PROPOSED DEVELOPMENT OF THE 9.9MW WILDEBEESTKUIL 2 SOLAR PV PLANT, 132KV POWER LINE AND ASSOCIATED INFRASTRUCTURE NEAR LEEUDORINGSTAD, NORTH WEST PROVINCE

DESKTOP GEOTECHNICAL REPORT

MARCH 2021

REVISION 02

Prepared by:

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TITLE:
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SYNOPSIS

Desktop geotechnical investigation of founding conditions for the proposed 9.9MW Wildebeestkuil 2 Solar PV Plant, 132kV Power Line and Associated Infrastructure.

KEY WORDS:

Bearing Pressure, Foundations, Geology.

QUALITY VERIFICATION

This report has been prepared under the controls established by a quality management system that meets the requirements of ISO 9001: 2015 which has been independently certified by DEKRA Certification.

Verification	Capacity	Name	Signature	Date
By Author	Engineering Geologist	K Singh Pr.Sci.Nat.		29/03/2021
Checked & Authorised by:	Director Geotechnical	J Norris Pr.Eng.	J.C Norris	29/03/2021

Filename:	

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National Environmental Management Act, 1998 (Act No. 107 of 1998) and Environmental Impact Regulations 2014 (as amended) Requirements for Specialist Reports (Appendix 6)

Section in EIA Regulations 2014 (as amended)		Clause	Section in Report
Appendix 6	(1)	A specialist report prepared in terms of these Regulations must contain —	
	(a)	details of –	
		(i) the specialist who prepared the report; and	Verification Page
		(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae.	Appendix C
	(b)	A declaration that the person is independent in a form as may be specified by the competent authority;	Appendix C
	(c)	An indication of the scope of, and the purpose for which, the report was prepared;	1
	(cA)	An indication of the quality and age of base data used for the specialist report;	4, 5, 6, 11
	(cB)	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Table 8-1
	(d)	The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	N/A
	(e)	A description of the methodology adopted in preparing the report or carrying out the specialized process; inclusive of equipment and modelling used;	1
	(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;	Appendix A Figure 1, 2, 3, 4
	(g)	An indication of any areas to be avoided, including buffers;	Appendix A Figure 1, 2, 3, 4
	(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;	Appendix A Figure 1, 2, 3, 4
	(i)	A description of any assumptions made and any uncertainties or gaps in knowledge;	2
	(j)	A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment or activities;	3, 4, 5, 6, 7
	(k)	Any mitigation measures for inclusion in the EMPr;	Table 8-1
	(l)	Any conditions for inclusion in the environmental authorization;	Table 8-1
	(m)	Any monitoring requirements for inclusion in the EMPr or environmental authorization;	Table 8-1
	(n)	A reasoned opinion –	
		(i) as to whether the proposed activity, activities or portions thereof should be authorized;	10
		(iA) regarding the acceptability of the proposed activity or activities; and	10
		(ii) if the opinion is that the proposed activity, activities or portions thereof should be authorized, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Table 8-1
	(o)	A description of any consultation process that was undertaken during the course of preparing the specialist report;	N/A

	(p)	A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	None
	(q)	Any other information requested by the authority.	N/A
	(2)	Where a government notice gazetted 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.	N/A

PROPOSED DEVELOPMENT OF THE 9.9MW WILDEBEESTKUIL 2 SOLAR PV PLANT, 132KV POWER LINE AND ASSOCIATED INFRASTRUCTURE NEAR LEEUDORINGSTAD, NORTH WEST PROVINCE

DESKTOP GEOTECHNICAL REPORT

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EXECUTIVE SUMMARY

This desktop level study presents the findings concluded for the proposed 9.9MW Wildebeestkuil 2 Solar PV Plant, 132kV Power Line and Associated Infrastructure situated in the North-West Province. The study area receives a relatively low mean annual precipitation of 588mm, with the warmest month being January. Various tributaries of the Leeudoringspruit River drain the study area. The study area is underlain by the Ventersdorp Supergroup, which comprises amygaloidal lava, agglomerate and tuff. The Ventersdorp Supergroup is predominantly an accumulation of andesitic to basaltic lavas with related pyroclastic rocks. Competent founding conditions can be anticipated in the residual soil profile and in weathered bedrock conditions, which will have to be assessed during the detailed investigation. Typical boreholes indicate moderate yields estimated in the range of 0.50-2.0 l/s. Regional groundwater quality test results indicate a conductivity value of 0.70 mS/m, indicating relatively non-corrosive groundwater attributes. The desktop study indicates no fatal flaws from a preliminary and geological and geotechnical assessment. The impact of the development from a geotechnical perspective will be restricted to the removal and displacement of soil, boulders and bedrock. The impact assessment matrix impact of the 9.9MW Wildebeestkuil 2 Solar PV Plant, 132kV Power Line and Associated Infrastructure was found to be "Negative low impact - The anticipated impact will have negligible negative effects and will require little to no mitigation." The site, from a desktop level geotechnical study is considered suitable for the proposed 9.9MW Wildebeestkuil 2 Solar PV Plant, 132kV Power Line and Associated Infrastructure.

PROPOSED DEVELOPMENT OF THE 9.9MW WILDEBEESTKUIL 2 SOLAR PV PLANT, 132KV POWER LINE AND ASSOCIATED INFRASTRUCTURE NEAR LEEUDORINGSTAD, NORTH WEST PROVINCE

DESKTOP GEOTECHNICAL REPORT

1 INTRODUCTION

This geotechnical report presents the findings of a desktop study undertaken by JG Afrika (Pty) Ltd, for the proposed 9.9MW Wildebeestkuil 2 Solar PV Plant, 132kV Power Line and Associated Infrastructure situated in the North-West Province. It is understood that a desktop level geotechnical report is required as part of an environmental submission for a basic assessment (BA) report being undertaken by SiVEST SA (Pty) Ltd. The proposed development is located approximately 4km east of the town of Leeudoringstad.

The proposed solar PV plant will be located on the following properties:

- Portion 13 of the Farm Wildebeestkuil No. 59;
- Portion 14 of the Farm Wildebeestkuil No. 59; and
- Remainder of Portion 22 of the Farm Wildebeestkuil No. 59

The power line corridor alternatives associated with the solar PV plant which were assessed as part of the BA process traverse the following properties:

- Portion 13 of the Farm Wildebeestkuil No. 59;
- Portion 14 of the Farm Wildebeestkuil No. 59;
- Remainder of Portion 5 of the Farm Wildebeestkuil No. 59;
- Remainder of Portion 7 of the Farm Leeuwbosch No. 44;
- Remainder of Portion 29 of the Farm Leeuwbosch No. 44;
- Remainder of Portion 22 of the Farm Wildebeestkuil No. 59;
- Portion 35 of the Farm Leeuwbosch No. 44;
- Portion 36 of the Farm Leeuwbosch No. 44;
- Portion 37 of the Farm Leeuwbosch No. 44; and
- Portion 38 of the Farm Leeuwbosch No. 44

The key components to be constructed are listed below:

- Solar PV field (arrays) comprising multiple PV modules;
- PV panel mountings. PV panels will be single axis tracking mounting, and the modules will be either crystalline silicon or thin film technology;
- Each PV module will be approximately 2274mm (≈2.3m) long and 1134mm (≈1.1m) wide and mounted on supporting structures above ground. At this stage it is anticipated that the

structures will be mono-facial modules. The final design details will become available during the detailed design phase of the proposed development, prior to the start of construction; and

- The foundations will most likely be either concrete or rammed piles. The final foundation design will be determined at the detailed design phase of the proposed development.

In addition, related infrastruture required are:

- Underground cabling (≈0.8m × 0.6m wide);
- Permanent Guard House (≈871m²);
- Temporary building zone (≈2994m²);
- Switching Substation (≈2003m²);
- Internal gravel roads (as required) (≈3.5m width);
- Upgrade to existing roads; and
- Site fencing (≈2.1m high).

In addition to the above, the electricity generated by the proposed solar PV plant will be fed into the national electricity grid via a 132kV power line, which will connect to the Leeudoringstad Solar Plant Substation (part of a separate BA process). For the purpose of this BA, corridors between approximately 60m and 150m wide were assessed for the proposed power line corridor route alternatives. This is to allow for flexibility to route the power line within the assessed corridor. As such, the selected preferred power line will be routed within the assessed corridor. The final servitude will be routed within the power line corridor, and it expected that the servitude will not exceed 32m.

Once fully developed, the intention is to generate electricity (by capturing solar energy) to feed into the national electricity grid and “wheel” the power to customers based on a power purchase agreement. Additionally, an agreement is in place to sell the energy to PowerX, who hold a NERSA-issued electricity trading license which allows them to purchase energy generated from clean and renewable resources and sell it to its customers.

The construction phase will be between 12 and 24 months and the operational lifespan will be approximately 20 years, depending on the length of the power purchase agreement with the relevant off taker.

Three (3) power line corridor route alternatives for the proposed 132kV power line were however identified and assessed. These alternatives essentially provide for different power line route alignments contained within an assessment corridor. The various power line corridor alternatives are described below.

<u>1) Power Line Corridor Option 1:</u>

This involves an overhead power line which will run north of the R502, from the switching substation located within the Wildebeestkuil 2 Solar PV Plant application site (namely Portion 14 of the Farm Wildebeestkuil No. 59) to either Option 1 or Option 2 of the Leeudoringstad Solar Plant Substation, depending on the alternative chosen as "preferred" for the Leeudoringstad Solar Plant Substation site[1]. The Leeudoringstad Solar Plant Substation site alternatives are situated approximately 2km to the north-east of the Wildebeestkuil 2 Solar PV Plant application site, within Portion 37 of the Farm Leeuwbosch No. 44.

2) Power Line Corridor Option 2A:

This involves an overhead power line which will run south of the R502, from the switching substation located within the Wildebeestkuil 2 Solar PV Plant application site (namely Portion 14 of the Farm Wildebeestkuil No. 59) to either Option 1 or Option 2 of the Leeudoringstad Solar Plant Substation, depending on the alternative chosen as "preferred" for the Leeudoringstad Solar Plant Substation site[1]. The Leeudoringstad Solar Plant Substation site alternatives are situated approximately 2km to the north-east of the Wildebeestkuil 2 Solar PV Plant application site, within Portion 37 of the Farm Leeuwbosch No. 44.

3) Power Line Corridor Option 2B:

This involves an underground power line which will run south of the R502, from the switching substation located within the Wildebeestkuil 2 Solar PV Plant application site (namely Portion 14 of the Farm Wildebeestkuil No. 59) to either Option 1 or Option 2 of the Leeudoringstad Solar Plant Substation, depending on the alternative chosen as "preferred" for the Leeudoringstad Solar Plant Substation site[1]. The Leeudoringstad Solar Plant Substation site alternatives are situated approximately 2km to the north-east of the Wildebeestkuil 2 Solar PV Plant application site, within Portion 37 of the Farm Leeuwbosch No. 44.

1.1 Scope of works

The investigation seeks to give a desktop evaluation of the proposed study site. The objectives of the desktop were to assess the geological and geotechnical conditions across the study area.

This involved a literature review and a review of topographic and geological maps. Consideration was given to, but not limited to the following from a desktop level:

- The influence of topography on site suitability.
- The envisaged geological and geotechnical influences on the competency of foundations for the construction of structures.
- Tectonic influences on overall stability, namely the presence of faulting, lineaments and preferred discontinuity orientations.

[1] 132kV power line corridor route associated with solar PV plant intrinsically linked to Leeudoringstad Solar Plant Substation site (part of separate on-going BA process). Leeudoringstad Solar Plant Substation site chosen as "preferred" by respective specialists as part of that separate BA process therefore informed connection point for power line corridor being proposed as part of this BA application.

- Comments regarding likely founding conditions, geotechnical constraints, problem areas and overall site stability from a desktop level.
- Recommendations regarding requirements for subsequent detailed geotechnical investigations.

1.2 Terms of Reference

The appointment to proceed with the investigation is based upon JG Afrika's cost estimate email referenced, "Leeudoringstad Desktop Investigation" dated 27th of February 2020. JG Afrika received the appointment via a sub-consultancy agreement letter referenced, "1593: Leeudoringstad PV Facilities."

1.3 Specialist Credentials

Mr. Singh is a professionally registered and qualified engineering geologist, attaining a Master of Science Degree in Engineering Geology, from the University of KwaZulu-Natal (UKZN).

Mr. Singh holds the position of Engineering Geologist at JG Afrika's Pietermaritzburg branch. He has experience in the various fields of earth science and ground engineering, namely: engineering geology, geotechnical engineering, environmental geology and geophysics.

At present Mr. Singh specializes in conducting foundation investigations and material investigations for dams, roads, photo-voltaic plants and quarries.

1.4 Assessment Methodology

The methodology entailed a literature review and a review of topographic and geological maps. Consideration was given to the terrain, geological, hydrogeology and envisaged geotechnical constraints.

An Environmental Impact Assessment matrix was provided by SiVEST:

- 16343_SiVEST Impact Rating Table_Ver1_20190128 AG
- Updated Environmental Impact Assessment Methodology_Ver1 - 2019 SJ

2 ASSUMPTIONS, LIMITATIONS, UNCERTAINTIES - DISCLAIMER

The interpretation of the overall geotechnical conditions across the site are based on observations and point information acquired from a desktop level. Subsurface and geotechnical conditions intermediate to these have been inferred by extrapolation, interpolation and professional judgement. The information and interpretations are given as a guideline only. There is no guarantee that the information given is totally representative of the entire area in every respect and no responsibility will be accepted for consequences arising out of the fact that actual conditions vary from those inferred.

3 TECHNICAL DESCRIPTION

3.1 Project Location

The Wildebeestkuil 2 Solar PV Plant and 132kV Power Line is situated 4 km east of the town of Leeudoringstad. The site is buffered in the north by the R502.

A Site Plan is presented as Figure 1, **Appendix A**.

3.2 Topography and Land Use

The elevation profile on site indicates a gentle terrain with elevation values decreasing from 1315m to 1305 metres above sea level from the east to the west.

A Slope map is presented as Figure 2, **Appendix A**.

3.3 Climate

The study area is characterized by a dry climate with a “BSk” classification according to the Köppen-Geiger climate classification. Leeudoringstad receives a mean annual precipitation of 588 mm. The average lowest rainfall is received in July (6 mm) and the highest in January (103 mm), which is a seasonally variation of 97 mm.

The average maximum midday temperature for Leeudoringstad ranges from 23.2°C in January to 9.5°C in July, which is a seasonal variation of 13.7°C.

Table 3-1 bellow summarizes the climatic conditions.

Table 3-1: Summary of Climatic Conditions, Leeudoringstad (information extracted from “Climate-Data.org”)

Months	Average Rainfall (mm)	Temperature (°C)		
		Maximum	Minimum	Average
January	103	30.2	16.3	23.2
February	93	28.6	15.8	22.2
March	80	27	13.7	20.3
April	50	24.4	9.5	16.9
May	23	21.4	5	13.2
June	8	18.2	1.2	9.7
July	6	18.3	0.7	9.5
August	10	21.4	2.9	12.1
September	16	24.9	7.4	16.1
October	51	27.8	11.3	19.5
November	67	28.5	13.6	21
December	81	29.3	15.2	22.4

3.4 Drainage

The proposed Wildebeestkuil 2 Solar PV Plant, 132kV Power Line and associated infrastructure is located within the C25A quaternary catchment. This catchment receives a mean annual precipitation of 542mm over an area of 863m^2.

The Leeudoringspruit River buffers the southern extremity of the site which falls outside the study site. The presence of wetlands on site is an indication of localized depressions in which poor drainage conditions exist.

3.5 Vegetation

The regional biome within which the study site is located is classed as a Grassland Biome, with the presence of high grassland.

4 GEOLOGY

According to the 1: 250 000 Geological Map of Kroonstad (2726 C) compiled by the Council for Geoscience. The study area is underlain by the Ventersdorp Supergroup, which comprises amygaloidal lava, agglomerate and tuff. The Ventersdorp Supergroup is predominantly an accumulation of andesitic to basaltic lavas with related pyroclastic rocks (Brink, 1979).

A Geological Map is presented as Figure 3, **Appendix A**.

No structural lineaments in the form of dykes or faults were observed during the review of Geological Maps and aerial photography.

The Ventersdorp Supergroup is represented in the study area by the Platberg Group. The Platberg Group consists of four formation of heterogeneous rock ranging from clastic and chemical sediments to mafic and felsic volcanics (Johnson *et al*., 2006). The volcanic rocks were developed during graben development and accumulated in numerous fault troughs. The Goedgenoeg Formation lavas which is anticipated in the study site, indicates contemporaneous volcanism and sedimentation. These mafic, andesitic lavas are interbedded with feldspar porphyries and become more prominent towards the top of the succession (Johnson *et al*., 2006). Minor tuffaceous rocks are sparsely interbedded with the porphyries and mafic lavas, while sedimentary rocks are rare (Johnson *et al*., 2006). In the Bothaville area the maximum lava thickness intersected was 1 777 m (Johnson *et al*., 2006).

The feldspar porphyry rock variants are dark green in colour due to the presence of chlorite.

5 ENGINEERING GEOLOGY

Brink (1979), recognised that the occurrence of the Ventersdorp Supergroup within South Africa falls within three distinct climatic zones. The Wildebeestkuil 2 Solar PV Plant and 132kV Power Line study site is located within an area classed as a sub-humid dry zone, in which the soils are potentially expansive. In this climate zone where residual soils have developed, the profiles are not deeper than 12m depth (Brink, 1979).

The upper 2m of the residual profile is red or reddish brown in colour, which may contain abundant ferruginous concretions and may be densely cemented by ferricrete. Below this the profile can be a yellow coloured clayey silt can be anticipated which merges into an olive green coloured soil with depth. This typical colour sequence is indicative of well-drained soils in basic igneous rocks (Brink, 1979).

Investigations in Klerksdorp have shown that heaving conditions can be expected in the residual lava profiles. Indicator tests conducted on the Ventersdorp lavas by Brink (1979), record mean plasticity index values in the range of 17 to 23, implying active soil properties.

Clay contents generally averaged 20-21% of the soil composition. More importantly, the clay contains smectite minerals such as montmorillonite, which is subject to shrink and swell upon moisture variations.

The presence of well-developed ferricrete hardpans of substantial thicknesses (1-2m) developed in the upper horizons is not uncommon in the Ventersdorp lavas. Hardpans reduces the effects of heaving, with structures founded on ferricrete recording minimal heave.

6 HYDROGEOLOGY

According to the 1: 500 000 scaled Hydrogeological Series map of Kroonstad (2726). The aquifer type is classed as an intergranular, fractured aquifer type. According to the hydrogeological map the groundwater table can be anticipated at transition zones, weathered zones and joints.

A Hydrogeological Map is presented as Figure 4, **Appendix A**.

Typical boreholes indicate moderate yields estimated in the range of 0.50-2.0 l/s. Regional groundwater quality test results indicate a conductivity value of 0.70 mS/m, indicating relatively non-corrosive groundwater attributes.

7 GEOTECHNICAL APPRAISAL

Soil activity may be influence by the presence of expansive soil conditions if deep, residual andesitic lava horizons are present. The presence of ferricrete hardpans may influence the depth of excavation during exploratory trial pitting.

Depending on site-specific considerations such as the topography and weathering extent of the bedrock. The andesitic bedrock may not be suitable material for construction use. This will have to be assessed during the detailed investigation. Competent founding conditions can be anticipated in the residual soil profile and in weathered bedrock conditions, which will have to be assessed during the detailed investigation. Consideration can be given to the following foundation types:

- Ballasted Foundations (concrete raft) – these foundations are suitable in areas where shallow bedrock conditions are encountered or in poor, non-cohesive soils, where helical or screw-in piles are not suitable. The limitations is that; ballasted foundations require additional design considerations on steep slopes, they are not suited to areas susceptible to settlement and areas underlain by expansiveness soil conditions.

- Driven Piles - these piles are suited to clay, gravel and dense sand where shallow groundwater conditions can be anticipated. The advantages is that they can be accurately positioned, no curing is required and the cost of installation is relatively low (e.g Duktus pile).

It is important to select the correct foundation type and optimize the design, as such a detailed and comprehensive geotechnical investigation is required this will be undertaken prior to construction and upon finalisation of the layout plan. The presence of uplift and downward forces in the form of wind loads must be taken into consideration during foundation design.

The presence of wetlands is a possible indication of shallow groundwater conditions, which will need to be evaluated on site.

8 GEOTECHNICAL IMPACT ASSESSMENT MATRIX

From a preliminary geological and geotechnical assessment, no fatal flaws have been identified.

8.1 Impact of the Project on the Geological Environment

The impact of the development from a geotechnical perspective will be restricted to the removal and displacement of soil, boulders and bedrock referred to in this report as “subsoils”. The levelling of areas to create building platforms will also result in the displacement and exposure of subsoils. These impacts will have a negative visual impact on the environment, which in some cases can be remediated.

The potential impact of the development on the terrain and geological environment, will be the increased potential for soil erosion, caused by construction activities and the removal of vegetation. Areas of concentrated surface flow conditions can be anticipated at Wildebeestkuil 2 Solar PV Plant and 132kV Power Line, resulting in gradual erosion of unconsolidated soil, during the operational life of the facility. This can result in the creation of preferential drainage features, unless remediated through proper engineering design (i.e stormwater drainage).

Based on the impact assessment matrix undertaken for this project, from a geotechnical perspective the impact of the Wildebeestkuil 2 Solar PV Plant and 132kV Power Line was found to be "Negative low impact - The anticipated impact will have negligible negative effects and will require little to no mitigation." The assessment impact assessment matrix is presented overleaf as Table 8-1.

The impact assessment criteria was developed by SiVEST and is included in **Appendix B**.

Table 8-1: Geotechnical Impact Assessment Matrix

Wildebeestkuil 2 Solar PV Plant, 132kV Power Line and Associated Infrastructure																				
ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Construction Phase																				
Removal of subsoils (soil, rock)	Displacement of natural earth material and overlying vegetation. 1) Increase in soil and wind erosion due to clearing of vegetation. 2)Construction and earthmoving vehicles may displace soil during operations. 3) Creation of drainage paths along access tracks. 4) Potential oil spillages from heavy	1	3	2	2	2	2	20	-	Low Impact	Identify protected areas prior to construction. 1) Construction of temporary berms and drainage channels to divert surface water. 2)Minimize earthworks and fills. 3) Use existing road network and acess tracks. 4)Rehabilitation of affected areas (such as regrassing, mechanical	1	2	2	1	4	2	20	-	Low Impact

Wildebeestkuil 2 Solar PV Plant, 132kV Power Line and Associated Infrastructure																			
	plant. 6) Excessive dust.										stabilization). 5) Correct engineering design and construction of gravel roads and water crossings. 6) Correct construction methods for foundation installations. 7) Vehicle repairs to be undertaken in designated areas. 8) Control stormwater flow 9) Dust suppression									
Operational Phase																			
Removal of subsoils (soil, rock)	Displacement of natural earth material . 1) Increase in soil erosion due to concentrated flow received off PV Panels . 2) Potential oil spillages from maintainence vehicles. 3) Sedimentation of non-perennial features caused by soil erosion.	1	2	2	2	3	1	10	-	Low Impact	1) Use of existing roads and tracks. 2)Rehabilitation of affected areas (such as erosion control mats). 3) Correct engineering design and construction of roads and water crossings. 4) Vehicle repairs to be undertaken in designated areas. 8) Maintainence of stormwater system.	1	3	2	2	3	2	22	-	Low Impact

Wildebeestkuil 2 Solar PV Plant, 132kV Power Line and Associated Infrastructure																				
Decommissioning Phase																				
Removal of subsoils (soil, rock)	Decommissioning of the structure will disturb the geological environment. 1) Increase in soil and wind erosion due to clearance of structures. 2)Construction and earthmoving vehicles will displace the soil. 3) Creation of drainage paths. 4) Potential oil spillages from vehicles. 5) Excessive sediments in non-perennial features.	1	4	2	1	1	3	27	-	Low Impact	1) Use of temporary berms and drainage channels to divert surface water during flooding. 2)Minimize earthworks and demolish footprints. 3) Use of existing roads and tracks. 4)Rehabilitation of affected areas (such as regrassing). 5) Develop a chemical spill response plan. 6)Develop dust and demolitation fly supression plan. 7) Vehicle repairs to be undertaken in designated areas. 8) Reinstate channelized drainage features.	1	3	4	2	2	2	24	-	Low Impact
Cumulative																				
Removal of subsoils (soil, rock)	None							0			None							0		

9 GEOTECHNICAL COMPARATIVE ASSESSMENT OF ALTERNATIVES

Three (3) power line corridor route alternatives for the proposed 132kV power line were however identified and assessed. These alternatives essentially provide for different power line route alignments contained within an assessment corridor. The various power line corridor alternatives are described below.

1) Power Line Corridor Option 1:

This involves an overhead power line which will run north of the R502, from the switching substation located within the Wildebeestkuil 2 Solar PV Plant application site (namely Portion 14 of the Farm Wildebeestkuil No. 59) to either Option 1 or Option 2 of the Leeudoringstad Solar Plant Substation, depending on the alternative chosen as "preferred" for the Leeudoringstad Solar Plant Substation site[2]. The Leeudoringstad Solar Plant Substation site alternatives are situated approximately 2km to the north-east of the Wildebeestkuil 2 Solar PV Plant application site, within Portion 37 of the Farm Leeuwbosch No. 44.

2) Power Line Corridor Option 2A:

This involves an overhead power line which will run south of the R502, from the switching substation located within the Wildebeestkuil 2 Solar PV Plant application site (namely Portion 14 of the Farm Wildebeestkuil No. 59) to either Option 1 or Option 2 of the Leeudoringstad Solar Plant Substation, depending on the alternative chosen as "preferred" for the Leeudoringstad Solar Plant Substation site[1]. The Leeudoringstad Solar Plant Substation site alternatives are situated approximately 2km to the north-east of the Wildebeestkuil 2 Solar PV Plant application site, within Portion 37 of the Farm Leeuwbosch No. 44.

3) Power Line Corridor Option 2B:

This involves an underground power line which will run south of the R502, from the switching substation located within the Wildebeestkuil 2 Solar PV Plant application site (namely Portion 14 of the Farm Wildebeestkuil No. 59) to either Option 1 or Option 2 of the Leeudoringstad Solar Plant Substation, depending on the alternative chosen as "preferred" for the Leeudoringstad Solar Plant Substation site[1]. The Leeudoringstad Solar Plant Substation site alternatives are situated approximately 2km to the north-east of the Wildebeestkuil 2 Solar PV Plant application site, within Portion 37 of the Farm Leeuwbosch No. 44.

Although, none of the alternatives are considered fatally flawed provided the recommendations presented in this report are adhered to.

This assessment is based on the comparative assessment criteria, which is given in Table 9-1, with the full assessment presented in Table 9-2.

[2] 132kV power line corridor route associated with solar PV plant intrinsically linked to Leeudoringstad Solar Plant Substation site (part of separate on-going BA process). Leeudoringstad Solar Plant Substation site chosen as "preferred" by respective specialists as part of that separate BA process therefore informed connection point for power line corridor being proposed as part of this BA application.

Table 9-1: Comparative Assessment Criteria

PREFERRED	The alternative will result in a low impact / reduce the impact / result in a positive impact
FAVOURABLE	The impact will be relatively insignificant
LEAST PREFERRED	The alternative will result in a high impact / increase the impact
NO PREFERENCE	The alternative will result in equal impacts

The geotechnical comparative assessment is provided in Table 9-2.

Table 9-2: Geotechnical Comparative Assessment of Alternatives

Alternative	Preference	Reasons (incl. potential issues)
POWERLINE		
Power line Corridor Option 1:	**NO PREFERENCE**	• Favourable, relatively shallow bedrock conditions anticipated. • Position lies on a flat 0-2˚ slope, thus less likely to be deep, unstable transported soils. • Less likely to be slope stability issues. • Positioned away from water crossings. • Laydown area is suitable for expansion • Reasonable driving distance to access all areas on the site. • Less likely to be slope stability issues. • Positioned close to a water crossing.
Power line Corridor Option 2A:	**NO PREFERENCE**	
Power line Corridor Option 2B:	**NO PREFERENCE**	

10 CONCLUSIONS AND RECOMMENDATIONS

The foregoing report presents the findings concluded from a desktop study undertaken for the proposed Wildebeestkuil 2 Solar PV Plant, 132kV Power Line and Associated Infrastructure.

No fatal flaws from a geotechnical perspective were identified during this desktop study. Conclusions presented in this report will have to be more accurately confirmed during the detailed geotechnical investigation phase. The impact of the Wildebeestkuil 2 Solar PV Plant, 132kV Power Line and Associated Infrastructurewas found to be "Negative low impact - The anticipated impact will have negligible negative effects and will require little to no mitigation." The site from a desktop level geotechnical study is considered suitable for the proposed Wildebeestkuil 2 Solar PV Plant, 132kV Power Line and Associated Infrastructure.

It recommended that a detailed geotechnical investigation be undertaken during the detailed design phase of the project. The detailed geotechnical investigation must entail the following:

- Profiling and sampling exploratory trial pits to determine founding conditions for the PV modules, substation and pylons. Also to determine the subgrade conditions for internal roads and a materials investigation (if required);

- Thermal resistivity and electrical resistivity geophysical testing for electrical design and ground earthing requirements;
- Groundwater sampling of existing boreholes to establish a baseline of the groundwater quality for construction purposes;
- Dynamic Probe Super Heavy (DPSH) tests and rotary core drilling may be required depending on the soil profiles and imposed loads of the structures.

11 REFERENCES

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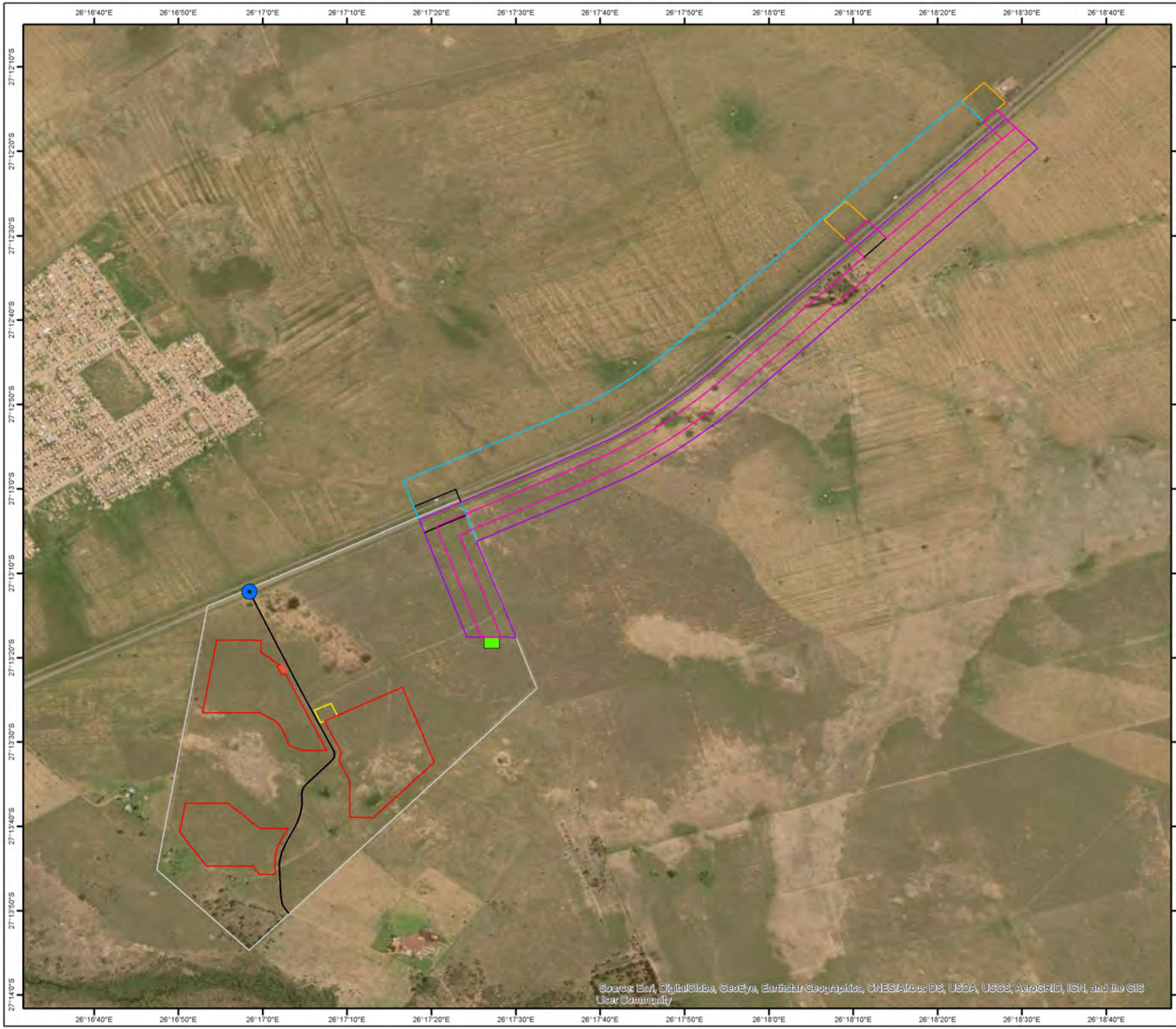
Appendix A: Figures



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Fax: (033) 343 6701

WILDEBEESTKUIL PHOTOVOLTAIC PLANT 2 GEOTECHNICAL DESKTOP STUDY

Site Map

Legend

- Access_Point
- Existing_Roads
- Corridor Road / RailCrossings
- Substation Alternatives (Separate Application)
- Corridor Opt1 Overhead Lines
- Corridor Opt2A Overhead Lines
- Corridor Opt2B Underground Lines
- PV Application Site
- Guard House
- PV Development Areas
- Switching Substation
- Temporary Building Zone

Meters
0 100 200 400 600 800

N W E S

Scale:
1:13 000

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WILDEBEESTKUIL PHOTOVOLTAIC PLANT 2 GEOTECHNICAL DESKTOP STUDY

Slope Map

Legend

- Access_Point
- 5m Contours
- Existing_Roads
- Corridor Road / RailCrossings
- Substation Alternatives (Separate Application)
- Corridor Opt1 Overhead Lines
- Corridor Opt2A Overhead Lines
- Corridor Opt2B Underground Lines
- PV Application Site
- Guard House
- PV Development Areas
- Switching Substation
- Temporary Building Zone

Slope (Degrees)

- 0.00025 - 0.15
- 0.16 - 0.28
- 0.29 - 0.42
- 0.43 - 0.56
- 0.57 - 0.72
- 0.73 - 0.9
- 0.91 - 1.1
- 1.2 - 1.4
- 1.5 - 2.6

Meters
0 100 200 400 600 800

N W E S

Scale: 1:13 000

Designed and detailed under the controls established by our quality management system that meet the requirements of ISO 9001:2015 which has been independently certified by DEKRA Certification under certificate number 90906882

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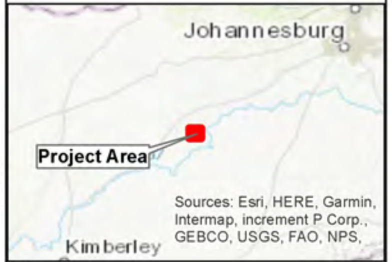
WILDEBEESTKUIL PHOTOVOLTAIC PLANT 2 GEOTECHNICAL DESKTOP STUDY

Geology Map



Legend

- Access_Point
- Existing_Roads
- Corridor Road / RailCrossings
- Substation Alternatives (Separate Application)
- Corridor Opt1 Overhead Lines
- Corridor Opt2A Overhead Lines
- Corridor Opt2B Underground Lines
- PV Application Site
- Guard House
- PV Development Areas
- Switching Substation
- Temporary Building Zone
- Ra - amygaloidal lava, agglomerate and tuff

Kilometers

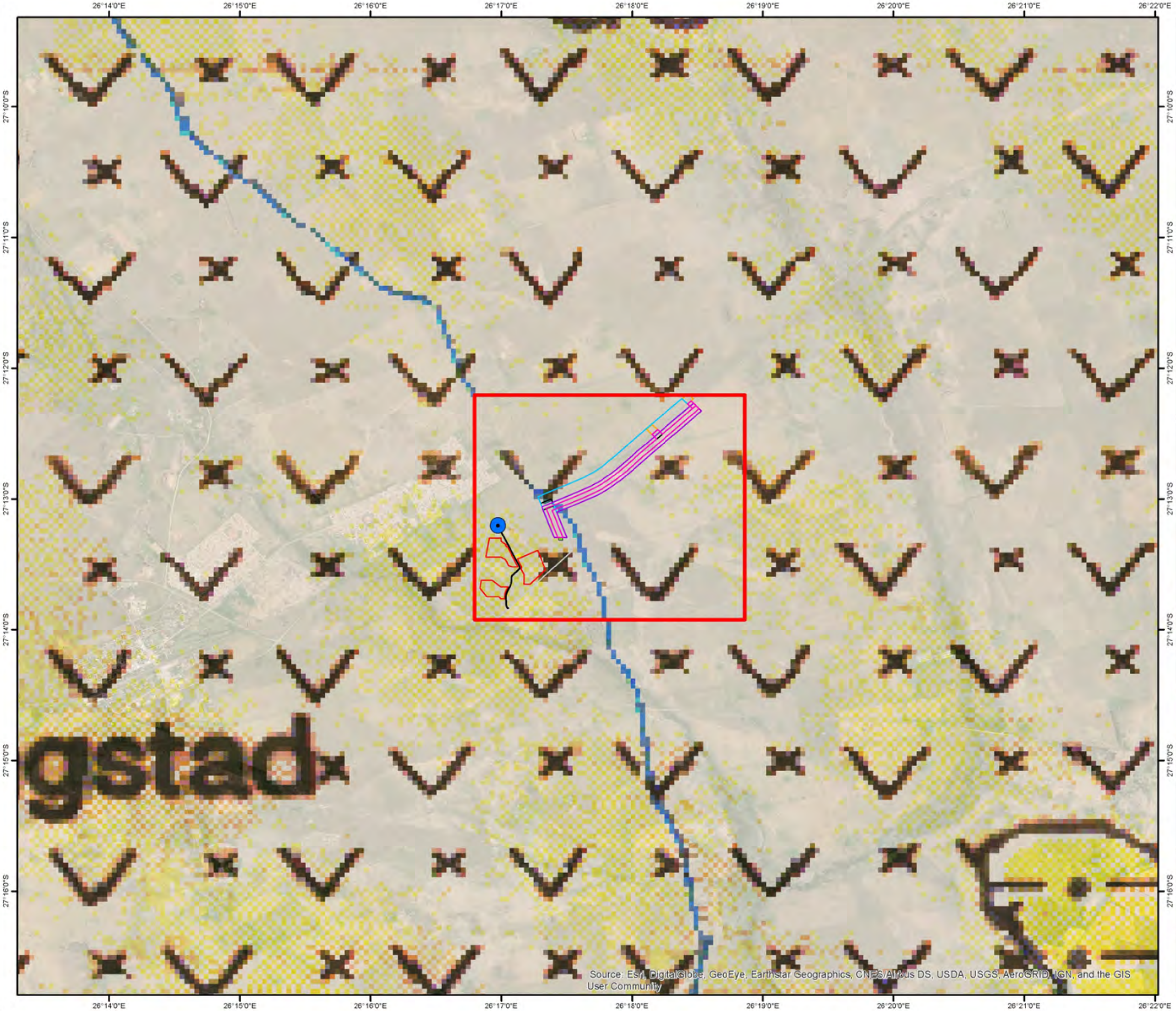
0 0.375 0.75 1.5 2.25 3

N W E S

Scale:

1:50 000

W:\Geotech\5163 - General Geotech JG Afrika\06 - Leeudoringstad PV\Drawings\Wildebeestkuil PV2



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WILDEBEESTKUIL PHOTOVOLTAIC PLANT 2 GEOTECHNICAL DESKTOP STUDY

Geohydrology Map

Legend

- Access_Point
- Existing_Roads
- Corridor Road / RailCrossings
- Substation Alternatives (Separate Application)
- Corridor Opt1 Overhead Lines
- Corridor Opt2A Overhead Lines
- Corridor Opt2B Underground Lines
- PV Application Site
- Guard House
- PV Development Areas
- Switching Substation
- Temporary Building Zone

d3 = 0.5 -2.00l/s

Kilometers
0 0.375 0.75 1.5 2.25 3

N W E S

Scale:
1:50 000

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Appendix B: SiVEST Impact Assessment Methodology

1 ENVIRONMENTAL IMPACT ASSESSMENT (EIA) METHODOLOGY

The Environmental Impact Assessment (EIA) Methodology assists in evaluating the overall effect of a proposed activity on the environment. Determining of the significance of an environmental impact on an environmental parameter is determined through a systematic analysis.

1.1 Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale (i.e. site, local, national or global), whereas intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in **Table 1**.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

1.2 Impact Rating System

The impact assessment must take account of the nature, scale and duration of effects on the environment and whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the various project stages, as follows:

- Planning;
- Construction;
- Operation; and
- Decommissioning.

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

The significance of Cumulative Impacts should also be rated (As per the Excel Spreadsheet Template).

1.2.1 Rating System Used to Classify Impacts

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the possible mitigation of the impact. Impacts have been consolidated into one (1) rating. In assessing the significance of each issue the following criteria (including an allocated point system) is used:

Table 1: Rating of impacts criteria

ENVIRONMENTAL PARAMETER		
A brief description of the environmental aspect likely to be affected by the proposed activity (e.g. Surface Water).		
ISSUE / IMPACT / ENVIRONMENTAL EFFECT / NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity (e.g. oil spill in surface water).		
EXTENT (E)		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
PROBABILITY (P)		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY (R)		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES (L)		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.

DURATION (D)		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
INTENSITY / MAGNITUDE (I / M)		
Describes the severity of an impact (i.e. whether the impact has the ability to alter the functionality or quality of a system permanently or temporarily).		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
SIGNIFICANCE (S)		

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula:

Significance = (Extent + probability + reversibility + irreplaceability + duration) x magnitude/intensity.

The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Points	**Impact Significance Rating**	**Description**
5 to 23	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
5 to 23	Positive Low impact	The anticipated impact will have minor positive effects.
24 to 42	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
24 to 42	Positive Medium impact	The anticipated impact will have moderate positive effects.
43 to 61	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
43 to 61	Positive High impact	The anticipated impact will have significant positive effects.
62 to 80	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
62 to 80	Positive Very high impact	The anticipated impact will have highly significant positive effects.

The table below is to be represented in the Impact Assessment section of the report. The excel spreadsheet template can be used to complete the Impact Assessment.

Table 2: Rating of impacts template and example

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Construction Phase																				
Vegetation and protected plant species	Vegetation clearing for access roads, turbines and their service areas and other infrastructure will impact on vegetation and protected plant species.	2	4	2	2	3	3	39	-	Medium	**Outline/explain the mitigation measures to be undertaken to ameliorate the impacts that are likely to arise from the proposed activity. These measures will be detailed in the EMPr.**	2	4	2	1	3	2	24	-	Low
Operational Phase																				

Fauna	Fauna will be negatively affected by the operation of the wind farm due to the human disturbance, the presence of vehicles on the site and possibly by noise generated by the wind turbines as well.	2	3	2	1	4	3	36	-	Medium	**Outline/explain the mitigation measures to be undertaken to ameliorate the impacts that are likely to arise from the proposed activity. These measures will be detailed in the EMPr.**	2	2	2	1	4	2	22	-	Low
Decommissioning Phase																				
Fauna	Fauna will be negatively affected by the decommissioning of the wind farm due to the human disturbance, the presence and operation of vehicles and heavy machinery on the site and the noise generated.	2	3	2	1	2	3	30	-	Medium	**Outline/explain the mitigation measures to be undertaken to ameliorate the impacts that are likely to arise from the proposed activity. These measures will be detailed in the EMPr.**	2	2	2	1	2	2	18	-	Low
Cumulative																				

Broad-scale ecological processes	Transformation and presence of the facility will contribute to cumulative habitat loss and impacts on broad-scale ecological processes such as fragmentation.	2	4	2	2	3	2	26	-	Medium	**Outline/explain the mitigation measures to be undertaken to ameliorate the impacts that are likely to arise from the proposed activity. These measures will be detailed in the EMPr.**	2	3	2	1	3	2	22	-	Low

Appendix C: Specialist's CV

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

PROPOSED DEVELOPMENT OF THE WILDERBEESTKUIL PV 2, 9.9MW SOLAR PHOTOVOLTAIC (PV) PLANT AND ASSOCIATED INFRASTRUCTURE NEAR LEEUDORINGSTAD IN THE NORTH WEST PROVINCE

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.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
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.

Departmental Details

Postal address:
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

1. SPECIALIST INFORMATION

Specialist Company Name:	JG Afrika (Pty) Ltd			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	1	Percentage Procurement recognition	
Specialist name:	Keval Singh			
Specialist Qualifications:	MSc			
Professional affiliation/registration:	Pr Sci Nat. MSAIEG			
Physical address:	6 Pin Oak Avenue, Hilton, Pietermaritzburg			
Postal address:	6 Pin Oak Avenue, Hilton, Pietermaritzburg			
Postal code:	3201	Cell:		
Telephone:	033 343 6700	Fax:		
E-mail:	singhk@jgafrika.com			

2. DECLARATION BY THE SPECIALIST

I, ________Keval Singh_________________________, 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

JG Afrika (Pty) Ltd

Name of Company:

01/09/2020

Date

3. **UNDERTAKING UNDER OATH/ AFFIRMATION**

I, **Keval Singh**, 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

JG Afrika (Pty) Ltd

Name of Company

01/09/2020

Date

Signature of the Commissioner of Oaths

COMMISSIONER OF OATHS
DAWN JANET BURGIN
9/1/8/2 (R/O) KZN (PIETERMARITZBURG)
6 PIN OAK AVENUE, HILTON

01/09/2020

Date

KEVAL SINGH

Profession	*Engineering Geologist*
Position in Firm	*Engineering Geologist*
Area of Specialisation	*Geotechnical Engineering, Material Investigations, Engineering Geology, Engineering Geophysics, Project Management.*
Qualifications	*Pr.Sci.Nat., MSc (Engineering Geology)*
Years of Experience	*7 Years*
Years with Firm	*7 Years*

SUMMARY OF EXPERIENCE

Mr. Singh is a professionally registered and qualified engineering geologist, attaining a Master of Science Degree in Engineering Geology, from the University of KwaZulu-Natal (UKZN).

Mr. Singh holds the position of Engineering Geologist at JG Afrika's Pietermaritzburg branch. He has experience in the various fields of earth science and ground engineering, namely: engineering geology, geotechnical engineering, environmental geology and geophysics.

At present Mr. Singh specializes in conducting foundation investigations and material investigations for dams, roads, photo-voltaic plants and quarries. He has experience in conducting geophysical investigations (seismic refraction and resistivity surveying) for ground engineering purposes. He has experience in conducting slope stability assessments and settlement analyses for design purposes.

Mr. Singh has both local and international (Africa) experience, in small, medium and large-scale investigations. More specifically, his international experience includes the countries of Lesotho, Mozambique and Zambia.

PROFESSIONAL REGISTRATIONS & INSTITUTE MEMBERSHIPS

Pr.Sci.Nat. - Registered Professional Natural Scientist with the South African Council for Natural Scientific Professions - Registration No 400119/16

SAIEG - Registered Member of the South African Institute of Engineering and Environmental Geologists - Registration No 11/302

NHBRC - Registered Competent Engineer with the National Home Builders Registration Council - Registration No 3000156472

EDUCATION

2008 - **Matric**– Glenwood High School, Durban.
2011 - **BSc** (Geological Science) - University of KwaZulu-Natal
2012 - **BSc Hons.** (Engineering & Environmental Geology) – University of KwaZulu-Natal
2018 - **MSc** (Engineering Geology) – University of KwaZulu-Natal

SPECIFIC EXPERIENCE

JG Afrika (Pty) Ltd

2020 - 2019
Position- Engineering Geologist

Ballito to Tinley Manor (N2, Section 27) – road prism and materials investigation for the widening of the N2 Highway from KM 7.40 to KM 18.93. Involved in pavement profiling, data analysis and contract administration. Client: SANRAL

Cornubia Rippability Assessment – seismic refraction investigation for a rippability and excavation assessment for Cornubia Boulevard. Client: SMEC

Cornubia Fill Assessment – excavation and fill assessment for the construction of infrastructure and fill platforms at Cornubia Boulevard. Involved in data analysis and contract administration. Client: SMEC

P280, P176, L311 Bridges, Weenen – seismic refraction investigation for founding conditions for 3No. multi-span bridges. Client: Nankhoo Engineers

D59 Bridge and Approach Roads, Richmond – foundation and road prism investigation for a multi-span bridge and approach roads. Client: Nathoo Mbenyane Engineers.

Vissershoek Piggyback Capping, Cape Town – settlement analyses for a proposed piggyback MSW design. Client: City of Cape Town

Gulden Gracht Box Culvert, Richards Bay – CPTu analysis for the rehabilitation of a failed road-way crossing. Client: Henwood & Nxumalo Consulting

N2 (Section 30, 31, 32) from Kangela to Pongola – assistant project leader for a material's correlation testing exercise. Client: SANRAL

uSuthu Off-Channel Storage Dam, Nongoma – technical specialist (geophysics & slope stability analyses) for a detailed dam investigation. Client: Zululand District Municipality.

Radio Tower Replacement Project, Eastern Cape – project leader for the upgrade and replacement of 16No. radio tower positions. Involved in data analysis and contract administration. Client: ESKOM.

Giba Gorge Industrial Development, Durban – project leader for a detailed investigation for a 204 000 m^2 industrial park. Client: Private Developer.

Wobben Wind Turbine, Port Elizabeth – technical specialist for a detailed foundation investigation for a single wind turbine and associated infrastructure. Client: Integrated Wind Power.

N3 Quarry Investigations, Durban – project leader for detailed logging of rotary core and percussion boreholes at 9No. quarries. Client: SANRAL.

Small Geotechnical Projects – Foundation Investigations
Poultry Abattoir, Cedara. Client: Mariswe.
LSI Building, Maseru, Lesotho. Client: Private

Slope Stability Analyses –slope optimization, design and rehabilitation. Client: Various
Vissershoek Landfill Capping, Cape Town.
N2 Caledon Riviersonderend Cutting, Cape Town.
Darvill Sludge Dam Optimization, Pietermaritzburg.
Chibabava Intake Works, Mozambique.
Nhlangano WWTW, Swaziland.
3 PCD Refurbishment Designs, Matla Mines, Mpumalanga
Radnor Landfill Slope Stability assessment

2018
Position- Engineering Geologist

N2 (Section 30, 31, 32) from Kangela to Pongola – assistant project leader/technical specialist for a geophysical, geotechnical and materials investigation for the widening of the N2 highway and related structures. Involved in seismic refraction surveying, profiling, data analysis and subcontractor management. Client: SANRAL

Mocuba PV Plant, Mozambique – project leader for thermal conductivity testing for the proposed Mocuba PV plant. Involved in data analysis and project management. Client: Scatec Solar.

Westgate Substation, Randfontein – technical specialist for a resistivity survey for the proposed expansion of a substation. Involved in resistivity testing and data analysis. Client: ESKOM.

Swayimane, Msilili, Ndaka and Hoqweni CWSS, Swayimane – project leader for a shallow geotechnical investigation for 61 km of uPVC and steel pipeline sections and 7No. reservoirs ranging from 100kl to 5ML. Involved in profiling and seismic refraction surveying. Client: Mzibani Consulting Engineers.

Darvil Sludge Embankment Dam, Pietermaritzburg – project leader for a geotechnical investigation for a lined homogenous, earthfil embankment dam. Involved in a materials investigation, slope stability analyses for the design and optimization of the dam, founding conditions for appurtenant structures. Client: Umgeni Water.

Small Geotechnical Projects – Foundation Investigations
Ngwelezane Electrification Project (A1276-A1277), Empangeni. Client: City of uMhlatuze Municipality.
Mogoje Street Road Prism and Culvert, Kroonstad. Client: Makhaotse, Narasimulu & Associates (Pty) Ltd.
Fishwater Flats WWTW, Port Elizabeth. Client: Labco.
Ekhamanzi Secondary Bulkwater Pipeline, Dalton. Client: Makhaotse, Narasimulu & Associates (Pty) Ltd.

2017 - 2016
Position - Engineering Geologist

Athlone Mall, Pietermaritzburg – project leader for a deep geotechnical and geophysical investigation for a multi-storey structure. Involved in seismic refraction surveying and DPSH testing. Client: Willmeg.

Lesotho Highlands Water Project: Phase II- Geotechnical Investigation, Lesotho – assistant to the project director for the Polihali Dam and Polihali Transfer Tunnel Project. Involved in data capturing, quality control and reporting. Client: Lesotho Highlands Development Authority (LHDA).

Wolwane Road L1969, Pomeroy – project leader for a geotechnical and materials investigation for the realignment of road L1969. Involved in seismic refraction testing and data analysis. Client: Nankhoo Engineers.

P7/4 Fill Instability, Underberg – assistant project leader for a geotechnical investigation for the rehabilitation of an unstable slope on road P7/4. Involved in slope stability modelling, design and construction drawings. Client: Emanzsi Engineers.

32 kV Welgevonde to New Valley Transmission Line, Kuruman – assistant project leader/technical specialist for a geophysical and geotechnical investigation for an overhead Eskom transmission cable. Involved in 2D resistivity testing and profiling. Client: ESKOM

Oribi Airport Infrastructure Project, Pietermaritzburg – project leader for a geotechnical investigation for the proposed structural and infrastructural developments to Pietermaritzburg airport. Client: INR

Department of Health, Edendale Hospital Priority Maintenance Phase 1 & 2 Investigation, Pietermaritzburg – project leader for a geotechnical investigation for the expansion of the new maternity ward. Client: Department of Health

Msunduse River Bridge and P423 Road Investigation – project leader for a geotechnical drilling investigation for a bridge and approach roads. Involved in a materials investigation, logging, profiling and subcontractor management. Client: Naidu Consulting

Polihali Dam and Polihali-Katse Transfer Tunnel, Lesotho – field geologist/assistant to the project director for the Polihali Dam project. Involved in data capturing, quality control, reporting and site supervision of sub-contractors. Client: LHDA

Polihali Infrastructure Project, Lesotho – field geologist for the Polihali Dam infrastructure project. Client: GIBB

Robben Island PV Plant, Cape Town – project leader for a geotechnical and geophysical investigation for a PV Plant and related infrastructure. Client: SolaFutura Energy

Adams PV Plant-Pullout Testing, Kuruman – project leader for the optimization of pile types for the proposed Adams PV Plant. Client: Exosun

Metolong Dam Tertiary Pipelines Geotechnical Investigation (GI), Lesotho – assistant project leader for a pipeline and reservoir investigation. Involved in profiling, seismic refraction testing and undisturbed sampling was undertaken. Client: Lesotho Ministry of Water

Goedehoop Pipeline and Reservoir GI, Utretcht – project leader for a shallow GI for an elevated reservoir tank and pipeline. Client: SiVEST

Arnot Coal Mine Infrastructure, Middelburg – project leader for a haul road centre-line survey, pollution control dam, coal stock pile and a materials investigation. Client: Exarro

Maputsoe Road Prism Investigation, Lesotho – assistant project leader for road centre-line survey for various roads in the Maputsoe CBD. Client: Lesotho Ministry of Roads

2015 - 2013
Position- Graduate Engineering Geologist

Greater Paninkuku Dam GI, Harding - assistant project leader for a deep foundation investigation for a 20-m high dam wall and a gauging weir. A materials investigation for core and shell material was undertaken. Profiling, seismic refraction and rotary core drilling was conducted. Client: Imvulu Engineers

Victoria Country Club Estate GI, Pietermaritzburg – project leader for various GI's for single, double and triple storey configuration structures over deep talus material. Client: Private Developers

Majuba Fly-Ash Pollution Control Dams, Volksrust – project leader for the upgrading of three PCD sites which included the dam wall, reservoir basin and spillway chute. Client: ESKOM

Mwinlinge to Jimbe Road, Zambia – assistant project leader for a deep foundation investigation for two bridge sites and a material investigation for five proposed quarries for material usage in the road layer works. Client: RDA Zambia

South Coast Pipeline Phase 2B GI, Pennington – project leader for shallow GI for 24 km of PVC pipeline. Client: Umgeni Water

Mocuba Photovoltaic Plant, Mozambique – assistant project leader and involved in a deep GI for a PV plant which included resistivity surveying, percussion drilling and DPSH testing. Client: Scatec Solar

Roggeveld Windfarm GI, Sutherland – field supervisor/geologist and involved in a deep GI for a windfarm development and associated infrastructure. Profiling and rotary core drilling was undertaken. Client: Acconia Energy

Adams and Bellatrix Photovoltaic Plants, Northern Cape – project leader for a GI for two PV sites and related infrastructure. Profiling, 2D resistivity and undisturbed sampling was undertaken. Client: Aurora Power Solutions

Contaminated Land Assessment (CLA), Durban Digout Port FEL II – field geologist/supervisor to determine the degree of contaminate impact on the sub-soils and groundwater table from existing pollutant sources. Client: Transnet Capital Projects

Matimatolo Sinkhole Geophysical Investigation, Greytown – project leader for a geophysical (EM34 & magnetometer) investigation to detect the presence of pseudo-sinkholes. Client: Private Developer

Contaminated Land Assessment, Durban Digout Port FEL I – site geologist/supervisor for a shallow and deep CLA spanning agricultural land, adjacent petrochemical industries and a chrome landfill site. Profiling, sonic drilling and environment testing for the presence of contaminants and volatile compounds were undertaken. Client: Transnet Capital Projects

Port of Ngqura Survey, Port Elizabeth – site geologist/supervisor for a geophysical investigation for the expansion of Coega Port. Seismic and 2D resistivity survey was undertaken on the salt pans, western and eastern shores. Client: Transnet Capital Projects

PERSONAL DETAILS

Nationality – South African
Date of Birth – 1990-12-05
Domicile – Durban, South Africa

Languages
English - Very Good
Afrikaans - Average
isiZulu - Poor