts with implementation would be greater than the existing impacts, the loss of socio-economic benefits is more significant and suggests that the No-Go option is less desirable in heritage terms.
Chapter 12: Palaeontology Site Sensitivity Verification Report	▪ Not applicable as the study did not require an impact assessment due to the low to very low palaeo-sensitivity.
Chapter 13: Socio-Economic Assessment	▪ The no development option would represent a lost opportunity for South Africa to improve energy security and supplement its current energy needs with clean, renewable energy. Given South Africa's current energy security challenges and its position as one of the highest per capita producers of carbon emissions in the world, this would represent a significant negative social cost. The no development option is not supported by the findings of the Socio-Economic Assessment.
Chapter 14: Traffic Impact Assessment	▪ The no-go option will result in no additional impacts on traffic and will result in the road and traffic status quo being maintained. ▪ However, with that being said, no fatal flaws were discovered in the course of the investigations for the proposed project, and with mitigation the potential impact significance is rated as mainly low to very low.
Chapter 15: Battery Energy Storage System High Level Safety, Health and Environment Risk Assessment	▪ No-go alternative is not required to be assessed based on technical nature of the study.
Chapter 16: Geohydrology Assessment	▪ The farm portions where the project is proposed does not currently utilise significant volumes of groundwater and small-scale abstraction is predominantly for domestic purposes. As such the No-go alternative does not represent a risk to groundwater or aquifer depletion. However, there is a low water demand in the study area and a large spatial extent; and the impacts relating to the use of ground water are not considered to be very significant, especially if the proposed projects are planned and phased suitably.
Chapter 17: Geotechnical Assessment	▪ In terms of the no-go alternative, if the proposed development does not go ahead, there will be no need for displacement and/or loss of topsoil in the area. However, to date, apart from the construction of farmhouses and the erection of boundary and subcamp fences for farming purposes; little disturbance of the subsoils and rocks in the area proposed for development has taken place. For this reason, the no-go alternative is considered of low significance. ▪ However, the potential impacts of the proposed project from a geotechnical perspective are not considered to be very significant, especially if the recommended mitigation measures are adopted.

- As outlined in Section 20.4 and Section 20.5 of this chapter, the majority of the negative impacts identified as part of this assessment can be reduced to moderate or low significance with the implementation of mitigation measures. None of specialists found that the proposed projects should not go ahead i.e. no fatal flaws were identified. As noted above, the Socio-Economic Impact Assessment identified positive impacts from a social upliftment perspective. These include benefits to the local community via employment opportunities and the development of locally-owned industries to support construction related activities.
- Therefore, while the "no-go" alternative will not result in any negative environmental impacts as a result of the proposed project; it will also not result in any positive community development or socio-economic benefits. It will not assist government in addressing climate change commitments and reaching its set targets for reduced carbon emissions. Furthermore, it will not assist in generating the additional electricity

that is urgently required to address the shortage of generation capacity in the country and the need for new solar PV generation capacity that is specified in the energy planning for the country. **Hence the "no-go" alternative is not a preferred alternative, or a reasonable and feasible alternative considered in this Scoping and EIA Process**.

- **Technology Alternatives**
  - Solid State Lithium Ion Battery Energy Storage System (BESS) and Redox Flow BESS technology types have been assessed and were considered by the specialists as part of the proposed project components.
  - None of the specialists have identified any specific concerns relating to the BESS.
  - As noted previously, a High-Level High Level Safety, Health and Environment Risk Assessment (Chapter 15 of the EIA Report) was specifically commissioned for the BESS and it provides significant detail and information of the BESS technology alternatives.
  - Table 20.3 provides a summary of the specialist findings regarding the BESS technologies.

Table 20-3: Summary of the BESS Technology Alternatives based on Specialist Assessments

Specialist Assessment	Battery Energy Storage System (BESS) Technology Assessment
Chapter 6: Agriculture Compliance Statement	▪ Technology alternatives with respect to the BESS will make absolutely no material difference to the significance of the agricultural impacts. ▪ All BESS technology alternatives are acceptable.
Chapter 7: Terrestrial Biodiversity, Terrestrial Plant Species, and Terrestrial Animal Species Assessment	▪ No BESS is located in a sensitive area, but it is located within the grassland. ▪ For the Solid State Lithium Ion BESS, the necessary measures need to be put in place to limit potential fires, including considering a fire break (i.e. A natural or constructed barrier used to stop or check fires that may occur), if possible, around each Kudu PV facility (this is a worst-case scenario). ▪ However, as a containerised approach including the usual good practice of separation between containers which will be applied for this project, the impacts are likely restricted to events to one container at a time. ▪ For Redox Flow BESS, the most significant hazard is the possibility of spills of corrosive and environmentally toxic electrolyte. Several preventative and mitigative measures have been proposed in the EMPr and High-Level BESS Safety, Health and Environment Risk Assessment. ▪ The type of BESS technology will have no influence on terrestrial biodiversity; therefore, both are considered viable options. There are no fatal flaws associated with the proposed battery installation for either technology types.
Chapter 8: Aquatic Biodiversity	▪ Both BESS technologies have been considered. ▪ The proposed BESS within the site is not of aquatic ecosystem concern, given that the aquatic ecosystems have been avoided and adequately buffered. ▪ Either BESS technology would thus be suitable.
Chapter 9: Avifauna Assessment	▪ Both BESS technologies have been considered in this assessment. ▪ The type of technology will have no influence on avifauna; therefore, both are considered viable from an avifaunal perspective. ▪ The impacts of habitat transformation and disturbance associated with the BESS are covered in the assessment.
Chapter 10: Visual Impact Assessment	▪ The substation and BESS have been considered as an integral part of the solar facility and mitigations for these have been included in the Visual Impact Assessment. ▪ Both BESS technologies are considered viable from a visual perspective.
Chapter 11: Heritage Impact Assessment (Archaeology and Cultural Landscape)	▪ Two different battery technologies are being considered, but this makes no difference to the heritage assessment and, being equally acceptable, they were not assessed separately in the Heritage Impact Assessment report.

Specialist Assessment	Battery Energy Storage System (BESS) Technology Assessment
Chapter 12: Palaeontology Site Sensitivity Verification Report	▪ Not applicable as the study did not require an impact assessment due to the low to very low palaeo-sensitivity. However, no concerns were raised for all project components. The BESS was considered as part of the project components.
Chapter 13: Socio-Economic Assessment	▪ The proposed BESS site is not located within significant proximity to any social receptors. The study area is very sparsely populated. No inhabited dwellings are located within 2 km of the site. The proposed site is therefore suitable from a social impact assessment point of view. ▪ Both proposed technology options (Redox flow and Lithium ion) are acceptable from a Social Assessment perspective.
Chapter 14: Traffic Impact Assessment	▪ Both BESS technologies have been considered in the Traffic Impact Assessment. ▪ This type of technology will have no significant influence on traffic; therefore, both are considered viable from a traffic perspective. ▪ The traffic impacts discussed in the Traffic Impact Assessment are also associated with the BESS.
Chapter 15: Battery Energy Storage System High Level Safety, Health and Environment Risk Assessment	▪ A detailed BESS High-Level Safety, Health and Environment Risk Assessment was undertaken as part of the EIA Process. Note that this assessment is a technical study and does not need to comply with the requirements of the 2014 NEMA EIA Regulations (as amended). ▪ From a safety and health point of view, the Risk Assessment shows that risks posed by Vanadium Redox Flow BESS may be slightly lower than those of Solid State Lithium Ion BESS, particularly with respect to fire and explosion risks. ▪ From an environmental spill and pollution point of view the Vanadium Redox Flow BESS present higher short-term risks than the SSL systems. ▪ However, the above conclusions may be due to the fact that the Vanadium Redox Flow BESS technology is not as mature as Solid State Lithium technology and therefore there is not as much operating experience and accident information available for the Redox Flow BESS. ▪ Overall, from a Safety, Health and Environment Risk Assessment point of view, there is no specific preference for a type of technology. ▪ The assessment confirmed that there are no fatal flaws associated with the proposed battery installation for either technology type.
Chapter 16: Geohydrology Assessment	▪ Both BESS technologies have been considered in the assessment. T ▪ he risks associated with each individual technology is such that, with strict adherence to the appropriate mitigation measures, both technologies will have little risk to the local hydrogeological system. ▪ Furthermore, no fatal flaws of either technology with respect to the geohydrological system have been identified. ▪ Considering this, both Lithium Ion BESS and Redox Flow BESS are considered suitable, and no preference is given to either one.
Chapter 17: Geotechnical Assessment	▪ Both Lithium Ion and Redox Flow BESS technologies have been assessed. ▪ It is important to note that the choice of technology will not be influenced by geotechnical factors, thus both options are considered suitable from a geotechnical standpoint.

Based on the above, and the High-Level Safety, Health and Environment (SHE) Risk Assessment which has provided significantly detailed inputs, Solid State Lithium Ion BESS has been selected as the preferred BESS technology.

It must be re-iterated that both BESS technologies were assessed during the EIA Phase and found to be acceptable. However, Solid State Lithium Ion is the preferred and if this changes post EA (should such authorisation be granted), the Project Applicant will apply for a separate amendment process with the Competent Authority.

20.3 Need and Desirability

This EIA considered the nature, scale and location of the proposed development as well as the wise use of land (i.e., is this the right time and place for the development of this proposed project). The proposed project is linked to the national planning vision for large-scale wind and solar development in South Africa. The development of solar energy is important for South Africa to reduce its overall environmental footprint from power generation (including externality costs), and thereby to steer the country on a pathway towards sustainability.

The development of renewable energy is strongly supported at a national, provincial, and local level. The Northern Cape region is attractive for renewable energy projects due to the significant solar energy resources. Several renewable energy projects have been approved within a 30 km radius of the proposed project side, with a few facilities already developed and in operation.

The Final Integrated Development Plan (IDP) (2022 – 2027) for the Pixley Ka Seme District Municipality (PKSDM) identifies solar energy as a development opportunity in the RLM. The 2019-2020 IDP notes that the economy in the PKSDM is characterized by high levels of poverty, and low levels of development despite the strategic location in terms of the national transport corridors. The IDP recognises renewable energy projects as potential sustainable economic development opportunities. The development of the proposed project will therefore also be in line with the vision of the PKSDM to diversify the job market by creating and supporting sustainable economic growth and development opportunities.

20.4 Specialist Impact Assessment

Based on the detailed specialist assessments, various potential impacts have been identified. A summary of the main impacts identified is provided in Table 20.4. Note that several mitigation measures have also been provided by the specialists, however only selected key measures are noted in the table below. The specialist assessments included in Chapters 6 to 17 of this EIA Report contain all the detail. The recommended mitigation measures have been included in the Environmental Management Programme (EMPr) in Appendix I and Appendix J of this EIA Report.

Table 20-4: Summary of Key Impacts that were identified and assessed during the EIA Phase as part of the Specialist Assessments, including key recommended mitigation measures

Specialist Assessment undertaken	Key Impacts Identified	Recommended Mitigation Measures
Chapter 6 – Agriculture Compliance Statement	**Negative Direct Impacts:** **Construction Phase**: • Loss of agricultural potential by occupation of land. • Loss of agricultural potential by soil degradation. Soil can be degraded by impacts in three different ways: erosion; topsoil loss; and contamination. • Loss of agricultural potential by dust generation. **Decommissioning Phase**: • Loss of agricultural potential by soil degradation. Soil can be degraded by impacts in three different ways: erosion; topsoil loss; and contamination. • Loss of agricultural potential by dust generation. **Positive Indirect Impacts (mainly during operations):** • Increased financial security for farming operations. • Improved security against stock theft and other crime due to the presence of security infrastructure and security personnel at the energy facility.	**Design Phase:** ▪ Design an effective system of stormwater run-off control, where it is required - that is at any points where run-off water might accumulate. The system must effectively collect and safely disseminate any run-off water from all accumulation points and it must prevent any potential down slope erosion. This is included in the stormwater management plan. **Construction and Decommissioning Phases:** ▪ Implement an effective system of stormwater run-off control, where it is required (as specified above). ▪ Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize disturbed soil against erosion. ▪ If an activity will mechanically disturb the soil below surface in any way, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface. **Operational Phase:** ▪ Maintain the stormwater run-off control system. Monitor erosion and remedy the stormwater control system in the event of any erosion occurring. ▪ Facilitate re-vegetation of denuded areas throughout the site.
Chapter 7: Terrestrial Biodiversity, Terrestrial Plant Species, and Terrestrial Animal Species Assessment	**Negative Direct Impacts:** **Construction Phase:** • Habitat loss and fragmentation • Loss of protected species • Increased alien invasive species • Increased erosion and soil compaction • Littering and general pollution **Operational Phase:** • Loss of species composition and diversity • Increased alien invasive species • Littering and general pollution	**Construction Phase:** ▪ No development should take place within High sensitivity areas or buffer zones. Accordingly, the Koppies habitat (where relevant) should be avoided. The Watercourse habitats of medium sensitivity should be avoided, as recommended by the Aquatic specialist. ▪ No construction related activities, such as the site camp, storage of materials, temporary roads or ablution facilities may be located in the high sensitivity areas. ▪ Where the approved layout designs impact on individuals, permit applications are required for either the relocation or destruction of provincially protected species (Northern Cape Nature Conservation Act No.9 of 2009) and for protected trees in terms of the National Forests Act No. 84 of 1998. ▪ Alien invasive species establishment and spreading should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with such plants. ▪ Utilise existing access routes as far as possible. Confine the movement of vehicles to the access routes to and from the site and to the construction areas.

Specialist Assessment undertaken	Key Impacts Identified	Recommended Mitigation Measures
	Decommissioning Phase: • Loss of habitat • Increased alien invasive species **Cumulative Impacts – Construction Phase and Negative:** • Loss of habitat and vegetation	▪ Rehabilitate new vehicle tracks and areas where the soil has been compacted as soon as possible. ▪ Monitor the entire site for signs of erosion. ▪ General good housekeeping in terms of spills, refuelling and waste management. These have been included in the Environmental Management Programme. **Operational Phase:** ▪ The loss of species composition and diversity cannot be mitigated due to a permanent structure which will change microclimatic conditions for the life of the facility operation. ▪ Implement appropriate rehabilitation measures to restore each habitat to a natural state that is representative of the respective vegetation type after construction. ▪ Follow an alien and invasive species control and monitoring plan. ▪ General good housekeeping in terms of spills, refuelling and waste management. These have been included in the Environmental Management Programme. **Decommissioning Phase:** ▪ The loss of vegetation is unavoidable within the approved layout development footprint, but sensitive areas must be avoided. ▪ Rehabilitation and alien invasive management as per the construction and operational phase.
Chapter 8: Aquatic Biodiversity	**<u>Negative Direct Impacts:</u>** **Construction Phase:** ▪ Disturbance of aquatic habitat and impact on aquatic biota; ▪ Removal of indigenous aquatic vegetation and associated loss of aquatic ecological integrity and functionality; ▪ Water supply for construction and stress on available water resources; ▪ Road crossing structures may impede flow in the aquatic features; ▪ Alien vegetation infestation within the aquatic features due to disturbance; and ▪ Increased sedimentation and contamination of surface water runoff may result from construction activities. **Operational Phase:** ▪ Ongoing disturbance of aquatic features and associated vegetation along access roads or adjacent to the infrastructure that needs to be maintained; ▪ Modified runoff characteristics from hardened surfaces has the potential to result in erosion of adjacent watercourses; and ▪ Water supply and water quality impacts (e.g. contamination from sewage) as a result of the operation of the proposed Solar Facility and associated infrastructure. **Decommissioning Phase:**	**Construction Phase:** ▪ Ensure the final layout of the PV facility and associated infrastructure avoids watercourses and recommended buffers as far as possible; utilisation should be made of existing disturbed areas where possible. The medium sensitivity aquatic habitats should be avoided in the layout design, with only low-sensitivity habitats being disturbed during construction. Note that this has been achieved in the EIA Phase, whereby the recommended development setbacks (i.e. recommended buffer of at least 35 m for the smaller drainage features; and setback from the wider floodplain adjacent to the larger rivers) have been adopted in the identification of the development footprints. The recommended avoidance areas have been avoided. ▪ Clearing of indigenous vegetation should not take place within the aquatic features and the recommended buffers. ▪ Rehabilitate disturbed aquatic habitats by revegetating them with suitable local indigenous vegetation. ▪ Water use for construction should be minimised as much as possible. The water should be obtained from an existing water allocation or other viable water sources for construction purposes.

Specialist Assessment undertaken	Key Impacts Identified	Recommended Mitigation Measures
	▪ Increased disturbance of aquatic habitat due to the increased activity; and ▪ Increased sedimentation and contamination of surface water runoff. **<u>Negative Cumulative Impacts:</u>** **Construction and Decommissioning Phases:** ▪ Increased disturbance of aquatic habitat due to the increased activity in the wider area. **Operational Phases:** ▪ Degradation of ecological condition of aquatic ecosystems	▪ The road crossing structures should be designed to not impede flow in watercourses - low water crossing is preferred. Use existing crossings, as best as possible and where allowable. ▪ The existing road infrastructure, particularly within the floodplain, should be utilised as far as possible to access new infrastructure to minimise the overall disturbance. It is recommended that any new linear type of infrastructure crossings over watercourses be placed where there are existing structures or road crossings within the watercourse corridors, where possible. ▪ Undertake monitoring for the growth of alien vegetation. **Operational Phase:** ▪ Implement avoidance setbacks as recommended above the for the construction phase. ▪ Develop a stormwater management plan for the proposed development that addresses the stormwater runoff from the developed areas. ▪ Stormwater run-off infrastructure must be designed to mitigate both the flow and water quality impacts of any stormwater leaving the developed areas. The runoff should rather be dissipated over a broad area covered by natural vegetation or managed using appropriate shaping of the road with berms or channels and swales adjacent to hardened surfaces where necessary. Should any erosion features develop, they should be stabilised immediately. ▪ Sewage generated within the site should be discharged to a conservancy tank that is properly serviced and regularly evacuated to nearby wastewater treatment works. **Decommissioning Phase:** ▪ Minimise works within aquatic ecosystems. If the project layout avoided these areas, the decommissioning works would also be able to avoid aquatic habitats as delineated. Note that all aquatic areas recommended for avoidance have been avoided in the EIA phase layout identification. ▪ Rehabilitate and revegetate disturbed areas, where required. ▪ Decommissioning activities within aquatic features should be undertaken in the dry season where possible.
Chapter 9: Avifauna Assessment	**<u>Negative Direct Impacts:</u>** **Construction Phase:** ▪ Displacement due to disturbance associated with the construction of the solar PV plant and associated infrastructure. **Operational Phase:** ▪ Displacement due to habitat transformation associated with the presence of the solar PV plant and associated infrastructure.	**Construction Phase:** ▪ Activity should as far as possible be restricted to the footprint of the infrastructure. ▪ Measures to control noise and dust should be applied according to best practice in the industry at the time. ▪ Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum as far as practical. ▪ Access to the rest of the property must be restricted. ▪ The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the construction footprint is concerned.

Specialist Assessment undertaken	Key Impacts Identified	Recommended Mitigation Measures
	▪ Collisions with the solar panels. ▪ Entrapment in perimeter fences. ▪ Electrocutions in the onsite substation complex. ▪ Electrocution of priority species on the internal 33kV powerlines. **Decommissioning Phase:** ▪ Displacement due to disturbance associated with the decommissioning of the solar PV plant and associated infrastructure. **<u>Negative Cumulative Impacts:</u>** **Construction and Decommissioning Phases:** ▪ Displacement due to disturbance associated with the construction and decommissioning of the solar PV plants and associated infrastructure. **Operational Phase:** ▪ Displacement due to habitat transformation associated with the presence of the solar PV plants and associated infrastructure. ▪ Collisions with the solar panels. ▪ Entrapment in perimeter fences. ▪ Electrocutions in the onsite substation complexes. ▪ Electrocution of priority species on the internal 33kV powerlines.	▪ A 1km all infrastructure exclusion zone around the Verreaux's Eagle nest at -30.227660° 24.329773° must be implemented to provide unhindered access to the nest. The development footprint assessed in this report does not infringe on this buffer. **Operational Phase:** ▪ The recommendations of the botanical specialist must be strictly implemented, especially as far as limiting the vegetation clearance to what is absolutely necessary, and rehabilitation of transformed areas are concerned. ▪ Where possible, surface water (pans, dams and water troughs) must be buffered by a minimum of 50m to ensure unhindered access of priority species to the water. No PV panels should be constructed in this zone. Note that some of the waterpoints in the development footprint will be removed, however, since the minimum circular solar panel exclusion zone of 50m will be applied, the removal of some of the waterpoints will therefore not be a significant impact. ▪ A single perimeter fence should be used. ▪ The hardware within the proposed substation yard is too complex to warrant any mitigation for electrocution at this stage. It is recommended that if on-going impacts are recorded once operational, site-specific mitigation (insulation) be applied reactively. This is an acceptable approach because Red List priority species are unlikely to frequent the substation and be electrocuted. ▪ Use underground cabling as far as possible. Where the use overhead lines are unavoidable due to technical constraints, a bird-friendly pole design must be used. The avifaunal specialist must sign off on the pole design. **Decommissioning Phase:** ▪ Activity should as far as possible be restricted to the footprint of the infrastructure. ▪ Measures to control noise and dust should be applied according to best practice in the industry at the time. ▪ Maximum use should be made of existing access roads during the decommissioning phase and the construction of new roads should be kept to a minimum as far as practical. ▪ The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the activity footprint is concerned.
Chapter 10: Visual Impact Assessment	**<u>Negative Direct Impacts:</u>** **Construction Phase:** ▪ Potential effect of dust and noise from trucks and construction machinery during the construction period, and the effect of this on nearby farmsteads and visitors to the area. ▪ Potential visual effect of haul roads, access roads, stockpiles and construction camps in the visually exposed landscape.	**Construction Phase:** ▪ Locate construction camps, batching plants and stockpiles in visually unobtrusive areas, away from public roads. ▪ Implement EMPr with ECO during construction. **Operational Phase:**

Specialist Assessment undertaken	Key Impacts Identified	Recommended Mitigation Measures
	Operational Phase: ▪ Potential visual intrusion of solar arrays and related infrastructure on receptors including glint and glare. ▪ Potential visual impact of an industrial type activity on the pastoral / rural character and sense of place of the area. **Decommissioning Phase:** ▪ Potential visual effect of any remaining structures, platforms and disused roads on the landscape. **Negative Cumulative Impacts:** **Construction, Operational and Decommissioning Phases:** ▪ Potential combined visual effect of the proposed 12 solar PV facilities in the study area, seen together with other existing and proposed renewable energy facilities in the area, and could potentially increase the overall cumulative visual impact.	▪ Substation and BESS to be located in an unobtrusive low-lying area, away from public roads. ▪ Muted natural colours and non-reflective finishes to be used for structures generally. ▪ Internal access roads to be as narrow as possible, and existing roads or tracks used as far as possible. ▪ Outdoor/ security lighting to be fitted with reflectors to obscure the light source, and to minimise light spillage. ▪ Internal powerlines (i.e. 22 kV or 33 kV) to be located underground where possible. (In some cases, such as stream crossings, internal powerlines may need to be above ground). ▪ Outdoor signage to be discrete and commercial / billboard signage avoided. **Decommissioning Phase:** ▪ Solar arrays and infra-structure to be removed and recycled. ▪ Access roads no longer required to be ripped and regraded. ▪ Exposed or disturbed areas to be revegetated to blend with the surroundings.
Chapter 11: Heritage Impact Assessment (Archaeology and Cultural Landscape)	**Negative Direct Impacts:** **Construction Phase:** ▪ Potential impacts to archaeology; ▪ Potential impacts to graves; and ▪ Potential impacts to the cultural landscape. **Operational Phase:** ▪ Potential impacts to the cultural landscape. **Decommissioning Phase:** ▪ Potential impacts to the cultural landscape. **Negative Cumulative Impacts:** **Construction, Operational and Decommissioning Phases:** ▪ Potential impacts to the cultural landscape. **Construction Phase:** ▪ Potential impacts to archaeology; and ▪ Potential impacts to graves.	**Construction Phase:** ▪ Report any chance finds of dense clusters of artefacts to SAHRA and/or an archaeologist. Protect in situ and appoint archaeologist to sample as needed. ▪ Report any chance finds of graves to SAHRA and/or an archaeologist. Protect in situ and appoint archaeologist to exhume. ▪ Minimise the duration of construction period. ▪ Ensure effective rehabilitation, at the end of the construction period, of areas not needed during operation. **Operational Phase:** ▪ Ensure that all maintenance vehicles and operational activities stay within designated areas. ▪ Paint buildings in earthy colours to reduce contrast. ▪ Make use of motion detectors and downlighting to reduce night-time light pollution. **Decommissioning Phase:** ▪ Minimise duration of decommissioning period ▪ Ensure effective rehabilitation of the entire site once the infrastructure has been removed.

Specialist Assessment undertaken	Key Impacts Identified	Recommended Mitigation Measures
Chapter 12: Palaeontology Site Sensitivity Verification Report	▪ The study area has been confirmed as low to very low palaeo-sensitivity. Provided that the Chance Fossil Finds Protocol is incorporated into the EMPrs and fully implemented during the construction phase of the solar PV facility, there are no objections on palaeontological heritage grounds to authorisation of the proposed project. Pending the discovery of significant new fossil finds before or during construction, no further specialist palaeontological studies, reporting, monitoring or mitigation are recommended for the proposed project.	▪ The Chance Fossil Finds Protocol has been incorporated into the project EMPrs (Appendix I and Appendix J of this EIA Report).
Chapter 13: Socio-Economic Assessment	**Direct Negative Impacts** **Construction Phase:** ▪ Impacts associated with the presence of construction workers on local communities. ▪ Impacts related to the potential influx of job seekers. ▪ Increased risks to livestock and farming infrastructure associated with the construction related activities and presence of construction workers on the site. ▪ Increased risk of grass fires associated with construction related activities; ▪ Nuisance impacts, such as noise, dust, and safety, associated with construction related activities and vehicles. ▪ Impact on productive farmland. **Operational Phase:** ▪ Visual impacts and associated impacts on sense of place. ▪ Potential impact on property values. ▪ Potential impact on tourism. **Decommissioning Phase:** ▪ Social Impacts associated with retrenchment, including loss of jobs and source of income. **Direct Positive Impacts** **Construction Phase:** ▪ Creation of employment and business opportunities, and opportunity for skills development and on-site training. **Operational Phase:** ▪ Establishment of infrastructure to improve energy security and support renewable sector. ▪ Creation of employment opportunities. ▪ Benefits associated with socio-economic contributions to community development.	Note that several mitigation and enhancement measures have been identified in the assessment. The list below is only a summary of some of the recommendations. **Positive Impacts – Enhancement Measures:** **Construction Phase:** ▪ Where reasonable and practical, the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. However, due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area. ▪ Where feasible, efforts should be made to employ local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria. ▪ Before the construction phase commences the proponent should meet with representatives from the Renosterberg Local Municipality (RLM) and the Emthanjeni Local Municipality (ELM) to establish the existence of a skills database for the area. If such as database exists, it should be made available to the contractors appointed for the construction phase. ▪ The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the proponent intends following for the construction phase of the project. ▪ Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase. ▪ The recruitment selection process should seek to promote gender equality and the employment of women wherever possible. ▪ The proponent and contractor should develop a Code of Conduct (CoC) for construction workers. The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be subject to appropriate disciplinary action and/or dismissed. All dismissals must comply with the South African labour legislation. The CoC should be signed by the proponent and the contractors before the contractors move onto site. The CoC should form part of the CHSSP. **Operational Phase:**

Specialist Assessment undertaken	Key Impacts Identified	Recommended Mitigation Measures
	▪ Benefits for local landowners. **<u>Cumulative impacts:</u>** ▪ Negative: Cumulative impacts on sense of place ▪ Negative: Cumulative impact on local services and accommodation ▪ Positive: Cumulative impact on local economy.	▪ Maximise the number of employment opportunities for local community members. ▪ Implement training and skills development programs for members from the local community. ▪ Maximise opportunities for local content and procurement. ▪ Implement agreements with affected landowners on which the PV facility will be constructed. **Negative Impacts – Mitigation Measures:** **Construction Phase:** ▪ Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the construction phase. ▪ Preparation and implementation of a Community Health, Safety and Security Plan (CHSSP) prior to and during the construction phase. ▪ All farm gates must be closed after passing through. ▪ Contractors appointed by the proponent should provide daily transport for low and semi-skilled workers to and from the site. ▪ Timing of construction activities should be planned to avoid / minimise impact on key farming activities. ▪ All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc., should be rehabilitated at the end of the construction phase. **Operational Phase:** ▪ The recommendations of the Visual Impact Assessment should be implemented. **Decommissioning Phase:** ▪ The proponent should ensure that retrenchment packages are provided for all staff retrenched when the plant is decommissioned. ▪ All structures and infrastructure associated with the proposed facility should be dismantled and transported off-site on decommissioning.
Chapter 14: Traffic Impact Assessment	**<u>Direct Negative Impacts</u>** **Construction and Decommissioning Phases:** ▪ Potential congestion and delays on the surrounding road network. ▪ Potential impact on traffic safety and increase in accidents with other vehicles or animals. ▪ Potential change in the quality of the surface condition of the roads. ▪ Potential noise and dust pollution. **Operational Phase:**	**Construction and Decommissioning Phases:** ▪ Stagger delivery trips and schedule trips, including staff trips outside of peak hours where possible. ▪ Implement speed control by means of a stop and go system and speed limit road signage within the construction and decommissioning site. ▪ Ensure all vehicles are roadworthy, visible, adequately marked, and operated by an appropriately licenced operator. ▪ Regular maintenance of internal farm access roads by the contractor.

Specialist Assessment undertaken	Key Impacts Identified	Recommended Mitigation Measures
	▪ The traffic generated during the operational phase are mainly related to the staff that will be transported to and from the sites and are not anticipated to have a significant traffic impact on the surrounding road network. **<u>Cumulative Negative Impacts</u>** **Construction and Decommissioning Phases:** ▪ Potential congestion and delays on the surrounding road network. ▪ Potential impact on traffic safety and increase in accidents with other vehicles or animals. ▪ Potential change in the quality of the surface condition of the roads. ▪ Potential noise and dust pollution.	▪ Ensure private access roads that are impacted on by the proposed development are restored to original pre-construction road condition. ▪ Implement dust control on gravel roads within the construction and decommissioning site.
Chapter 15: Battery Energy Storage System High Level Safety, Health and Environment Risk Assessment	Various risks were identified in terms of safety, health and the environment due to the proposed BESS. The BESS High Level Safety, Health and Environment Risk Assessment identified risks, hazards, and consequences, such as, but not limited to: ▪ Human Health - chronic exposure to toxic chemical or biological agents. Causes - Construction materials such as cement, paints, solvents, welding fumes, truck fumes etc. Consequences - Employee / contractor illness. ▪ Human Health - exposure to noise. Causes - Drilling, piling, generators, air compressors. Consequences - Adverse impact on hearing of workers. Possible nuisance factor in near-by areas. ▪ Human and Equipment Safety - exposure to fire radiation Causes – ▪ Involvement in an external fire. Fire involving fuels used in construction vehicles or vehicles themselves (e.g., tyre fire). Fire due to uncontrolled welding or other hot-work. Consequences - Injuries due to radiation especially amongst first responders and bystanders. Fatalities unlikely from the heat radiation as not highly flammable nor massive fire. ▪ Human and Equipment Safety - exposure to explosion over pressures. Transformer shorting / overheating / explosion. Consequences - Potential fatalities, e.g., amongst first responders. Damage to nearby equipment.	▪ There are numerous different battery technologies but using one consistent battery technology system for the BESS installations associated with all the proposed Kudu Solar Facilities would allow for ease of training, maintenance, emergency response and could significantly reduce risks. ▪ Where reasonably practicable, state-of-the-art battery technology should be used with all the necessary protective features e.g., draining of cells during shutdown and standby-mode, full Battery Management System (BMS) with deviation monitoring and trips, leak detection systems. ▪ Ensure that the technical and system suggestions for reducing risks, as specified in the assessment, specifically in terms of preventative and mitigative measures are included in the design. ▪ The overall design should be subject to a full Hazard and Operability Study (HAZOP) prior to finalisation of the design. ▪ For Redox Flow systems, an end of life (and for possible periodic purging requirements) solution for the large quantities of hazardous electrolyte should be investigated, e.g., can it be returned to the supplier for re-conditioning. ▪ Prior to importing any solid-state battery containers into the country, the contractor should ensure that: o An Emergency Response Plan is in place that would be applicable for the full route from the ship to the site. This plan needs to include details of the most appropriate emergency response to fires both while the units are in transit and once they are installed and operating. o An End-of-Life Plan is in place for the handling, repurposing or disposal of dysfunctional, severely damaged batteries, modules and containers. ▪ The site layout and spacing between lithium solid-state containers should be such that it mitigates the risk of a fire or explosion event spreading from one container to another. ▪ In order to limit the possibility of domino failures the BESS should be separated from the substation by at least 20 m. ▪ Where there is a choice of alternative locations for the BESS, those that are further from water courses would be preferred. Redox Flow BESS hazards are mostly related to

Specialist Assessment undertaken	Key Impacts Identified	Recommended Mitigation Measures
		possible loss of containment of electrolyte and solid-state systems may experience fires that may result in loss of containment of liquids or the use of large amounts of fire water which could be contaminated. The run-off should not enter water courses directly. ▪ Finally, it is suggested once the BESS technology has been chosen and more details of the final design are available, the necessary updated Risk Assessments should be in place (prior to commencement, after EA and other necessary approvals are granted (should such be granted)).
Chapter 16: Geohydrology Assessment	**Direct Negative Impacts:** **Construction Phase:** ▪ Potential lowering of the groundwater level from construction requirements; ▪ Potential impact on groundwater quality as a result of accidental oil spillages or fuel leakages. **Operational Phase:** ▪ Potential lowering of the groundwater level from operational requirements. ▪ Potential impact of groundwater quality as a result of using cleaning agents for cleaning the solar panels. ▪ Groundwater quality deterioration as a result of electrolyte that will be used for the BESS. **Decommissioning Phase:** ▪ Potential impact on groundwater quality as a result of accidental oil spillages or fuel leakages. ▪ Potential lowering of the groundwater level from decommissioning requirements. **Cumulative Negative Impacts:** ▪ Potential lowering of groundwater level during the construction, operational and decommissioning phase for all 12 of the Kudu PV facilities. ▪ Potential impact on groundwater quality as a result of accidental oil spillages or fuel leakages from the construction and the decommissioning phase for all 12 Kudu facilities. ▪ Potential of impact on groundwater quality as a result of using cleaning agents for cleaning the solar panels during the operational phase for all the 12 Kudu facilities. ▪ Potential impact on groundwater quality as a result of electrolyte that will be used for the BESS.	**Construction and Decommissioning Phases:** ▪ Adhere to the borehole's safe yield and to monitor water levels and flow. ▪ Boreholes must be correctly yield tested according to the National Standard (SANS 10299-4:2003, Part 4 – Test pumping of water boreholes). This includes a Step Test, Constant Discharge Test and recovery monitoring. ▪ Vehicles must be regularly serviced and maintained to check and ensure there are no leakages. ▪ Diesel fuel storage tanks, if required, should be above ground on an impermeable surface in a bunded area. ▪ Vehicles and equipment should also be refuelled on an impermeable surface. A designated area should be established at the construction site camp for this purpose, if off-site refuelling is not possible. If spillages occur, they should be contained and removed as rapidly as possible, with correct disposal procedures of the spilled material, and reported. **Operational Phase:** ▪ Borehole's safe yield, monitoring and yield testing as per the construction phase. ▪ Use environmentally safe cleaning agents that breakdown naturally and do not cause adverse effects. ▪ Ensure that all electrolyte or chemicals stored or used on site have secondary containment systems in place with reliable leak detection, annunciation in place. Ensure that all chemicals are handled on concrete bunded surfaces and not on bare soil. ▪ Wastewater produced by fire hydrants should not be allowed to runoff into the environment. ▪ It is recommended that all BESS's are placed a minimum of 50m from any borehole.

Specialist Assessment undertaken	Key Impacts Identified	Recommended Mitigation Measures
	▪ Other wind and solar, and EGI projects within a 30 km radius.	
Chapter 17: Geotechnical Assessment	**<u>Direct and Cumulative Negative Impacts:</u>** **Construction Phase:** ▪ Displacement of geologic materials. ▪ Contamination of geologic materials as a consequence of the construction activities. **Operational and Decommissioning Phase:** ▪ Increased unnatural hard surfaces. ▪ Contamination of geologic materials as a consequence of typical maintenance and decommissioning activities.	**Construction Phase:** ▪ Favour dolerite as an aggregate (as opposed to Karoo sandstones and mudstones). Subject to investigation. ▪ Any road cuttings should be designed by an appropriately qualified professional. ▪ Drainage in the region should be designed and managed appropriately. ▪ Investigate and confirm the geotechnical suitability of each structure (or other appropriate level of investigation) prior to construction (i.e., determine that soil with an adequate bearing capacity is obtained beneath each footing). Such investigations would not be required to fulfil the requirements of this EIA process. However, it would be necessary prior to construction. ▪ Only strip vegetation necessary for the next phase of construction. ▪ Install temporary drainage to divert stormwater away from active construction activities, where required. ▪ Where impacted through construction-related activities, all sloped areas must be stabilised to ensure proper rehabilitation is affected and erosion is controlled. **Operational Phase:** ▪ Install drainage to divert stormwater away from activities, roads/tracks, structures, where required. ▪ During the execution of the operations, appropriate measures to prevent pollution and contamination of the riparian environment must be implemented e.g. including ensuring that construction equipment is well maintained; **Decommissioning Phase:** ▪ Land rehabilitation to near natural state, i.e., removal of foundations and backfilling of any resultant voids within the soil, as well as removal of hard surfaced areas. Replacement soil should be sourced locally to ensure homogeneity. ▪ Reinstate natural topography where cut-to-fill embankments have been constructed.

20.5 Summary of Key Impact Assessment Findings

Based on the findings of the detailed specialist impact assessments, which are included in Chapter 6 to 17 of this EIA Report, the proposed project is considered to have an **overall Moderate to Very Low negative environmental impact** and an **overall High to Moderate positive socio-economic impact** (with the implementation of respective mitigation and enhancement measures). Table 20.5 below provides a summary of the impact assessment for the proposed project post mitigation for direct impacts. Table 20.6 provides the same information for the cumulative impacts.

As indicated in Table 20.5, the direct negative impacts were rated with an overall **Low to Very Low** post-mitigation impact significance for the **construction phase**, with only Terrestrial Biodiversity impacts being rated as Moderate. In terms of the **operational and decommissioning phases**, the majority of the direct negative impacts were rated with a **Low to Very Low** post-mitigation impact significance. In terms of direct positive impacts, the Socio-Economic impacts are rated as having a **Moderate** impact significance post-mitigation for the construction phase; and **Moderate to High** impact significance post-mitigation for the operational phase.

Based on Table 20.6, the majority of the cumulative negative impacts were rated with a **Low** post-mitigation impact significance for the **construction phase**, with the exception of Terrestrial and Socio-Economic impacts, which were respectively rated with a Moderate and Moderate to Low post-mitigation impact significance. A similar trend is applicable to the **operational phase**, with Visual and Avifauna impacts being rated as **Moderate**; and Socio-Economic impacts being rated as **Moderate to Low**.

During the **decommissioning phase**, the majority of cumulative impacts were rated with a **Low to Very Low** post-mitigation impact significance, whereas some were not identified, or are considered insignificant, or could not be measured empirically at the time of assessment. In terms of cumulative positive impacts, the Socio-Economic impacts were rated with an overall **Moderate** post-mitigation impact significance.

Table 20-5: Overall Impact Significance with the Implementation of Mitigation Measures for Direct Negative and Positive Impacts

Specialist Assessment	Construction Phase	Operational Phase	Decommissioning Phase
DIRECT NEGATIVE IMPACTS			
Agriculture and Soils	Low	Low	Low
Terrestrial Biodiversity, Terrestrial Plant Species, and Terrestrial Animal Species	Moderate	Low	Low
Aquatic Biodiversity	Very Low	Very Low	Very Low
Avifauna	Low	Very Low / Low	Low
Visual	Low	Low	Very Low
Heritage (Archaeology and Cultural Landscape)	Low	Low	Low
Palaeontology	Insignificant and/or not identified and/or not applicable	Insignificant and/or not identified and/or not applicable	Insignificant and/or not identified and/or not applicable
Socio-Economic	Low	Low	Low
Traffic	Low / Very Low	Insignificant	Low / Very Low
Geohydrology	Low / Very Low	Low / Very Low	Very Low
Geotechnical	Very Low	Very Low	Very Low
DIRECT POSITIVE IMPACTS			
Socio-Economic	Moderate	Moderate / High	Insignificant and/or not identified and/or not applicable

Table 20-6: Overall Impact Significance with the Implementation of Mitigation Measures for Cumulative Negative and Positive Impacts

Specialist Assessment	Construction Phase	Operational Phase	Decommissioning Phase
CUMULATIVE NEGATIVE IMPACTS			
Agriculture and Soils	Low	Low	Low
Terrestrial Biodiversity, Terrestrial Plant Species, and Terrestrial Animal Species	Moderate	Low	Low
Aquatic Biodiversity	Very Low	Very Low	Very Low
Avifauna	Low	Moderate	Low
Visual	Low	Moderate	Very Low
Heritage (Archaeology and Cultural Landscape)	Low	Low	Low
Palaeontology	Insignificant and/or not identified and/or not applicable	Insignificant and/or not identified and/or not applicable	Insignificant and/or not identified and/or not applicable
Socio-Economic	Low / Moderate	Low / Moderate	Insignificant and/or not identified and/or not applicable
Traffic	Low	Insignificant	Low / Very Low
Geohydrology	Low / Very Low	Low / Very Low	Very Low
Geotechnical	Low	Low	Low
CUMULATIVE POSITIVE IMPACTS			
Socio-Economic	Moderate	Moderate	Moderate

20.6 Overall Environmental Impact Statement and Reasoned Opinion from the EAP

The information presented above, contributes to this overall environmental impact statement and reasoned opinion from the EAP as to whether the proposed project should or should not be authorised, including any conditions that should be made in respect of the authorisation (should it be granted).

Based on the findings of the detailed specialist assessments and technical studies, which all recommend that the proposed project can proceed and should be authorised by the DFFE, the proposed project is considered to have an **overall Moderate to Very Low negative environmental impact, and an overall Moderate to High positive socio-economic impact** (with the implementation of respective mitigation and enhancement measures).

The proposed project will take place within the development footprint on the preferred and approved project site, as contemplated in the accepted Final Scoping Report. The development footprint and buildable areas will avoid the "no-go" sensitive features identified and mapped by the respective specialists, where relevant and applicable, as discussed in Section 20.1 of this chapter.

This EIA has considered the nature, scale and location of the development as well as the wise use of land. When considering the timing of this project, the IRP 2019 proposes to secure 17 800 MW of renewable energy capacity by 2030. As discussed in the preceding chapters of this EIA Report, it is the Project Applicant's intention to bid this project in the future bidding rounds of the REIPPPP.

The proposed project will be in line with and will be supportive of the objective of the PKSDM IDP in terms of creating more job opportunities. The proposed Solar PV Facility will assist in local job creation during the construction and operational phases of the project (if approved by the DFFE). It should be noted that employment during the construction phase will be temporary and provided for a period of 12 to 18 months.

Section 24 of the Constitutional Act states that "*everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures, that prevents pollution and ecological degradation; promotes conservation; and secures ecologically sustainable development and use of natural resources while promoting justifiable economic and social development*". Based on this, this EIA was undertaken to ensure that these principles are met through the inclusion of appropriate management and mitigation measures, and monitoring requirements. These measures will be undertaken to promote conservation by avoiding the sensitive environmental features present on site and through appropriate monitoring and management plans (refer to the EMPr in Appendix I and Appendix J of this EIA Report).

The outcomes of this project therefore succeed in meeting the environmental management objectives of protecting the ecologically sensitive areas and supporting sustainable development and the use of natural resources, whilst promoting justifiable socio-economic development in the towns nearest to the project site. The findings of this EIA show that all natural resources will be used in a sustainable manner (i.e., this project is a renewable energy project, and the majority of the negative site specific and cumulative environmental impacts are considered to be of low significance with mitigation measures implemented), while the benefits from the project will promote justifiable economic and social development. Furthermore, additional specialist studies (not recommended by the Screening Tool) have been undertaken as part of the EIA Process to ensure that all potential environmental impacts are addressed and assessed. Refer to Table 20.7 for a summary of reasoned opinions from the specialists.

Table 20-7: Summary of the Reasoned Opinions from the Specialists

Specialist Assessment undertaken	Reasoned Opinion on whether the project should be authorised
Chapter 6: Agriculture Compliance Statement	▪ The conclusion of the assessment is that the proposed development offers a valuable opportunity for renewable energy development with very little loss of future agricultural production potential. ▪ Based on various factors, the impact of the proposed development on the agricultural production capability of the site is assessed as being acceptable. Therefore, from an agricultural impact point of view, it is recommended that the development be approved.
Chapter 7: Terrestrial Biodiversity, Terrestrial Plant Species, and Terrestrial Animal Species Assessment	▪ The proposed development is not located in a threatened vegetation type or ecosystem and is located in an ESA mainly due to presence of sensitive birds and watercourses. However, in the specialist's opinion, ESA cannot be regarded as Very High sensitivity as it is not irreplaceable areas, and depending on what ecological features it is based on, can be regarded as Medium or High sensitivity. ▪ There are no high sensitivity features on site, and no plant SCC were recorded. However, provincially protected species recorded will require permits for relocation from the provincial authority. ▪ The proposed project can proceed should all no-go sensitive areas be avoided (which has been achieved in the layout plan), and the recommended mitigation measures are implemented.
Chapter 8: Aquatic Biodiversity	▪ Based on the findings of the specialist assessment, there is no reason from a freshwater perspective, why the proposed activity (with the implementation of the recommended mentioned mitigation measures) should not be authorised. ▪ The proposed development footprint within the preferred development site (i.e. study area) has been amended through the EIA process to ensure that it will be within aquatic ecosystem areas of "low" sensitivity and are thus considered appropriate areas for development.
Chapter 9: Avifauna Assessment	▪ The proposed project will have a range of potential pre-mitigation impacts on priority avifauna ranging from low to high significance, which is expected to be reduced to medium and low significance with the appropriate mitigation. ▪ No fatal flaws were discovered during the investigations. The proposed project is supported, and it is therefore recommended that the activity is authorised, with the understanding that all mitigation measures recommended in this report will be strictly implemented.
Chapter 10: Visual Impact Assessment	▪ The layout of the proposed facility has been subject to revisions, based on the various specialist findings, including the mapping of scenic resources and sensitive receptors. The currently proposed layout succeeds in avoiding visually sensitive areas as indicated on the visual sensitivity map in the Visual Impact Assessment. ▪ It is the opinion of the Visual Specialists that provided the recommended mitigation measures and EMPr are implemented, the proposed project would not present a potential fatal flaw in visual terms and may be authorised.

Specialist Assessment undertaken	Reasoned Opinion on whether the project should be authorised
Chapter 11: Heritage Impact Assessment (Archaeology and Cultural Landscape)	▪ Given the lack of significant heritage resources in the proposed project footprint and generally limited impacts to the cultural landscape, it is the opinion of the heritage consultant that the project may be authorised in full using either battery technology.
Chapter 12: Palaeontology Site Sensitivity Verification Report	▪ Provided that the Chance Fossil Finds Protocol is incorporated into the EMPrs and fully implemented during the construction phase of the solar PV facility, there are no objections on palaeontological heritage grounds to authorisation of the proposed renewable energy developments.
Chapter 13: Socio-Economic Assessment	▪ The establishment of the proposed project and associated infrastructure is supported by the findings of the socio-economic assessment.
Chapter 14: Traffic Impact Assessment	▪ The proposed project will have a range of potential traffic related impacts ranging from very low to moderate significance before mitigation, which is expected to be reduced to very low to low significance with the appropriate mitigation. ▪ No fatal flaws were discovered during the investigations. The proposed project is supported, and it is therefore recommended that the activity is authorised, with the understanding that all mitigation measures recommended in this report will be strictly implemented.
Chapter 15: Battery Energy Storage System High Level Safety, Health and Environment Risk Assessment	▪ The Risk Assessment found that with suitable preventative and mitigative measures in place, none of the identified potential risks are excessively high, i.e., from a Safety, Health and Environment (SHE) perspective no fatal flaws were found with either type of technology for the proposed BESS installation.
Chapter 16: Geohydrology Assessment	▪ Based on various factors, such as the anticipated demands of the facility (individually) being less than the regional yield potential of the underlying aquifer, and the low to very low post-mitigation impact assessment, it is the opinion of the specialist that development of the proposed project may be authorised, provided that the mitigation measures are implemented during each phase of the project to suppress the intensity of identified impacts.
Chapter 17: Geotechnical Assessment	▪ Based on the geotechnical analysis conducted, it is recommended that the proposed project be authorised, as no fatal flaws were found during the desktop assessment. However, it is crucial to implement appropriate mitigation measures at every phase of the project to minimise the intensity of the identified impacts.

Taking into consideration the findings of the Scoping and EIA Process and given the national and provincial strategic requirements for infrastructure development, particularly from an electricity generation perspective, and based on the fact that the environmental sensitivity of the study area is largely medium to low, with a few isolated high and very high sensitivity areas, it is the opinion of the EAP, that the project benefits outweigh the costs and that the project will make a positive contribution to sustainable infrastructure development in the RLM, as well as the towns of Petrusville and Phillipstown.

Provided that the specified mitigation measures and management actions are applied effectively throughout, it is recommended that the proposed project receive EA in terms of the 2014 NEMA EIA Regulations (as amended), promulgated under the NEMA.

It is understood that the information contained in this EIA Report and appendices is sufficient to make a decision in respect of the activity applied for.

It is recommended that the EA (should it be granted) be **valid for a period of 10 years**.

In addition, it is recommended that the EMPr compiled as part of this EIA Process, included in Appendix I and Appendix J of this EIA Report be approved concurrently in the EA (should it be granted). A detailed layout of the PV Facility has been identified at the EIA Phase. However, as confirmed by the specialists, changes to the detailed layouts are deemed acceptable if the changes remain within the approved buildable areas / development footprints and area assessed during the Scoping and EIA Process with no-go sensitive areas avoided. Any changes can be subjected to an EA amendment process, where warranted.

20.7 Cumulative Environmental Impact Statement

The cumulative impacts have been assessed by all the relevant specialists. The cumulative assessment included other renewable energy and grid connection projects within a 30 km radius of the proposed project.

No cumulative impacts have been identified that were considered to be fatal flaws. The specialists recommended that the project receive EA in terms of the 2014 NEMA EIA Regulations (as amended), including consideration of cumulative impacts, provided the mitigation is applied.

20.8 Conditions to be included in the EA

In order to ensure the effective implementation of the mitigation measures and management actions, EMPrs have been compiled and are included in Appendix I and Appendix J of this EIA Report. Appendix I includes the EMPr for the proposed Solar PV facility and associated infrastructure, and Appendix J includes the EMPr for the proposed Independent Power Producer (IPP) substation. The EMPr for the proposed IPP substation is a Generic EMPr and it is required to comply with the Generic EMPr published for substation development (Government Gazette 42323, GN 435, dated 22 March 2019).

The mitigation measures necessary to ensure that the proposed projects are planned and carried out in an environmentally responsible manner are listed in the EMPr. The EMPr includes the mitigation measures noted in this EIA Report, inclusive of the specialist assessments and technical studies. The EMPr is a dynamic document that should be updated as required and provides clear and implementable measures for the proposed project.

Listed below are the main recommendations applicable to the proposed project that should be considered for inclusion in the EA (should such authorisation be granted by the DFFE). These main recommendations as well as additional recommendations are included in the EMPr and EIA Report.

- Mitigation measures detailed within the EIA Report, specialist assessments and technical studies are to be implemented, where relevant and applicable.
- No-go areas of very high sensitivity identified by the specialists, and mapped accordingly, should be avoided.
- Vegetation clearing must be limited to the development footprint, as much as possible.
- A walk through of the approved site prior to construction activities must be undertaken in the relevant season to record all provincially protected species that will be impacted on by the development.
- Ensure the necessary permit applications are submitted with the provincial authority prior to construction for the relocation of provincially protected species. Copies of the permits must be kept on site by the Environmental Control Officer (ECO).
- Implement appropriate rehabilitation measures to restore each habitat to a natural state that is representative of the respective vegetation type after construction (for temporary use facilities in natural areas) and decommissioning.
- No alien and invasive plant species may be used for rehabilitation purposes; only indigenous species of the area / vegetation type may be used.
- Invasive alien plant growth and signs of erosion should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants.
- The recommended buffer area between the aquatic features and the project components should be implemented.
- Visually permeable fences, preferably in a dark colour, should be used.
- Buildings are to be painted in earthy colours to reduce contrast.
- Night-time light spillage should be minimised, possibly through the use of motion detectors so that the area can stay dark until light is needed.
- If any archaeological material or human burials are uncovered during the course of development, then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.
- Implement the Chance Fossil Finds Protocol during the construction phase of the solar PV facility.
- Undertake regular maintenance of the internal farm access roads by the contractor during the construction and decommissioning phases and by the operator during the operational phase.
- Ensure that the necessary permits or approvals from the relevant road authority are in place for the removal of the island at the TR38/01 and DR3093 intersection to accommodate the turning movements of the abnormal load vehicles.
- The route to the site should be further investigated to ensure that the abnormal loads are not obstructed at any point by geometric, height and width limitations along the route.

- If groundwater is sourced from existing boreholes, in the case that multiple Kudu Solar Facility projects are constructed simultaneously, adherence to recommended mitigation measures should be strictly followed to prevent over abstraction of groundwater.
- Phase two of the groundwater monitoring plan is to be discussed and evaluated in the event that groundwater is to be used in the project.
- Ensure that the BESS facilities are placed at least 50 m from any boreholes along with appropriate bunding and secondary containment.
- A stormwater management plan should be developed prior to the construction phase by an accredited professional.
- Rehabilitation of soil and geological material to commence during the construction phase, if possible, alternatively following the construction phase to allow successful re-vegetation.
- Authorised vehicles to only use proposed access points and roads and keep within the footprint of the facility.
- Ground protection measures to be implemented during maintenance and refuelling operations.

Paul Lochner

NAME OF EAP

7 July 2023

SIGNATURE OF EAP **DATE**