HERITAGE IMPACT ASSESSMENT REPORT FOR THE SOYUZ 5 WIND ENERGY FACILITY PROJECT, PIXLEY KA SEME DISTRICT MUNICIPALITY, NORTHERN CAPE PROVINCE

CES

ENVIRONMENTAL AND SOCIAL ADVISORY SERVICES

Heritage Impact Assessment Report for the Soyuz 5 Wind Energy Facility Project, Pixley ka Seme District Municipality, Northern Cape Province

Prepared for:

Red Rocket (Pty) Ltd

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REVISIONS TRACKING TABLE

CES Report Revision and Tracking Schedule

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DECLARATION

I, Nelius Le Roux Kruger, declare that –

- I act as the independent specialist;
- I am conducting any work and activity relating to the proposed Soyuz 5 Wind Energy Facility Project in an objective manner, even if this results in views and findings that are not favourable to the client;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have the required expertise in conducting the specialist report and I will comply with legislation, including the relevant Heritage Legislation (National Heritage Resources Act no. 25 of 1999, Human Tissue Act 65 of 1983 as amended, Removal of Graves and Dead Bodies Ordinance no. 7 of 1925, Excavations Ordinance no. 12 of 1980), the Minimum Standards: Archaeological and Palaeontological Components of Impact Assessment (SAHRA, AMAFA and the CRM section of ASAPA), regulations and any guidelines that have relevance to the proposed activity;
- I have not, 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 declaration are true and correct.

Disclosure of Vested Interest

I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations.

_____

Signature of specialist
Company: CES
Date: 22 February 2023

This Archaeological Impact Assessment report has been compiled considering the National Environmental Management Act 1998 (NEMA) and Environmental Impact Regulations 2014 as amended, requirements for specialist reports, Appendix 6, as indicated in the NEMA Table below.

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Relevant section in report	Comment where not applicable.
1.(1) (a) (i) Details of the specialist who prepared the report	Page 3, Section 2 and Addendum 1 of Report.	-
(ii) The expertise of that person to compile a specialist report including a curriculum vita	Section 2 and Addendum 1 of Report.	-
(b) A declaration that the person is independent in a form as may be specified by the competent authority	Page iii of the report	-
(c) An indication of the scope of, and the purpose for which, the report was prepared	Section 2: Introduction and Terms of Reference, Section 3: Description of the Project Activity	-
(cA) An indication of the quality and age of base data used for the specialist report	Section 7: The Heritage Baseline Environment	-
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 9: Expected Heritage Impacts of the Project	-
(d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 6: Methodology	-
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Section 6: Methodology	-
(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;	Section 9: Expected Heritage Impacts of the Project	-
(g) An identification of any areas to be avoided, including buffers	Section 8: Findings and Results	-
(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 8: Findings and Results	-
(i) A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 6.2: Assumptions and Limitations	-
(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	Section 9: Statement of Significance and Impact Rating	
(k) Any mitigation measures for inclusion in the EMPr	Section 10: Heritage Management Section 11: Conclusion and Recommendations	
(l) Any conditions for inclusion in the environmental authorisation	N/A	None required
(m) Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 10: Heritage Management Section 11: Conclusion and Recommendations	
(n)(i) A reasoned opinion as to whether the proposed activity, activities or portions thereof should be authorised and	Section 1 & Section 9	
(n)(iA) A reasoned opinion regarding the acceptability of the proposed activity or activities; and		
(n)(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 10: Heritage Management Section 11: Conclusion and Recommendations	-
(o) A description of any consultation process that was undertaken during the course of carrying out the study	N/A	Not applicable. A public consultation process will be conducted as part of the EIA and EMPr process.
(p) A summary and copies if any comments that were received during any consultation process	N/A	Not applicable.
(q) Any other information requested by the competent authority.	N/A	Not applicable.
(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.	Section 4: CRM: Legislation, Conservation and Heritage Management	

1 EXECUTIVE SUMMARY

This report details the results of an Archaeological Impact Assessment (AIA) study subject to an Environmental Impact Assessment (EIA) process for the proposed Soyuz 5 Wind Energy Facility (WEF) Project in the Pixley ka Seme District Municipality of the Northern Cape Province. The report also includes summary findings of a Visual Impact Assessment (VIA) conducted by Nuleaf Planning and Environmental. A preferred project site with an extent of approximately **16200ha** has been identified as a technically suitable area for the development of the WEF project. It is proposed that the WEF will comprise up to 75 turbines with a contracted capacity of up to 480 MW as well as access roads, a 132kV OHL line, laydown areas, construction camps and BESS. It is anticipated that the Soyuz 5 WEF will have an actual (permanent) footprint of up to **150ha**. The report includes background information on the area's archaeology, its representation in Southern Africa, and the history of the larger area under investigation, survey methodology and results as well as heritage legislation and conservation policies. A copy of the report will be supplied to the South African Heritage Resources Agency (SAHRA) and recommendations contained in this document will be reviewed.

Project Title	Soyuz 5 Wind Energy Facility Project
Project Location	**Relative Midpoint:** S31.138193° E23.594058°
1:50 000 Map Sheet	3123BA
Magisterial District / Municipal Area	Various farms portions and parcels.
Province	Pixley ka Seme District Municipality

The history of the Northern Cape Province is reflected in a rich archaeological landscape, mostly dominated by Stone Age occurrences. Generally, numerous sites documenting Earlier, Middle and Later Stone Age habitation occur across the province, mostly in open air locales or in sediments alongside rivers or pans. In addition, a wealth of Later Stone Age rock art sites, most of which are in the form of rock engravings are to be found in the larger landscape. These sites occur on hilltops, slopes, rock outcrops and occasionally in river beds. The archaeological record reflects the development of a rich Colonial frontier, characterised by traces of the Anglo-Boer war, indigenous and colonial contact sites and more recent historic occupation and development of the region, which herald the modern era in South African history.

Data on the history and archaeology of the surroundings of Britstown is primarily captured in heritage and archaeological studies associated with environmental impact assessments, the bulk of which are associated renewable energy facilities and particularly solar energy facilities and associated infrastructure. In order to arrive at a final Layout for the proposed project, a rigorous process of site screening was conducted for the Soyuz 5 WEF at desktop level. Here, a detailed appraisal of previous AIAa, HIAs and published literature coupled with a detailed analysis of historical aerial imagery and archive, topographical, geological and landscape feature maps was conducted in order to inform on the final layout for the WEF during the **Scoping Phase.** An archaeological site assessment was then conducted to identify heritage receptors on-site and in the larger landscape. It should be noted that information on the layout of components such as the 132kV OHL line, laydown areas, construction camps and BESS areas were made available to specialists at an advanced stage of this assessment and these areas could not be included in the site surveys. Some turbine positions and access road alignments were changed during final stages of the project design in order to avoid sensitive environmental and heritage receptors and not all of these proposed development areas could be revisited. In terms of heritage impacts, WEF developments with linear and narrow components such as OHLs and access roads are generally considered to be lower-risk since localised and spatially confined heritage resources can easily be avoided by project design of individual

turbine positions, pylon placements and service roads. The following observations are made for the proposed Soyuz 5 Wind Energy Facility Project in terms of heritage aspects, impacts and heritage resources management.

- Stone Age remains occur abundantly in the project landscape (observations at **S5WEF01 - S5WEF34**) where locally available raw material for the manufacture of stone tools is available in the geological setting. Most of the artefacts are probably Middle Stone Age (MSA) lithics such as blades, scrapers, chunks and cores produced on locally sourced hornfels, dolerite and siltstones. Despite the high number of observations of artefacts and high densities in places, these resources are common and representative of similar scatters across widespread areas of the Karoo. The widespread but ephemeral scatters are often of low heritage value due to temporally mixed contexts and the frequent absence of faunal, organic and other cultural remains which is scattered over thousands of square kilometres of the Karoo. The Stone Age localities are not conservation-worthy and even though the resources may be destroyed during construction, the impact is inconsequential.
- Khoekhoen pastoralist rock art is known to occur along dolerite hills and outcrops in the larger landscape around Britstown. Many of the dolerite hills and outcrops occurring in the project area have been removed from developable areas and layouts and no rock art was noted within the context of dolerite hills in the project areas.
- The term “Living Heritage” can broadly refer to a place of cultural heritage and sacred nature; with cultural attributions that are not generally physically manifested. Ritual and symbolic spaces and practices, and the material residues thereof convey an intangible cultural significance beyond the physical site or artefact, where the meaning of the ritual area speaks directly of a sense of place and lived experience. Such sites might occur on the project area or it surroundings and due cognisance should be taken of these sites of “Living Heritage” in the cultural landscape. In addition, it is possible that groups, farmers and locals living in the area have occupied the region for many generations and have expressed long-term cultural associations with the region. Therefore, it is important to ascertain from these respondents whether there are any further undetected sites of cultural significance in the area to which they relate and / or attach cultural meaning.
- It is assumed that findings in this assessment provides an accurate representation of the heritage landscape and potential site sensitivities. Still, it is recommended that final site walkovers be conducted of potential heritage sensitive zones in areas where turbine positions and access road alignments have been changed significantly prior to construction. In addition, site walkovers of potential heritage sensitive zones in the proposed 132kV OHL line alignments, laydown areas, construction camps and BESS areas will be required prior to construction.
- Considering the localised nature of heritage remains, the general monitoring of the development progress by an ECO or by the heritage specialist is recommended for all stages of the project. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during construction activities, all activities should be suspended and the archaeological specialist should be notified immediately.

It is the opinion of the Specialist that the proposed Soyuz 5 Wind Energy Facility will have a low negative cumulative impact on the heritage value of the area for the following reasons:

- The low frequency of significant archaeological resources documented within the project area implies low-severity short and long-term impacts on the heritage landscape. In addition, localised and spatially confined heritage resources can easily be avoided by project design of individual turbines, pylon placements and service roads.
- The significance of the landscape in terms of its heritage is bound not to change during the course of construction, operation and decommissioning of the project.

- The proposed Soyuz 5 WEF is situated in region which has seen the rapid development of vast and large-scale renewable energy facilities such as the Maanhaarberg WEF, the Great Karoo Renewable Energy Facility, the Modderfontein WEF and many Solar PV Developments around the town of De Aar. The developments cumulatively add to a transformed landscape and sense of place where the character of this portion of the Karoo is evolving into a centre for renewable power generation.
- It should be noted that archaeological knowledge and the initiation of research projects into significant archaeological sites often result from Heritage Impact Assessments conducted for developments. Provided that significant archaeological sites are conserved and that appropriate heritage mitigation and management procedures are followed, the cumulative impact of development can be positive.

The VIA conducted by Nuleaf Planning and Environmental indicates that the construction and operation of the proposed **Soyuz 5 WEF** will have an overall high visual effect on both the rural landscape and on sensitive receptors in the study area. The visual impact will differ amongst places, depending on the distance from the facility, but it is expected to be of the highest significance within (but not restricted to) a 5km radius of the proposed facility. Within this distance it will generally be restricted to residents of homesteads, as well as observers travelling along the various roads in the area (i.e. N12 and R398). This is largely due to the relatively close distance between the observers and the wind turbines, as well as the generally flat topography.

Overall, the significance of the visual impacts is predominately **moderate** to **high,** as a result of the generally rural character of the landscape and the fair number of homesteads located within the study area (increasing the number of sensitive receptors affected). A significance of **very high** is expected on sensitive receptors in close proximity (within 5km) of the proposed facility during the operational phase. Some impacts, post mitigations (if applicable), are expected to of **high** significant (visual impacts on sensitive receptors within the local area between 5 - 10km offset, shadow flicker, visual quality of the landscape and the cumulative impact), **moderate** significance (visual impacts of construction, on sensitive receptors within the within the district between 10 - 20km offset, lighting at nights and ancillary infrastructure) and others **low** significance (visual impacts on sensitive receptors within the region beyond the 20km offset). The facility would be visible within an area that contains certain sensitive visual receptors who would consider visual exposure to this type of infrastructure to be intrusive. Such visual receptors include people travelling along roads and residents of the homesteads scattered throughout the region. The areas of higher cumulative visual exposure (especially along the plains) contain sensitive visual receptors in the form of residents of homesteads and observers travelling along the national (N12), arterial (R398) and secondary roads traversing the plains. It is expected that should all 450 wind turbines of the Britstown Wind Farm Cluster be constructed; the potential cumulative visual impacts may range from moderate (where observers are absent i.e. vacant natural land) to high significance (where observers are present i.e. at homesteads and along roads).Additionally, since only a limited number of other REFs are located within the study area it is not expected that these smaller facilities will further contribute to the expected cumulative visual impact of the Britstown Wind Farm Cluster. Should the Britstown Wind Farm Cluster be constructed then these facilities will most likely be experienced as one facility by observers in the area. The overall cumulative visual impact of Britstown Wind Farm Cluster is therefore ultimately expected to be of **high** significance on the region due to the very large surface area it covers, its remote location, as well as the sensitivity of the identified receptors to this kind of development.

This study found that seventeen (17) turbines**,** located on the central portion of the Soyuz 5 WEF are likely to have a shadow flicker impact on motorists using a portions of the R398. Other areas to potentially be impacted on by shadow flicker are loacted along the secondary and internal farm roads located in the designated development properties**.** These roads are likely to be affected by the eight (8) turbines. It is, however, expected that the number of motorists travelling on these roads will be very limited and the level of exposure will be brief, thereby, not constituting a shadow flicker visual impact of concern for these receptors. Additionally, the residents of the homesteads known as **Schramfontein, Gediertesfontein and Beskuitkuil are also likely to experience shadow flicker** from four (4) different turbines. Gediertesfontein is exepceted to experience shadow

flicker at different parts of the day by two (2) different turbines. Of note is that these homesteads are located on properties involved in this development. It must also be noted that Gediertesfontein and Beskuitkuil were identified during the scoping phase as the potential sensitive receptors likely to experience shadow flicker. As per the recommendations of the IFC Performance Standards, it was recommended that further consultation was undertaken as part of the Scoping Phase consultation process with these specific sensitive receptors in order to establish their understanding and concerns regarding this possible impact. Since no objections have been reported by the EAP or Applicant to the author of this report, it is, therefore assumed that the residents of these two homesteads are in fact aware of and to a certain extent accepting of the shadow flicker associated with this turbine.

As a result of the layout change between the Scoping and EIR Phases an additional residence of Schramfontein has been identified as likely to experienec shadow flicker. Despite being located on a property involved in this development, since Schramfontein were not consulted during the Scoping Phase, as per the recommendations of the IFC Performance Standards, it is recommended that further consultation is undertaken as part of the EIR Phase consultation process with this specific sensitive receptor in order to establish their understanding and concerns regarding this possible impact. Should it be found during the consultation process that this specific receptor is concerned with the impact associated with shadow flicker, it is then recommended that the positioning of the specific turbine in question be revised or removed. Conventional mitigation (e.g., such as screening of the structures) of the potential visual impacts is highly unlikely to succeed due to the nature of this type of development (tip height exceeding 260m) and the receiving environment. However, a number of best practice mitigation measures have been proposed (Section **Error! Reference source not found.**) in order to limit the impacts that can be mitigated. Additionally, irrespective of whether or not mitigation measures will reduce the significance of the anticipated visual impacts, they are considered to be best practice and should all be implemented and maintained throughout the construction, operation and decommissioning phases of the proposed facility, should it be authorized. Impacts deemed possible to mitigate are general lighting of the facility and the construction activities on sensitive receptors in close proximity of the proposed facility. In order to ensure that all the spatial analyses and mapping undertaken in this report is as accurate as possible, a transparent and scientifically defensible approach, in line with best practice methodology for this type of assessment, has been utilised. The objective of this process is to quantify the potential visual impacts associated with the proposed Soyuz 5 WEF, using visibility analyses, proximity analyses and the identification of sensitive receptors. However, it must be noted that visual impact is a very subjective concept, personal to each individuals' backgrounds, opinions and perceptions. The subjects in this case are the identified sensitive receptors such as the residents of the homesteads, observers travelling along public roads and visitors to the region.

According to the Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning (DEA&DP) Guideline for Involving Visual and Aesthetic Specialists in the EIA Process (Oberholzer, 2005), the criteria that determine whether or not a visual impact constitutes a potential fatal flaw are categorised as follows:

1. Non-compliance with Acts, Ordinances, By-laws and adopted policies relating to visual pollution, scenic routes, special areas or proclaimed heritage sites.
2. Non-compliance with conditions of existing Records of Decision.
3. Impacts that may be evaluated to be of high significance and that are considered by the majority of the stakeholders and decision-makers to be unacceptable.

In terms of the above and to the knowledge of the author the proposed development is compliant with all Acts, Ordinances, By-laws and adopted policies relating to visual pollution, scenic routes, special areas or proclaimed heritage sites, as well as conditions of existing Records of Decisions. Since no reported objections from stakeholders or decision-makers within the region regarding the visual impacts have been received by the EAP (during the scoping phase), this assessment has adopted a risk averse approach by assuming that the perception

of most (if not all) of the sensitive visual receptors (bar the landowners of the properties earmarked for the development), would be predominantly negative towards the development of a WEF in the region. While still keeping in mind that there are also likely to be supporters of the Soyuz 5 WEF (as renewable energy generation is a global priority) amongst the population of the larger region, they are largely expected to be indifferent to the construction of the WEF and not as vocal in their support for the wind farm as the detractors thereof. In spite of the predominantly high residual ratings and the likelihood that the proposed development could be met with concern and objections from some of the affected sensitive receptors and landowners in the region, this report cannot categorically state that any of the above conditions were transgressed. Therefore, the visual impacts are not considered to be a fatal flaw for a development of this nature. It is recommended that the proposed Soyuz 5 WEF, as per the assessed layout be supported from a visual perspective, subject to the implementation of the suggested best practice mitigation measures.

This report details the methodology, limitations and recommendations relevant to these heritage areas, as well as areas of proposed development. It should be noted that recommendations and possible mitigation measures are valid for the duration of the development process, and mitigation measures might have to be implemented on additional features of heritage importance not detected during this Phase 1 assessment (e.g. uncovered during the construction process.

NOTATIONS AND TERMS/TERMINOLOGY

Archaeological record: The archaeological record minimally includes all the material remains documented by archaeologists. More comprehensive definitions also include the record of culture history and everything written about the past by archaeologists.

Artefact: Entities whose characteristics result or partially result from human activity. The shape and other characteristics of the artefact are not altered by removal of the surroundings in which they are discovered. In the Southern African context examples of artefacts include potsherds, iron objects, stone tools, beads and hut remains.

Assemblage: A group of artefacts recurring together at a particular time and place, and representing the sum of human activities.

Collective Memory: The shared pool of information (stories, artefacts, symbols, traditions, images) held in the memories of two or more members of a group. As for individual memory, it is construed over time through the interpretation of past events (in the present case, interpreted by the group members). By the virtue of being shared among the group members, it creates a social group identity in the sense that it forms the ties that bind group members together.

Context: An artefact's context usually consists of its immediate *matrix*, its *provenience* and its *association* with other artefacts. When found in *primary context*, the original artefact or structure was undisturbed by natural or human factors until excavation and if in *secondary context,* disturbance or displacement by later ecological action or human activities occurred.

Cultural Heritage Resource: The broad generic term *Cultural Heritage Resources* refers to any physical and spiritual property associated with past and present human use or occupation of the environment, cultural activities and history. The term includes sites, structures, places, natural features and material of palaeontological, archaeological, historical, aesthetic, scientific, architectural, religious, symbolic or traditional importance to specific individuals or groups, traditional systems of cultural practice, belief or social interaction.
Cultural landscape: A cultural landscape refers to a distinctive geographic area with cultural significance.

Cultural Resource Management (CRM): A system of measures for safeguarding the archaeological heritage of a given area, generally applied within the framework of legislation designed to safeguard the past.

Feature: Non-portable artefacts, in other words artefacts that cannot be removed from their surroundings without destroying or altering their original form. Hearths, roads, and storage pits are examples of archaeological features

Impact: A description of the effect of an aspect of the development on a specified component of the biophysical, social or economic environment within a defined time and space.

Intangible cultural heritage: UNESCO defines "intangible cultural heritage" as the practices, representations, expressions, knowledge and skills recognized by communities, groups and individuals as part of their cultural heritage. It is transmitted from generation to generation inconstant recreation, providing the communities with a sense of identity (Article 2).

Lithic: Stone tools or waste from stone tool manufacturing found on archaeological sites.

Matrix: The material in which an artefact is situated (sediments such as sand, ashy soil, mud, water, etcetera). The matrix may be of natural origin or human-made.

Midden: Refuse that accumulates in a concentrated heap.
Microlith: A small stone tool, typically knapped of flint or chert, usually about three centimetres long or less.
Monolith: A geological feature such as a large rock, consisting of a single massive stone or rock, or a single piece of rock placed as, or within, a monument or site.
Provenience: Provenience is the three-dimensional (horizontal and vertical) position in which artefacts are found. Fundamental to ascertaining the provenience of an artefact is *association,* the co-occurrence of an artefact with other archaeological remains; and *superposition,* the principle whereby artefacts in lower levels of a matrix were deposited before the artefacts found in the layers above them, and are therefore older.

Random Sampling: A probabilistic sampling strategy whereby randomly selected sample blocks in an area are surveyed. These are fixed by drawing coordinates of the sample blocks from a table of random numbers.

Scoping Assessment: The process of determining the spatial and temporal boundaries (i.e. extent) and key issues to be addressed in an impact assessment. The main purpose is to focus the impact assessment on a manageable number of important questions on which decision making is expected to focus and to ensure that only key issues and reasonable alternatives are examined. The outcome of the scoping process is a Scoping Report that includes issues raised during the scoping process, appropriate responses and, where required, terms of reference for specialist involvement.

Site (Archaeological): A distinct spatial clustering of artefacts, features, structures, and organic and environmental remains, as the residue of human activity. These include surface sites, caves and rock shelters, larger open-air sites, sealed sites (deposits) and river deposits. Common functions of archaeological sites include living or habitation sites, kill sites, ceremonial sites, burial sites, trading, quarry, and art sites,

Stratigraphy: This principle examines and describes the observable layers of sediments and the arrangement of strata in deposits

Systematic Sampling: A probabilistic sampling strategy whereby a grid of sample blocks is set up over the survey area and each of these blocks is equally spaced and searched.

Trigger: A particular characteristic of either the receiving environment or the proposed project which indicates that there is likely to be an *issue* and/or potentially significant *impact* associated with that proposed development that may require specialist input. Legal requirements of existing and future legislation may also trigger the need for specialist involvement.

Abbreviation	Description
ASAPA	Association for South African Professional Archaeologists
AIA	Archaeological Impact Assessment
BP	Before Present
BCE	Before Common Era
BESS	Battery Energy Storage System
BGG	Burial Grounds and Graves
CRM	Culture Resources Management
EIA	Early Iron Age (also Early Farmer Period)
EIA	Environmental Impact Assessment
EFP	Early Farmer Period (also Early Iron Age)
ESA	Earlier Stone Age
GIS	Geographic Information Systems
HIA	Heritage Impact Assessment
ICOMOS	International Council on Monuments and Sites
K2/Map	K2/Mapungubwe Period
LFP	Later Farmer Period (also Later Iron Age)
LIA	Later Iron Age (also Later Farmer Period)
LSA	Later Stone Age
MIA	Middle Iron Age (also Early later Farmer Period)
MRA	Mining Right Area
MSA	Middle Stone Age
NHRA	National Heritage Resources Act No.25 of 1999, Section 35
OHL	Overhead Line
PFS	Pre-Feasibility Study
PHRA	Provincial Heritage Resources Authorities
SAFA	Society for Africanist Archaeologists
SAHRA	South African Heritage Resources Association
YCE	Years before Common Era (Present)
WEF	Wind Energy Facility

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2 INTRODUCTION AND TERMS OF REFERENCE

CES was contracted to conduct an Archaeological Impact Assessment (AIA) study subject to an Environmental Impact Assessment (EIA) process for the proposed Soyuz 5 Wind Energy Facility Project in the Northern Cape Province. The rationale of this AIA is to determine the presence of heritage resources such as archaeological and historical sites and features, graves and places of religious and cultural significance in previously unstudied areas; to consider the impact of the proposed project on such heritage resources, and to submit appropriate recommendations with regard to the cultural resources management measures that may be required at affected sites / features.

Heritage specialist input into the Environmental Impact Assessment (EIA) process is essential to ensure that, through the management of change, developments still conserve our heritage resources. It is also a legal requirement for certain development categories which may have an impact on heritage resources. Thus, EIAs should always include an assessment of heritage resources. The heritage component of the EIA is provided for in the **National Environmental Management Act, (Act 107 of 1998)** and endorsed by section 38 of the **National Heritage Resources Act (NHRA - Act 25 of 1999)**. In addition, the NHRA protects all structures and features older than 60 years, archaeological sites and material and graves as well as burial sites. The objective of this legislation is to ensure that developers implement measures to limit the potentially negative effects that the development could have on heritage resources. Based hereon, this project functioned according to the following **terms of reference for** heritage specialist input**:**

- Provide a detailed description of all archaeological artefacts, structures (including graves) and settlements which may be affected, if any.
- Assess the nature and degree of significance of such resources within the area.
- Establish heritage informants/constraints to guide the development process through establishing thresholds of impact significance;
- Assess and rate any possible impact on the archaeological and historical remains within the area emanating from the proposed development activities.
- Propose possible heritage management measures provided that such action is necessitated by the development.
- Liaise and consult with the South African Heritage Resources Agency (SAHRA). A Notification of Intent to Develop (NID) will be submitted to SAHRA at the soonest opportunity.

As archaeologist for CES, Mr Neels Kruger acted as field director and specialist for this project. He was responsible for the assimilation of all information, the compilation of the final consolidated AIA report and recommendations in terms of heritage resources on the demarcated project areas. Mr Kruger is an accredited archaeologist and Culture Resources Management (CRM) practitioner with the Association of South African Professional Archaeologists (ASAPA), a member of the Society for Africanist Archaeologists (SAFA) and the Pan African Archaeological Association (PAA). Please refer to Addendum 1 for a Specialist CV.

3 DESCRIPTION OF THE ACTIVITY

3.1 PROJECT DESCRIPTION

The Applicant, **Soyuz 5 (Pty) Ltd**, is proposing the development of a commercial Wind Energy Facility (WEF) and associated infrastructure on a site located approximately 46 km South of Britstown within the Ubuntu Local Municipality and the Pixley ka Seme District Municipality in the Northern Cape Province. Five additional WEF's are concurrently being considered on the surrounding properties and are assessed by way of separate impact assessment processes contained in the 2014 Environmental Impact Assessment Regulations (GN No. R982, as amended) for listed activities contained in Listing Notices 1, 2 and 3 (GN R983, R984 and R985, as amended). These projects are known as Soyuz 1 WEF, Soyuz 2 WEF, Soyuz 3 WEF, Soyuz 4 WEF and Soyuz 6 WEF.

A preferred project site with an extent of approximately 125 000 ha has been identified as a technically suitable area for the development of the six WEF projects (collectively referred to in this report as the **Britstown Wind Farm Cluster**). It is proposed that each WEF will comprise of up to 75 turbines with a contracted capacity of up to 480 MW. It is anticipated that each WEF will have an actual (permanent) footprint of up to 150 ha. The **Soyuz 5 WEF** project site covers approximately 16 800 ha and comprises the following farm portions:

- The Farm Lekkervlei No. 142
- Remaining Extent of the Farm Gediertesfontein No. 134.
- Portion 4 of the Farm Schram Fontein No. 21
- Portion 4 (Beschuid Kuil) of the Farm Schramfountain No. 23
- Remaining Extent (Portion 0) of the Farm Schram Fontein No. 21
- Portion 1 of the Farm Schram Fontein No. 21
- Remaining Extent of Portion 2 of the Farm Draayfountain No 24

The **Soyuz 5 WEF** project site is proposed to accommodate the following infrastructure, which will enable the wind farm to supply a contracted capacity of up to 480 MW:

- Up to 75 wind turbines with a maximum hub height of up to 160m and a rotor diameter of up to 200m;
- A transformer at the base of each turbine;
- Concrete turbine foundations of up to 1024m^2 each;
- Permanent Crane hardstand / blade and tower laydown area / crane boom erection area with a combined maximum footprint 5000m^2 at each WTG;
- Temporary concrete batch plants to be located at the construction camp area and the satellite laydown areas;
- Battery Energy Storage System (with a footprint of up to 5 ha);
- Internal up to 132kV overhead lines between substations. A 300m wide corridor (150m on either side of the proposed route) has been considered to allow for any technical and environmental sensitivity constraints identified during micro-siting prior to layout finalisation. Permanent service roads will be required for the construction and maintenance of the overhead lines. In areas where these overhead lines do not follow an existing or proposed road, additional roads of up to 3m in width will be required. Temporary construction areas beneath each overhead line tower position will also be required;
- Medium voltage (33kV) cables/powerlines running from wind turbines to the facility substations. The routing will follow existing/proposed access roads and will be buried where possible. If the use of overhead lines is required, the Avifaunal Specialist will be consulted timeously to ensure that a raptor friendly pole design are used, and that appropriate mitigation is implemented pro-actively.
- Up to six permanent met masts;

- Three substations and operation and maintenance facilities (up to 4 ha each) as well as a laydown area (8 000m^2) at each substation for the electrical contractor. Operation and maintenance facilities include a gate house, security building, control centre, offices, warehouses and workshops.
- Three temporary main construction camp areas (up to 12.25 ha each);
- Twelve temporary satellite laydown areas (5 000m^2 each).
- Access roads to the site and between project components inclusive of stormwater infrastructure. A 200m road corridor is being applied for to allow for slight realignments pending technical and environmental sensitivity constraints identified during micro-siting prior to layout finalisation. The final road will have maximum width of 12m (within the 200m corridor).

The project will also include self-build grid infrastructure to facilitate the connection of the WEFs to the national grid. This will include the construction of several 132kV/400kV overhead powerlines and the construction of a new Main Transmission Substation either to the North or South of the study area (awaiting confirmation from Eskom). The grid connections will be assessed in separate reports. A WEF generates electricity by means of wind turbine generators that harness the wind of the area as a renewable source of energy. Wind energy generation, or wind farming as it is commonly referred to, is a renewable electricity generation option. In order to optimise the use of the wind resource and the amount of power generated by the facility, the number of wind turbines erected in the area, as well as the careful placement of the turbines in relation to the topography must be considered. Each wind turbine is expected to consist of a concrete foundation, a steel tower, a hub and three turbine blades attached to the hub as illustrated in **Error! Reference source not found.**. Each turbine is expected to have a hub height of 160m, with a rotor diameter of 200m, ultimately culminating in an overall height of 260m (maximum blade tip height). Refer to Table 1 below for a full breakdown. Variations of the above dimensions may occur, depending on the preferred supplier or commercial availability of wind turbines at the time of construction).

Table 1: Specifications of the proposed Soyuz 5 WEF as provided by the Applicant

Component	Info
Wind turbine unit size	Unspecified
Rotor diameter	Up to 200m
Hub height	Up to 160m
Blade tip height	Up to 260m
Number of wind turbines	75 max
Total WEF capacity	Up to 480MW

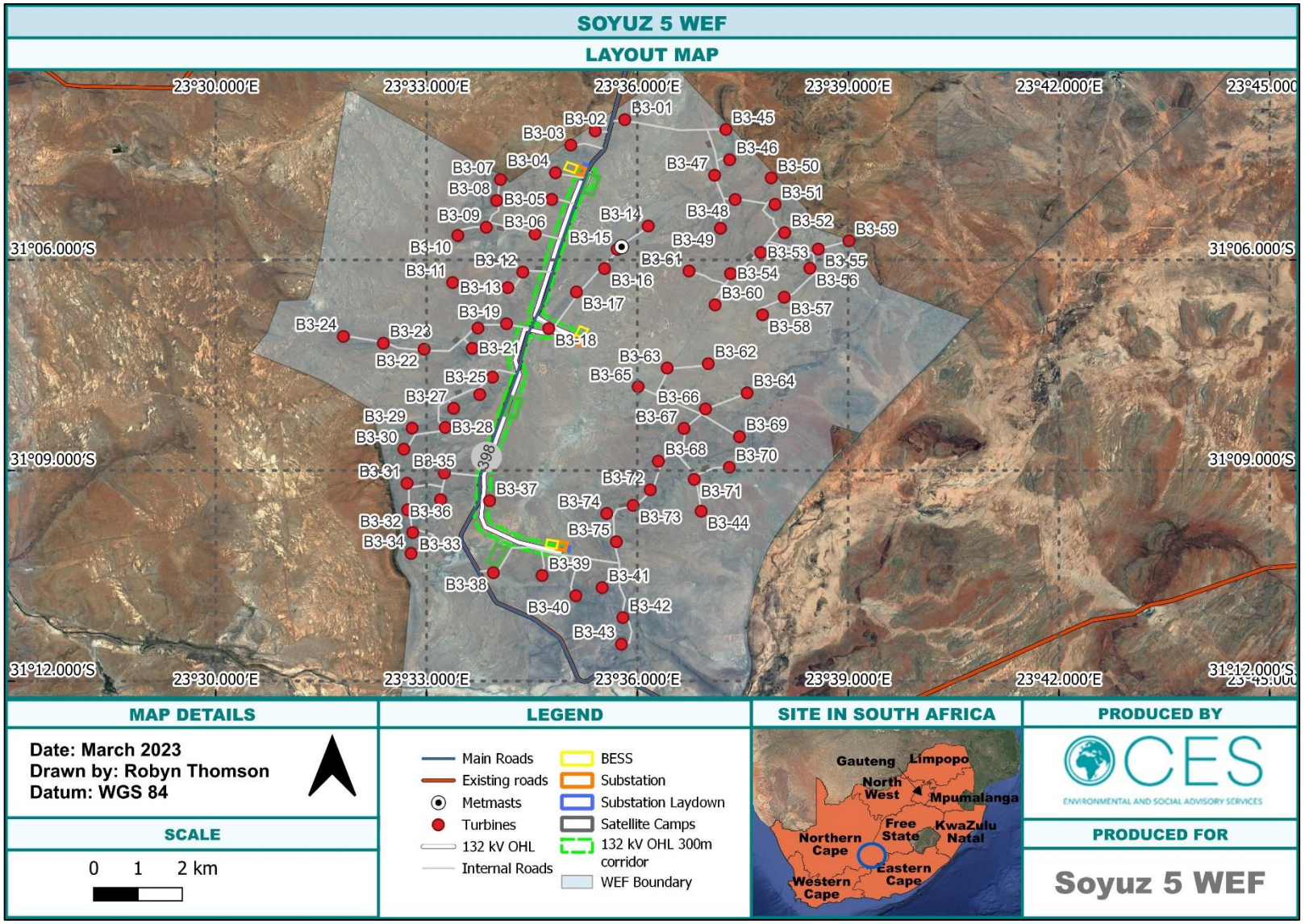

Figure 3-1: Aerial map indicating the proposed development areas subject to the Soyuz 5 Wind Energy Facility Project.

4 LEGAL BASIS OF THE ACTIVITY

4.1 OVERVIEW

The broad generic term *Cultural Heritage Resources* refers to any physical and spiritual property associated with past and present human use or occupation of the environment, cultural activities and history. The term includes sites, structures, places, natural features and material of palaeontological, archaeological, historical, aesthetic, scientific, architectural, religious, symbolic or traditional importance to specific individuals or groups, traditional systems of cultural practice, belief or social interaction.

4.2 LEGISLATION FOR THE PROTECTION OF HERITAGE SITES

The South African Heritage Resources Agency (SAHRA) and its provincial offices aim to conserve and control the management, research, alteration and destruction of cultural resources of South Africa. It is therefore vitally important to adhere to heritage resource legislation at all times.

a. National Heritage Resources Act No 25 of 1999, section 35

According to the National Heritage Resources Act No 25 of 1999 (section 35) the following features are protected as cultural heritage resources:

a. Archaeological artefacts, structures and sites older than 100 years

b. Ethnographic art objects (e.g. prehistoric rock art) and ethnography

c. Objects of decorative and visual arts

d. Military objects, structures and sites older than 75 years

e. Historical objects, structures and sites older than 60 years

f. Proclaimed heritage sites

g. Grave yards and graves older than 60 years

h. Meteorites and fossils

i. Objects, structures and sites of scientific or technological value.

In addition, the national estate includes the following:

a. Places, buildings, structures and equipment of cultural significance

b. Places to which oral traditions are attached or which are associated with living heritage

c. Historical settlements and townscapes

d. Landscapes and features of cultural significance

e. Geological sites of scientific or cultural importance

f. Archaeological and paleontological sites

g. Graves and burial grounds

h. Sites of significance relating to the history of slavery

i. Movable objects (e.g. archaeological, paleontological, meteorites, geological specimens, military, ethnographic, books etc.)

With regards to activities and work on archaeological and heritage sites this Act states that:

"No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit by the relevant provincial heritage resources authority." (34. [1] 1999:58)

and

"No person may, without a permit issued by the responsible heritage resources authority-

(a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;

(b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;

(c) trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or

(d) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites. (35. [4] 1999:58)."

and

"No person may, without a permit issued by SAHRA or a provincial heritage resources agency-

(a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;

(b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority;

(c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) and excavation equipment, or any equipment which assists in the detection or recovery of metals (36. [3] 1999:60)."

b. Human Tissue Act of 1983 and Ordinance on the Removal of Graves and Dead Bodies of 1925

Graves and burial grounds are commonly divided into the following subsets:

a. ancestral graves

b. royal graves and graves of traditional leaders

c. graves of victims of conflict

d. graves designated by the Minister

e. historical graves and cemeteries

f. human remains

Graves 60 years or older are heritage resources and fall under the jurisdiction of both the National Heritage Resources Act and the Human Tissues Act of 1983. However, graves younger than 60 years are specifically protected by the Human Tissues Act (Act 65 of 1983) and Ordinance on Excavations (Ordinance no. 12 of 1980) as well as any local and regional provisions, laws and by-laws. Such burial places also fall under the jurisdiction of the National Department of Health and the Provincial Health Departments.

c. National Heritage Resources Act No 25 of 1999, section 35

This act (Act 107 of 1998) states that a survey and evaluation of cultural resources must be done in areas where development projects, that will change the face of the environment, will be undertaken. The impact of the development on these resources should be determined and proposals for the mitigation thereof are made. Environmental management should also take the cultural and social needs of people into account. Any disturbance of landscapes and sites that constitute the nation's cultural heritage should be avoided as far as possible and where this is not possible the disturbance should be minimized and remedied

4.3 Background to Heritage Impact Assessments

South Africa's unique and non-renewable archaeological and palaeontological heritage sites are 'generally' protected in terms of the National Heritage Resources Act (Act No 25 of 1999, section 35) and may not be disturbed at all without a permit from the relevant heritage resources authority. Heritage sites are frequently threatened by development projects and both the environmental and heritage legislation require impact assessments (HIAs & AIAs) that identify all heritage resources in areas to be developed. Particularly, these assessments are required to make recommendations for protection or mitigation of the impact of the sites. HIAs and AIAs should be done by qualified professionals with adequate knowledge to (a) identify all heritage resources including archaeological and palaeontological sites that might occur in areas of developed and (b) make recommendations for protection or mitigation of the impact on the sites.

A detailed guideline of South African statutory terms and requirements is supplied in Addendum 2.

4.4 International Norms and Standards

Since the project is to lenders standards, the survey and assessment needs to meet the standards set out by the International Finance Corporation (IFC) and the Equator Principles. It should be noted that South African Environmental Legislation and Heritage Legislation in particular are rigorous and aligned with the principals set out in the IFC. As such, the requirements listed below have been addressed in this report, with the exception of stakeholder engagement which is addressed in the EIA.

4.4.1 International Finance Corporation (IFC)

A number of international guidelines on Cultural Heritage provide important guidance for the project, particularly those required by main international lenders such as the World Bank and the International Finance Corporation (IFC). In the case of private sector projects these guidelines default to the IFC's performance standards (PS) on social and environmental sustainability. It is important to note that the PS complement, rather than substitute, the requirements of the applicable national law. Applicable here is PS 8 (Cultural Heritage), which is aligned with the UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage mentioned above. PS 8 aims to protect cultural heritage from the adverse impacts of project activities, support its preservation and promote the equitable sharing of benefits from the use of cultural heritage. Cultural heritage includes tangible assets (moveable or immovable objects, property, sites, structures), natural features that embody cultural values (sacred groves, rocks, lakes, and waterfalls) and certain intangible forms of culture (cultural knowledge, innovations and traditional lifestyle practices). The requirements of PS 8 apply to cultural heritage regardless of whether or not it has been legally protected or previously disturbed.

PS 8 requires that the Client follows a number of requirements:

1. Identify and protect cultural heritage by ensuring that internationally recognized practices for the protection, field-based study, and documentation of cultural heritage are implemented;
2. Design a project to avoid significant adverse impacts to cultural heritage during construction or operation phases, as identified in the environmental and social risks and impact assessment process. The client must develop provisions for managing chance finds through a chance find procedure, which will be applied in the event that cultural heritage is subsequently discovered.;
3. Consult with affected communities (who use or have used within living memory the cultural heritage for cultural purposes) to identify relevant cultural heritage and incorporate their views on such cultural heritage into the project decision-making process. Consultation also involves relevant national or local regulatory agencies entrusted with the protection of cultural heritage;
4. Allow affected communities within living memory for long-standing cultural purposes, continued access to the cultural site(s) located within the project area, or provide an alternative access route, subject to overriding health, safety, and security considerations;
5. Where tangible cultural heritage that is replicable and not critical is found in the project area, mitigation measures that favour avoidance must be applied. Where this is not feasible, the client will apply the following hierarchy of mitigation measures:
   - 5.1 Minimize adverse impacts and implement restoration measures, *in situ*, that ensure maintenance and functionality of the cultural heritage;
   - 5.2 If restoration *in situ* is not possible, restore the functionality of the cultural heritage in a different location, including the ecosystem needed to support it;
   - 5.3 Carry out the permanent removal of historical and archaeological artefacts and structures according to specific principles; and
   - 5.4 Only where minimisation measures are not possible, and where the Affected Communities are using the tangible cultural heritage for long-standing cultural purposes, compensate for loss of that tangible cultural heritage.
6. Refrain from removing any nonreplicable cultural heritage, where cultural heritage is best protected by preservation in its place (i.e. removal is likely to result in irreparable damage or destruction), unless:
   - 6.1 There are no technically or financially feasible alternatives for removal;
   - 6.2 The overall project benefits conclusively outweigh the anticipated cultural heritage loss from removal; and
   - 6.3 Removal of cultural heritage is done with the best available technique;
7. Where critical cultural heritage is found (internationally recognized heritage or legally protected cultural heritage areas), refrain from removing, significantly altering or damaging it. In exceptional circumstances when impacts on critical cultural heritage are unavoidable, the client must use a process of Informed Consultation and Participation of the Affected Communities, with good faith negotiation that result in a documented outcome. The assessment and protection of such heritage must be assisted by external experts.

PS 8 describes the potential risks and impacts of a given project over Cultural Heritage that require particular attention, and establishes the requirements to avoid, minimize and (where impacts remain) compensate for risks and impacts to affected communities, workers and the socio-cultural environment. Table 2 below summarizes the main international guidelines for the protection of cultural heritage.

Table 2: List of International Guidelines

LEGISLATION	Brief Description	APPLICABILITY TO THE PROJECT
Cultural Heritage Protection		
UNESCO 1970 Convention on the Means of Prohibiting and	Defines 'cultural property' and measures to prohibit and prevent the illicit use of cultural property, including its import, export and transfer of ownership, by State	Cultural heritage found in the project area must be

LEGISLATION	Brief Description	APPLICABILITY TO THE PROJECT
Preventing the Illicit Import, Export and Transfer of Ownership of Cultural Property	parties. Not yet ratified by the DRC, however the cultural property protection measures are reflected in law 10/88.	respected in accordance to law 10/88.
UNESCO 1970 Convention Concerning the Protection of the World Cultural and Natural Heritage	Recognizes the increasing threat to cultural and natural heritage to damage and destruction. Calls State Parties to identify, protect, conserve, present and transmit future generations of the cultural and natural heritage situated on national territory. Ratified by the DRC in 1982; the responsibility of the State is reflected on law 10/88	Tangible and intangible resources are protected by Law 10/88. Private organizations, among other entities, are also responsible for protecting cultural heritage.
UNESCO 2003 Convention for the safeguarding of the Intangible Cultural Heritage	State parties requested to draw an inventory of the intangible cultural heritage present in its territory (regularly updated) and adopt a policy for the promotion of intangible cultural heritage in society. Policy includes an entity for the safeguarding the national intangible cultural heritage; scientific, technical and artistic studies to safeguard this heritage; education for the protection of intangible cultural heritage sites and promotion of access to such sites and their documentation. Ratified by the DRC in 2007.	
PS 8 of the IFC – Cultural Heritage	Aligned with the UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage. Aims to protect cultural heritage in all its features from the adverse impacts of project activities, support its preservation and promote the equitable sharing of benefits from the use of cultural heritage. Applies to cultural heritage regardless of whether or not it has been legally protected or previously disturbed. PS 8 is triggered in the process of environmental and social risks assessment, and includes a number of requirements to be followed.	Environmental and social risks assessment is currently in place PS 8 requirements can inform the Environmental and social risks assessment and the project decision making.

4.4.2 The Equator Principles

Equator Principles Financial Institutions (EPFIs) encourages clients to address potential or actual adverse risks and impacts identified during large infrastructure and industrial Projects. Here, environmental and social risks and impacts are identified, assessed and managed in a structured way in order to promote sustainable environmental and social performance for improved financial, environmental and social outcomes. As such, the Equator Principles have been adopted to ensure that Projects are developed in a manner that is socially responsible and reflects sound environmental management practices:

- **Principle 1**
  Requires a project to be categorised in accordance with the IFC screening criteria. The Etoile Project mine expansion is classified as an IFC Category B project based on potential adverse environmental impacts however less adverse than a Category A project. The impacts are site-specific, few are irreversible and in most cases mitigation measures can be designed.
- **Principle 2**
  Social and environmental assessment: This requires an assessment of the relevant environmental and social risks and scale of impacts of the proposed project.
- **Principle 3**
  Applicable social and environmental standards. Relevant host country laws and regulations needs to be adhered to. The Equator principles also support the international IFC standards.
- **Principle 4**
  Action plan and management system. The heritage and cultural assessment should propose a management plan to minimize impacts and where residual impacts remain, to compensate/offset/remedy for risks.
- **Principle 5**

Stakeholder Engagement needs to be undertaken in a structured and culturally appropriate manner, and needs to be focused on affected communities, workers and other relevant stakeholders.

- **Principle 6**
  A Grievance Mechanism must be established which are designed for use by affected communities and workers, as appropriate, to receive and facilitate resolution of concerns and grievances about the project's environmental and social performance.
- **Principle 7**
  An independent review of the assessment process will be undertaken by independent and qualified environmental practitioners.
- **Principle 8**
  Covenants. For all projects, where an applicant is not in compliance with its environmental and social covenants, the EPFI will work with the applicant on remedial actions to bring the project back into compliance
- **Principle 9**
  The EPFI will require independent monitoring and reporting provided by independent Environmental Practitioners
- **Principle 10**
  EPFI reporting and transparency. Reporting and Transparency is required and specific project reports must be made publicly available.

5 REGIONAL CONTEXT

5.1 LOCATION

The Soyuz 5 Wind Energy Facility Project area is located south of the town of Britstown and west of De Aar in the Pixley ka Seme District Municipality, Northern Cape Province (see Figure 2-1).

The project is situated on the following farm portions:

- The Farm Lekkervlei No. 142
- Remaining Extent of the Farm Gediertesfontein No. 134.
- Portion 4 of the Farm Schram Fontein No. 21
- Portion 4 (Beschuid Kuil) of the Farm Schramfountain No. 23
- Remaining Extent (Portion 0) of the Farm Schram Fontein No. 21
- Portion 1 of the Farm Schram Fontein No. 21
- Remaining Extent of Portion 2 of the Farm Draayfountain No 24

The study area appears on 1:50 000 Map Sheet 3123BA and a key location point of the proposed project area is:

- **Relative Midpoint: S31.138193° E23.594058°**

5.2 RECEIVING ENVIRONMENT

The environment around Britstown is characterised by flat undulating Karoo vegetation comprised out of relatively sparse scrub and grasses, with dolerite hills in the surrounding landscape. Large portions of the land are currently devoted to livestock farming but a number of solar and wind energy facilities are to be constructed on farms around Britstown and De Aar. Shallow soils cover a combination of calcrete, shale and dolerite substrates, and large sections in the landscape are exposed to sheet erosion, specifically along low lying areas and drainage lines. Dolerite and sandstone are present, while exotic rocks occur in the gravel of the Orange River bed and terraces.

5.3 SITE DESCRIPTION

The project area south west of Britstown is a Karoo landscape currently used for livestock farming. The specific segments of the landscape comprise relatively flat terrain with dolerite hills in the surrounding landscape. Relatively shallow soil veneers a combination of calcrete, Beaufort Group and dolerite substrates, with relatively sparse vegetation of Karoo scrub and grass. Surface archaeological traces are likely to be highly visible in such contexts. They should also give a good indication of what lies below the surface in situations where soil cover is shallow. Topographically, the development footprint is situated on relatively flat terrain with undulating hills and occasional dolerite koppies (dykes) defining the relief of the surrounding landscape. Where dolerite outcrops occur there is a possibility that rock engravings could be found. A number of shallow pans and drainage lines occur along the Brak River to the east and the Sout River to the west as well as in other areas across the

project area.

Figure 5-1: View of general surroundings in the project area. Note dolerite hills and outcrops in this area (left).

Figure 5-2: View of general surroundings in the project area.

Figure 5-3: View of general surroundings in the project area along grassy plains and deep red sands.

Figure 5-4: View of general surroundings in the project area.

Figure 5-5: View of Dolerite hills and outcrops in the larger project landscape.

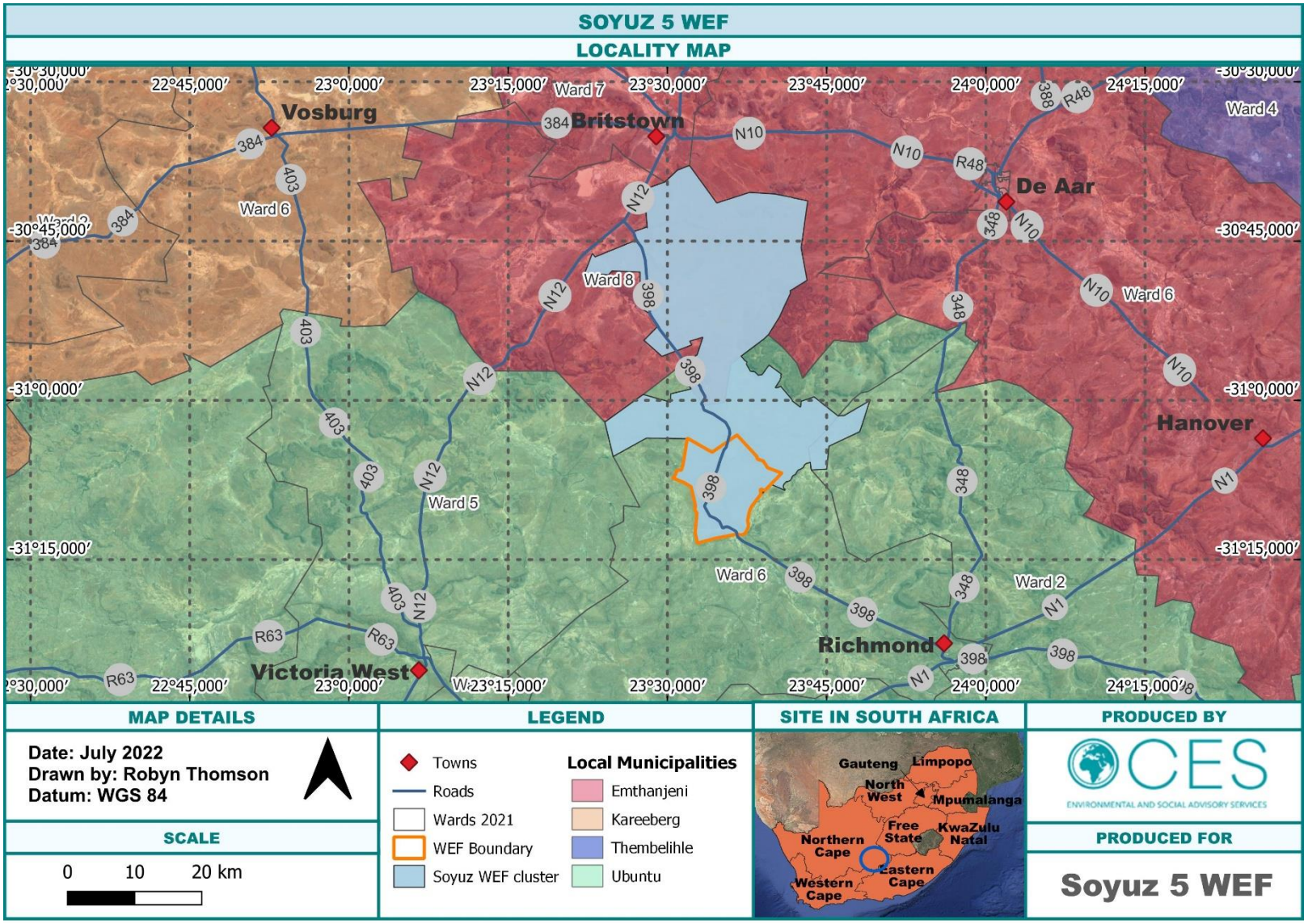

Figure 5-6: Map representation of the location of the proposed Soyuz 5 Wind Energy Facility Project.

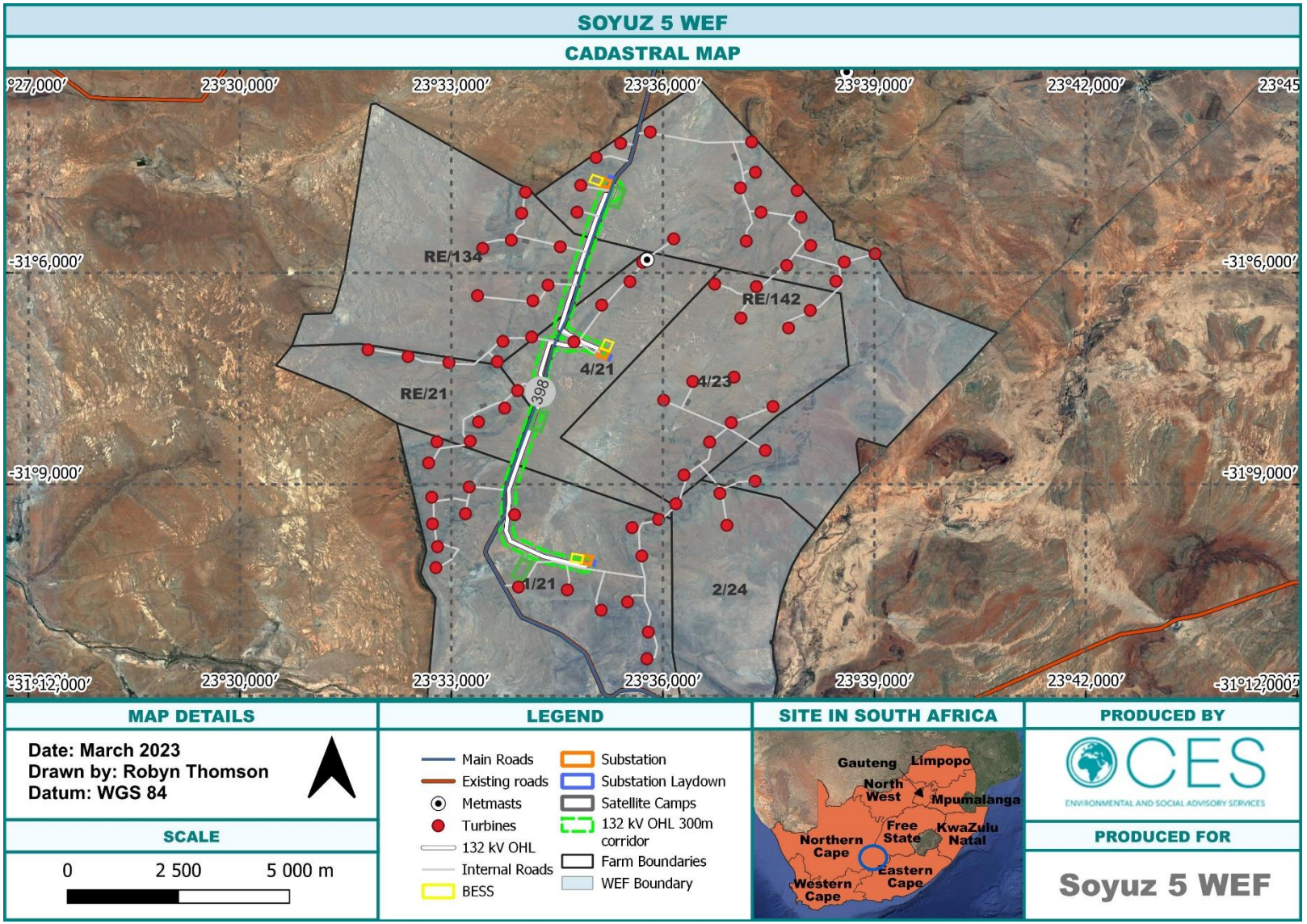

Figure 5-7: Aerial map providing a regional context for the proposed Soyuz 5 Wind Energy Facility Project.

6 METHODOLOGY

6.1 SOURCES OF INFORMATION

In order to arrive at a final Layout for the proposed project a rigorous process of desktop site screening was conducted for the Soyuz 5 WEF at desktop level. This was followed by a site survey of the proposed project landscape and development areas.

6.1.1 Desktop Work

A desktop study was prepared in order to contextualize the proposed project within a larger historical milieu and to inform on the final layout for the WEF. The study focused on relevant previous studies, archaeological and archival sources, aerial photographs, historical maps and local histories, all pertaining to the project area and the larger landscape of this section of the Northern Cape Province. The desktop study examined a number of archaeological and historical impact assessments available from the South African Heritage Resources Agency Information System (SAHRIS). It was established that no commercially driven HIAs have been conducted in Soyuz project area and research coverage of surrounding regions seem sporadic (refer to Figure 3-1). However, the following heritage assessments pertaining to the De Aar WEF project situated east of the Soyuz project were of particular interest:

- Kaplan, J. 2010. Archaeological Scoping Study for a proposed wind energy facility on the Maanhaarberge & Kombuisfonteinberge, De Aar. Report prepared for DJ Environmental Consultants. ACRM.
- Kaplan, J. 2010. Archaeological Impact Assessment for a proposed photovoltaic power generation facility in De Aar in the Northern Cape Province. Report prepared for DJ Environmental Consultants. ACRM.
- Almond, J. 2010. Palaeontological Impact Assessment: Desktop Study for the proposed windfarm at Maanhaarberg near De Aar, Northern Cape Province. Natura Viva cc, Cape Town

In addition, the following heritage studies were consulted with regards to the Soyuz WEF project:

- Kruger, N. 2019. Archaeological Impact Assessment (AIA) for the Britstown 800 Emthanjeni 4114 Housing Development in the Northern Cape Province. Exigo Sustainability.
- Morris, D. 2006. Revised archaeological specialist input for the proposed Hydra Gamma 765v Transmission line along the existing 400kv corridor near De Aar and Victoria West, Northern Cape Province, including assessment for the extension of the existing 765 Kv Hydra substation, on Eskom owned land. Report prepared for Bohlweki Environmental Kimberley: McGregor Museum
- Morris, D. 2004. Phase 1 Archaeological Specialist Input for the proposed Hydra-Gamma 765 transmission line along the `eastern' (existing) 400 Kv corridor near De Aar and Victoria West. Report prepared for Bohlweki Environmental. Kimberley: McGregor Museum.
- Morris, D. 2000. Assessment of impact of the proposed telecommunications project, Kimberley-De Aar network. Report prepared for Telkom.
- Morris, D. 2001. Archaeological resources in relation to the `western' option (vacant servitude) for the proposed Hydra-Gamma 765KV transmission line near De Aar and Victoria West, Northern Cape. A desktop study with preliminary limited field observations. Report prepared for Bohlweki Environmental. Kimberley: McGregor Museum.
- Morris, D. n.d. `Etchings' and `intaglios' in the Upper Karoo: Part 1: The engravings at Springbok Oog. Kimberley: McGregor Museum.
- Morris, D and Beaumont, P. 2004. Portable engravings at Springbok Oog and the archaeological context of rock art of the Upper Karoo, South Africa. In Dowson, T. A., & Lewis-Williams, J. D. (eds). Contested images: diversity in Southern African rock art research. Johannesburg: Witwatersrand University Press.

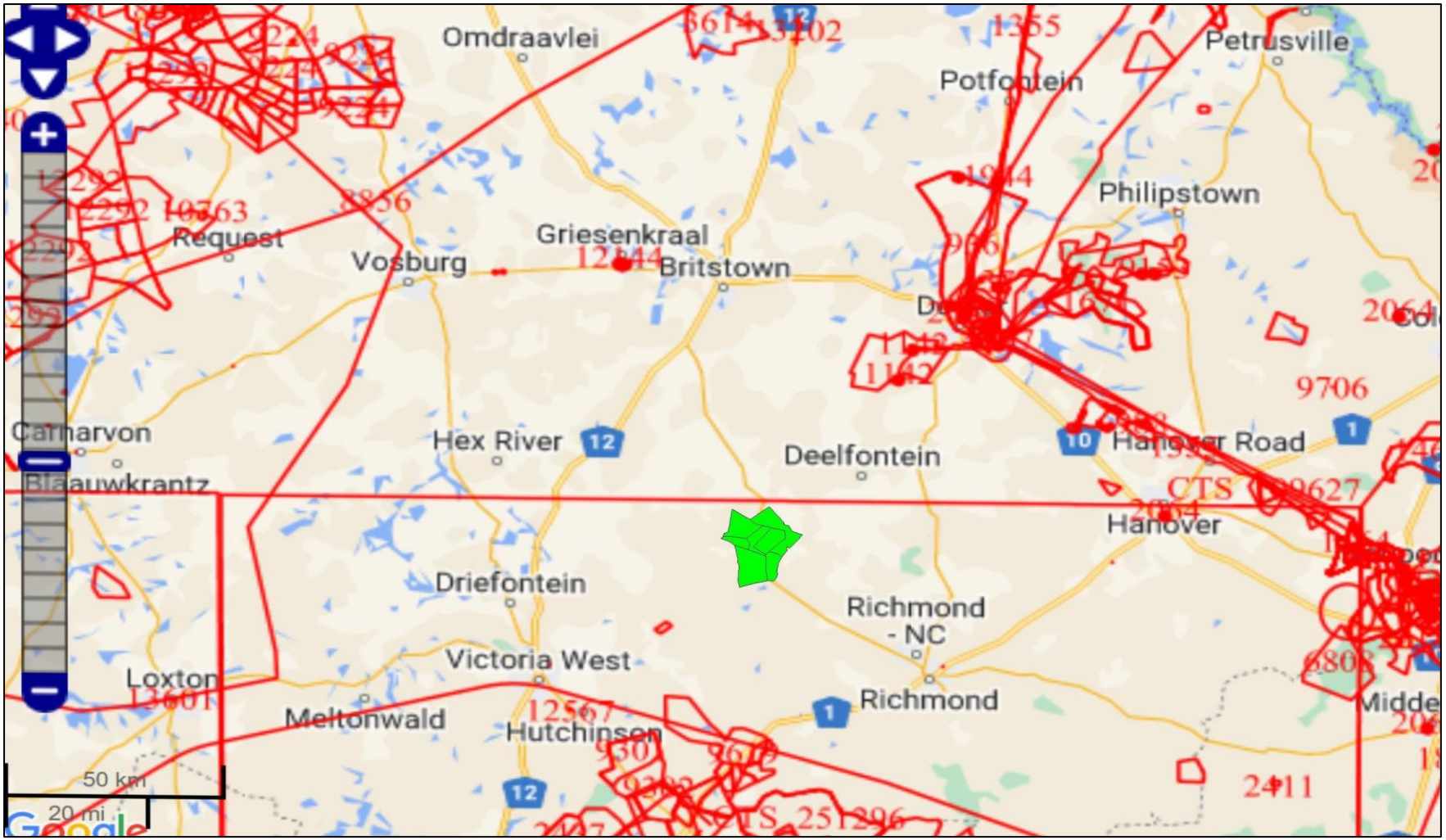

Figure 6-1: Regional map indicating coverage of the project area (green polygons) by commercially driven heritage assessments and research projects (red outlines) (https://sahris.sahra.org.za/map/reports).

6.1.2 Remote Sensing

Aerial photography is often employed to locate and study archaeological sites, particularly where larger scale area surveys are performed. The site assessment for the project relied heavily on this method to identify and demarcated potential sensitive zones. In addition, the process assisted the challenging foot and automotive site survey. Here, depressions, variation in vegetation, soil marks and landmarks were examined and specific attention was given to shadow sites (shadows of walls or earthworks which are visible early or late in the day), crop mark sites (crop mark sites are visible because disturbances beneath crops cause variations in their height, vigour and type) and soil marks (e.g. differently coloured or textured soil (soil marks) might indicate ploughed-out burial mounds). Attention was also given to moisture differences, as prolonged dampening of soil as a result of precipitation frequently occurs over walls or embankments. In addition, historical aerial photos obtained during the archival search were scrutinized and features that were regarded as important in terms of heritage value were identified and if they were located within the boundaries of the project area, they were physically visited in an effort to determine whether they still exist and in order to assess their current condition and significance. By superimposing high frequency aerial photographs with images generated with Google Earth as well as historical aerial imagery, potential sensitive areas were subsequently identified, geo-referenced and transferred to a handheld GPS device. These areas served as reference points from where further vehicular and pedestrian surveys were carried out. Similar to the aerial survey, the site assessment of the project areas relied heavily on archive and more recent map renderings of the landscape to assist the foot and automotive site survey where historical and current maps of the project area were examined. In addition, maps of geological features and land-use were studies in order to identify and demarcated landscape occurrences which could hold heritage sites, for example dolerite outcrops / Stone Age source material for lithic manufacture. By merging data obtained from the desktop study and the aerial survey, sites and areas of possible heritage potential were plotted on these maps of the larger area using GIS software. These maps were then superimposed on high-definition aerial representations in order to graphically demonstrate the geographical locations and distribution of potentially sensitive landscapes.

6.1.3 Site Surveys

Archaeological survey implies the systematic procedure of the identification of archaeological sites. An archaeological survey of the Soyuz 5 Wind Energy Facility Project area was conducted as part of a survey for the Soyuz 2, Soyuz 3, Soyuz 4, Soyuz 5 and Soyuz 6 Wind Energy Facility Projects. The site surveys were conducted by the heritage specialist and an assistant over an 8 day period in May 2022, a 7 day period in October 2022, a 3 day period in January 2023 and a 5 day period in February 2023. The process encompassed a field survey in accordance with standard archaeological practice by which heritage resources are observed and documented. Here, proposed turbine locations and access roads were surveyed on foot and in a vehicle with particular focus on GPS reference points identified during the aerial and mapping survey. Where possible, random spot checks were made and potentially sensitive heritage areas were investigated. Using a Garmin GPS, the survey was tracked and general surroundings were photographed with a Samsung Digital camera. Real time aerial orientation, by means of a mobile Google Earth application was also employed to investigate possible disturbed areas during the survey.

6.2 Assumptions and Limitations

The site survey for the Soyuz 5 Wind Energy Facility Project AIA proved to be constrained and the investigation primarily focused around development areas and areas tentatively identified as sensitive and of high heritage probability (i.e. those noted during the mapping and aerial survey) as well as areas of potential high human settlement catchment. In summary, the following constraints were encountered during the site survey:

- The surrounding vegetation in the project area mostly comprised out of low shrubs, occasional trees and mixed grasslands in places. Visibility proved to be a minor constraint in certain portions of the project area.

- The site survey in May 2022 was conducted during a wet spell and certain project areas could not be accessed and surveyed during this time.
- The Soyuz 5 WEF project area extends over vast surface areas and in some instances ground truthing of every infrastructure component was not possible. In addition, information on the layout of components such as the 132kV OHL line, laydown areas, construction camps and BESS areas were made available to specialists at an advanced stage of this assessment and these areas could not be included in the site surveys. Some turbine positions and access road alignments were changed during final stages of the project design in order to avoid sensitive environmental and heritage receptors and not all of these proposed development areas could be revisited. It is assumed that findings in this assessment provides an accurate representation of the heritage landscape and potential site sensitivities but final site walkovers in certain areas will be required prior to construction.
- Cognisant of the constraints noted above, it should be noted that the possibility exists that individual sites could be missed due to the high localised and sometimes subterranean nature of some archaeological sites, dense vegetation cover and access constraints. Therefore, maintaining due cognisance of the integrity and accuracy of the archaeological survey, it should be stated that the heritage resources identified during the study do not necessarily represent all the heritage resources present in the project area and any additional heritage resources located during consequent development phases must be reported to the Heritage Resources Authority or an archaeological specialist.

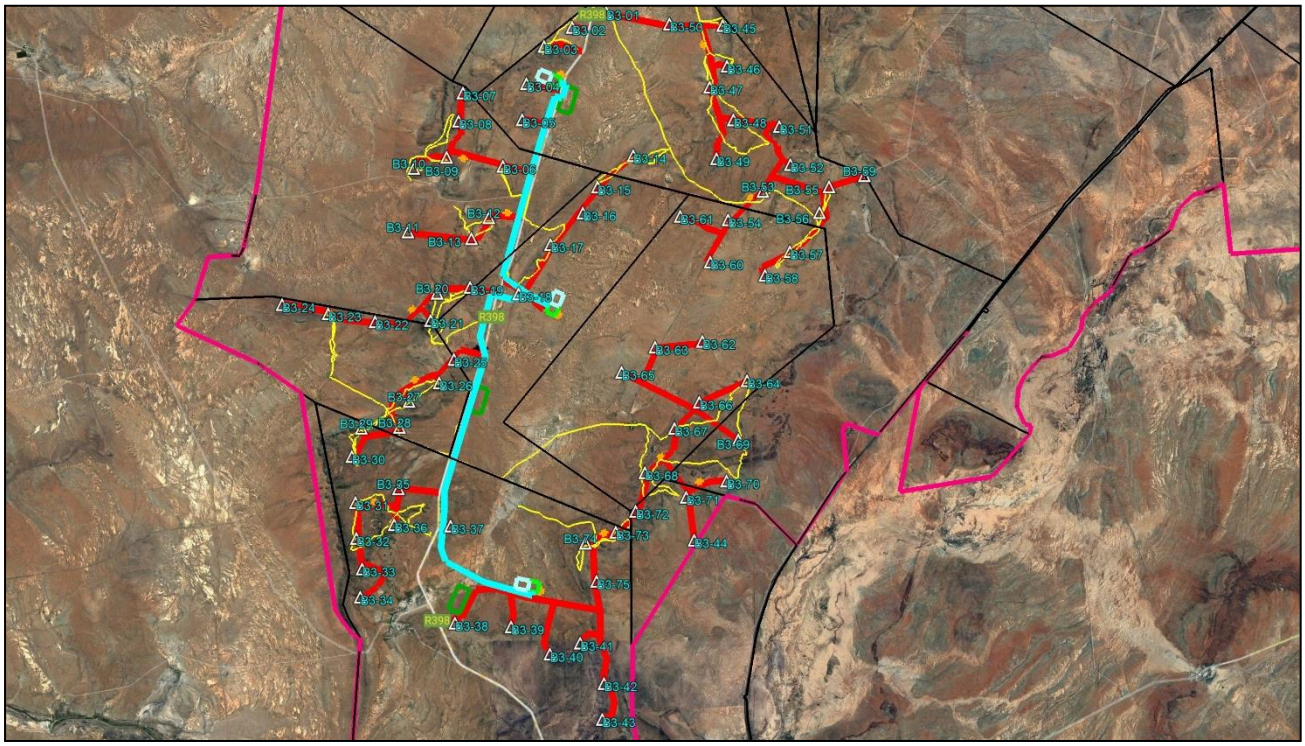

Figure 6-2: Track log (yellow lines) of the site survey. According to this final layout, the proposed turbine positions are indicated by red dots, the 132kV OHL line is indicated by the light blue line, laydown areas are indicated by white dots, construction camps are indicated by dark green polygons and BESS facilities are indicated by dark blue polygons. Road alignments are indicated in red.

7 THE HERITAGE BASELINE ENVIRONMENT

7.1 ARCHAEOLOGY AND THE CULTURAL LANDSCAPE

Archaeology in Southern and Central Africa is typically divided into two main fields of study, the **Stone Age** and the **Iron Age** or **Farmer Period**. The following table provides a concise outline of the chronological sequence of periods, events, cultural groups and material expressions in Southern African pre-history and history.

Period	Epoch	Associated cultural groups	Typical Material Expressions
Early Stone Age 2.5m – 250 000 YCE	Pleistocene	Early Hominins: *Australopithecines* *Homo habilis* *Homo erectus*	Typically large stone tools such as hand axes, choppers and cleavers.
Middle Stone Age 250 000 – 25 000 YCE	Pleistocene	First *Homo sapiens* species	Typically smaller stone tools such as scrapers, blades and points.
Late Stone Age 20 000 BC – present	Pleistocene / Holocene	*Homo sapiens sapiens* including San people	Typically small to minute stone tools such as arrow heads, points and bladelets.
Early Iron Age / Early Farmer Period 300 – 900 AD **(commonly restricted to the interior and north-east coastal areas of Central and Southern Africa)**	Holocene	First Bantu-speaking groups	Typically distinct ceramics, bead ware, iron objects, grinding stones.
Middle Iron Age (Mapungubwe / K2) / early Later Farmer Period 900 – 1350 AD **(commonly restricted to the interior and north-east coastal areas of Southern Africa)**	Holocene	Bantu-speaking groups, ancestors of present-day groups	Typically distinct ceramics, bead ware and iron / gold / copper objects, trade goods and grinding stones.
Late Iron Age / Later Farmer Period 1400 AD -1850 AD	Holocene	Various Bantu-speaking groups including Venda, Thonga, Sotho-Tswana and Zulu	Distinct ceramics, grinding stones, iron objects, trade objects, remains of iron smelting activities including iron smelting furnace, iron slag and residue as well as iron ore.
Historical / Colonial Period ±1850 AD – present	Holocene	Various Bantu-speaking groups as well as European farmers, traders, settlers and explorers	Remains of historical structures e.g. homesteads, missionary schools etc. as well as, glass, porcelain, metal and ceramics.

The history of the Northern Cape Province is reflected in a rich archaeological landscape, mostly dominated by Stone Age occurrences. Generally, numerous sites documenting Earlier, Middle and Later Stone Age habitation occur across the province, mostly in open air locales or in sediments alongside rivers or pans. In addition, a

wealth of Later Stone Age rock art sites, most of which are in the form of rock engravings are to be found in the larger landscape. These sites occur on hilltops, slopes, rock outcrops and occasionally in river beds. Sites dating to the Iron Age occur in the north eastern part of the Province and environmental factors delegated that the spread of Iron Age farming westwards from the 17th century was constrained mainly to these areas. However, evidence of an Iron Age presence as far as the Upington area in the eighteenth century occurs in this area. Moving into recent times, the archaeological record reflects the development of a rich colonial frontier, characterised by traces of the Anglo-Boer war, indigenous and colonial contact sites and more recent historic occupation and development of the region, which herald the modern era in South African history.

7.1.1 Early History and Archaeology

According to archaeological research, the earliest ancestors of modern humans emerged some two to three million years ago. The remains of Australopithecine and *Homo habilis* have been found in dolomite caves and underground dwellings at Sterkfontein and Swartkrans near Krugersdorp. *Homo habilis*, one of the Early Stone Age hominids, is associated with Oldowan artefacts, which include crude implements manufactured from large pebbles. The Acheulian industrial complex replaced the Oldowan industrial complex during the Early Stone Age. This phase of human existence was widely distributed across South Africa and is associated with *Homo erectus*, who manufactured hand axes and cleavers from as early as one and a half million years ago. Oldowan and Acheulian artefacts were also found four to five decades ago in some of the older gravels (ancient river beds and terraces) of the Vaal River and the Klip River in Vereeniging. The earliest ancestors of modern man may therefore have roamed the Vaal valley at the same time that their contemporaries occupied some of the dolomite caves near Krugersdorp. Middle Stone Age sites dating from as early as two hundred thousand years ago have been found all over South Africa. Middle Stone Age hunter-gatherer bands also lived and hunted in the Orange and Vaal River valleys. These people, who probably looked like modern humans, occupied campsites near water but also used caves as dwellings. They manufactured a wide range of stone tools, including blades and point s that may have had long wooden sticks as hafts and were used as spears. The Late Stone Age commenced twenty thousand years ago or somewhat earlier. The various types of Later Stone Age industries scattered across the country are associated with the historical San and Khoi-Khoi people. The San were renowned as formidable hunter-gatherers, while the Khoi-Khoi herded cattle and small stock during the last two thousand years. Late Stone Age people manufactured tools that were small but highly effective, such as arrow heads and knives.

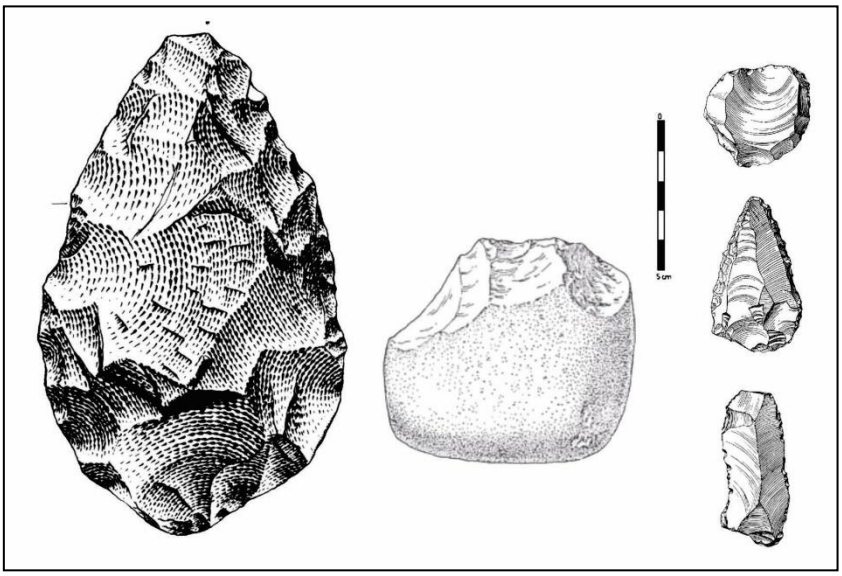

Figure 7-1: Typical ESA handaxe (left) and cleaver (center). To the right is a MSA scraper (right, top), point (right, middle) and blade (right, bottom).

The archaeology of the Northern Cape is rich and varied covering long spans of human history. Some areas are richer than others, and not all areas are equally significant. According to Humphreys (1987:117), `the amount of archaeological research that has been undertaken in the Karoo is in no way proportional to its importance in terms of area in South Africa'. While it is true to say that this part of the Karoo has probably been relatively marginal to human settlement for most of its history, it is in fact exceptionally rich in terms of Stone Age and rock art (Beaumont & Morris 1990; Morris and Beaumont 2004). Archaeologists from the McGregor Museum in Kimberley have focussed much of their attention on the Upper Karoo region and the northern periphery of the Karoo, where most of their academic research has been done. A few Archaeological Impact Assessments have been undertaken (as part of the EIA process) in Victoria West and De Aar (Morris 2000, 2004, 2006, 2007, 2010, 2012, 2019), where these have been required.

Figure 7-2: MSA tools from found by Kruger (2019) near Britstown.

Figure 7-3: MSA tools from found by Kruger (2019) near Britstown. Note secondary retouch and use ware marks on an end scraper (left), a [point (centre) and a scraper (right).

Contrary to its arid appearance, the Karoo had a relatively high carrying capacity and teamed with game long before European Colonization. Hunter gatherers (mainly San) successfully occupied the central interior of South Africa during the last 4500 years, subsisting on the large herds of grazing animals that occurred during that time (Sampson 1985; Sampson et al 1989). Late Stone Age archaeological sites dating to the late Holocene (within the last 4000 years) are surprisingly common. Although the Karoo is presently more suited to the keeping of small stock such as sheep and goats, research in the Eastern Karoo has revealed that, at about 1200 – 1400 AD, a climatic fluctuation (known as the Little Ice-Age) may well have caused an increased rainfall in the central Karoo resulting in the area being more suitable for grazing of cattle and occupation by Khoekhoen pastoralist groups. They left behind an archaeological legacy that consists of stone kraal complexes of which several hundred have been recorded in the Zeekoe Valley in the eastern Karoo and the Riet River area in the Northern Cape (Hart 1989). The indigenous people of Karoo waged a bitter war against colonial expansion as they gradually lost control of their traditional land. With the implementation of the commando system in the late 18th and early 19th centuries, the Karoo "Bushmen" were eventually destroyed or indentured into farm labour (Hart 1989).

Remnants of Stone Age archaeology in this landscape are mainly MSA and LSA tools. These tool scatters are often found spread very thinly and unevenly on the surface. MSA tools comprise mainly thick chunky flakes, chunks, flaked chunks, blade tools and a few retouched flakes mostly on weathered hornfels/lydianite. LSA lithics often comprise mostly unmodified, utilized and retouched flakes, chunks and cores on un-weathered hornfels. Formal tools such as scrapers, points and adzes are found in these contexts. In certain instances, the stone tools occur in association with organic remains or other cultural remains such as pottery or ostrich eggshell or even potable art. Rock art in the form of engravings on large boulders – often dolerite – as well as stone "gongs" are often found in these areas on rock outcrops and koppies. For example, Kaplan (2010) located several rock engravings on the Swartkoppies Mountains near Britstown northeast of the project areas where imagery of eland and ostriches were pecked on dolerite boulders. Some 2 000 years ago Khoekhoen pastoralists entered into the region and lived mainly in small settlements. They were the first food producers in South Africa and introduced domesticated animals (sheep, goat and cattle) and ceramic vessels to southern Africa. Often, these archaeological sites are found close to the banks of large streams and rivers. Large piles of freshwater mussel shell (called middens) usually mark these sites. Precolonial groups collected the freshwater mussel from the muddy banks of the rivers as a source of food. Mixed with the shell and other riverine and terrestrial food waste are also cultural materials. Human remains are often found buried in the middens (Deacon and Deacon 1999). Depending on the range, extent and integrity of site and artefact contexts, the significance of archaeological remains ranges from low to high on a regional level.

7.1.2 Rock Art

Rock art makes up a distinctly visible element of the Stone Age legacy of the region, and predominantly dates from the last 10 000 years. South Africa's heritage of Stone Age Art, among the richest in the world, is found in the form of engravings (petroglyphs) and paintings. Both forms are found in the Great Karoo. Engravings predominate, but finger paintings, often no more than ochre daubs, are often found in caves, shelters and overhangs. The nearest site in the Britstown area occurs on the farm Brakwater. Other sites are on the farms Keurfontein, Maritzdam and Omdraaivlei. The site at Maritzdam Holiday Farm is spread across about three hectares. Among the petroglyphs here are engravings of elephant, giraffe, reptiles, a variety of buck and a series of stick-like people.

Finger paintings occur in a small overhang west of the Keurfontein farm house. These are simple finger painted designs similar to those most commonly found in the Northern Cape. Most are plain rows of smears or dots, usually in red or orange ochre and sometimes in white or black. Mostly, this art form appears to date from the last 500 years. The imagery in the engravings at Keurfontein is based on animals. Mostly large mammals, such as eland, other antelope, rhino and elephant are depicted. But there are also engravings of people, objects and geometric figures. Different techniques were used. The oldest engravings in this area, hairline or fineline with

incised outline and detail, date back 2 000 to 8 000 years. Then there are the pecked engravings. In these the rock crust has been chipped away to create the image and are generally considered younger than the "finelines". Then there are the scraped engravings. In most of these the rock surface has been scraped away to create the image, which sometimes appears polished. Among these drawings are some scraped, speck-like images thought to have been created by Xhosas who moved to the Karoo in the late 1700s. Rock gongs, like those on Keurfontein, are normally flattish dolerite rocks that are balanced naturally on three or more points. Usually found at the tops of koppies, they emit a ringing sound when struck. Most have ancient strike marks on them, but many have been discovered without marks. These gongs are almost always associated with rock engraving sites in the Karoo, but no ethnographic explanations exist for their use. It has been suggested that "Bushman pianos" were used in rituals. Multiple strike marks on some gongs suggest that several people used them simultaneously.

Figure 7-4: Rock engravings located on the Swartkoppies Mountains east of the project area, by Kaplan (2010).

7.1.3 The Cultural Landscape

The first "Trekboers" moved through the landscape during the early 19th century. The small haven of Britstown along the diamond route across the plains was named after a man who loved the Karoo, Hans Brits. He once accompanied Dr David Livingstone, famous son-in-law of the great missionary Robert Moffat, on a journey to the north. Livingstone originally came to South Africa to help the Moffats at their mission in Kuruman, and it was on a journey to the north that he met Brits. They took a liking to each other, and Brits decided to travel with him. But, Livingstone did not get on with the Moffats, so he soon announced his intentions of travelling deeper into Africa, a decision that led to him becoming probably the continent's most famous explorer. Brits decided against a life of exploration, and returned to the Karoo. Hans Brits then settled on a farm he named Gemsbokfontein, which is where Britstown now stands. Soon after the discovery of diamonds at Hopetown and Kimberley, Brits realised that he and his neighbours could earn good money serving the growing traffic along the Diamond Way. So Brits arranged for a town to be laid out on a portion of his farm. As a tribute to him it was named Britstown. The thinking was to establish a point between Victoria West and Kimberley that could provide travellers on the Diamond Way with accommodation and refreshment as well as fresh horses and fodder.

In 1877, a group of men headed by T P Theron, purchased a section of Hans Brits's farm to establish a community centre with a church. This accomplished, they handed over the management of the fledgling settlement to church wardens. Traffic through the town increased when gold was discovered in "The Ridge of White Waters" in the old Transvaal Republic. Many of the fabled mining magnates, such as Cecil John Rhodes, passed through Britstown. In time, the town became a major junction on the route to the then South West Africa (Namibia). The last of the gentlemen's wars, the Anglo-Boer War, did not leave Britstown untouched. Shortly before the Battle of Paardeberg, Lord Roberts ordered General Settle, commander of the Orange River Station, to form three small columns and to check the course of the Rebellion. A three-pronged advance was planned. The 450-strong Western Column, under Colonel Charles Parsons, was to march on Carnarvon and Kenhardt from Victoria West. Colonel Adye was to concentrate the centre column, about 550 men, at Britstown, while General Settle, with

600 men, was to take the right flank and move due west from the Orange River Station. His objective was to clear the river, hold the drifts and cut off the advance of a Boer commando led by Commandant Liebenberg. But the action did not proceed as planned. On March 6, 1900, Colonel Adye and his men moved out of Britstown. About 20 miles from the village, as they neared a semi-circle of hills on the farm Houtwater, they were engaged by Commandant Liebenberg and his rebels. Despite his weaker force, Adye attacked, but without securing his flanks. Liebenberg was thus able to surround the British and force them into a hasty retreat. They were driven right back to Britstown with a loss of 21 men. Dr A E Ramsbottom and an ambulance were captured in the engagement. Once Roberts heard that Adye had been repulsed, he took vigorous measures to suppress a rebellion. He immediately sent Kitchener to take command and sent reinforcements of about 3 000 men from Cape Town. Kitchener's plan was similar to Settle's. He aimed to prevent Boer forces under commandants Liebenberg and Steenkamp from crossing the river, so he moved a column from Britstown to Omdraaivlei. But the Boer leaders moved quickly and evaded capture by charging for Prieska and crossing the Orange River there. Towards the end of December, 1900, Britstown was one of 14 districts in the Cape Colony to be placed under martial law.

A Boer force under Hertzog, who had occupied Philipstown, tried to march on Britstown on December 16, 1900, but was forced to abandon the plan as Settle's columns were stationed nearby. Troops again arrived in Britstown in February, 1901. On the 16th, Kitchener ordered Major-General Bruce Hamilton, from De Aar, and Bethune, from Richmond Road, to converge on Britstown. Henniker and Knox were also in the area pursuing forces led by commandants Kritzinger and Herzog. Commandant Brand and his men were also in Britstown. They had been sent there by Hertzog to collect provisions while he himself rode north to meet De Wet. Hamilton's forces arrived a few hours after Brand had left. He pursued the Boers to Houtwater, but lost contact with and Brand gained a clear lead. The Smartt Syndicate suffered heavy losses during the Boer war, mainly due to stock losses caused by the Boers cutting the fences and making off with large numbers of stock. From the war records mentioned in the previous paragraphs, Houwater was a much-prized temporary headquarters for the Boer Commandos to feed and water their own horses as it had by now lucerne, oats and wheat growing under irrigation so grazing was plentiful.

In addition, the region became well known for sheep farming and the landscape was divided into farms towards the end of the 1800's. As a result, important historical remnant in this area are farmsteads and associated features. Farmsteads are complex features in the landscape made up of different yet interconnected elements. Typically, these farmsteads consist of a main house, gardens, outbuildings, sheds and barns, with some distance from that labourer housing and family cemeteries. Farm buildings are generally single storied but town houses often reached two floors. Walls are thick and built with stone and the ridged roof, thatched or tiled, are terminated at either end by simple linear parapet gables. In some instances, outbuildings would be in the same style as the main house, if they date to the same period. Roads and tracks, stock pens and wind mills occur on farms across the project landscape. Material culture such as glass, metal fragments and fragments of ceramics and earthenware are often found at these sites. Infrastructure and industrial heritage such as roads, bridges, railway lines, electricity lines and telephone lines are also feature in this landscape.

Farms also hold the remains of "veewagtershuise" or shepherd's huts, typically single roomed buildings constructed out of undressed sandstone blocks. The huts occur in the veld where they served as temporary shelter for livestock sheperds. Material culture such as glass, metal fragments and fragments of ceramics and earthenware are often found at these sites. Infrastructure and industrial heritage such as roads, bridges, railway lines, electricity lines and telephone lines are also feature in this landscape. In addition, infrastructure associated with the Anglo Boer War (fortifications, block houses – e.g. at Merriman, the remains of field hospitals, burial sites) occur around De Aar and Britstown. A good example is the remains of the Imperial Yeomanry Hospital, the Yeomanry Hotel and war burial ground at Deelfontein along the southern periphery of the project area. Currently the landscape is still occupied by local farmers, however, the area has changed hands from the original settlers taking away the generational heritage of the "family farm", however, creating a new culture of farmers continuing the historical use of landscape. The landscape is currently being used for agricultural and domestic

grazing purposes accentuated by the easy access to water and irrigation. The railway adds to the use of landscape, historically, as the mainline between Cradock and De Aar.

Figure 7-5: Historical Period farmstead buildings in the project landscape.

Figure 7-6: The old Yeomanry Hotel near the site of the Anglo Boer War Imperial Yeomanry Hospital and an Anglo-Boer War blockhouse at Merriman in the project landscape.

Figure 7-7: Historical Period graves near the old Imperial Yeomanry Hospital at Deelfonetein in the project landscape.

Figure 7-8: Examples of two informal burial sites located in the larger project landscape by Kaplan (2010).

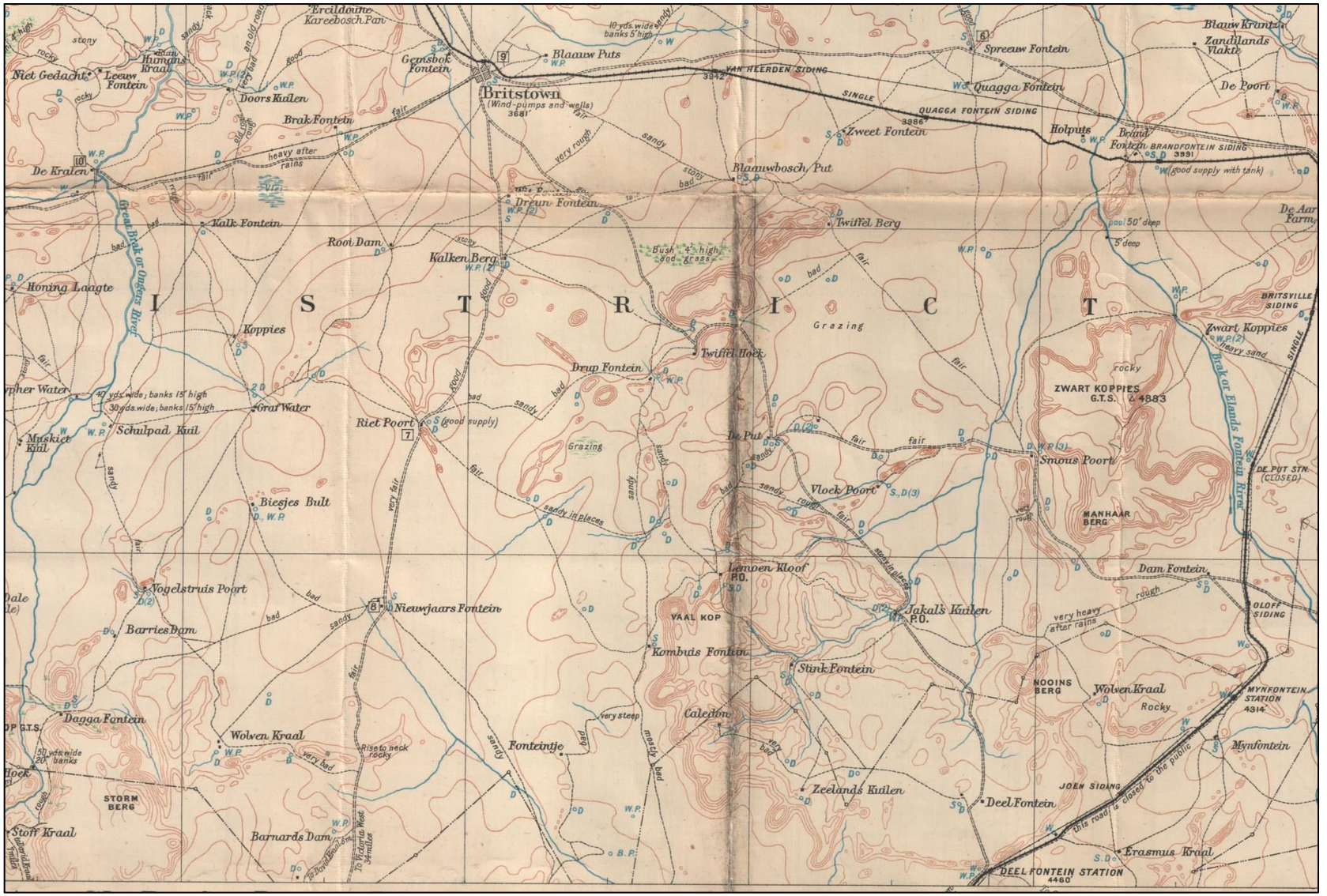

Figure 7-9: The Britstown region indicated on "The Great Britain War Office Map of the Cape Colony: Britstown 1907".

Figure 7-10: The Britstown region indicated on "The Imperial Map of South Africa. South African War, 1899-1902 - Britstown Region".

7.2 THE VISUAL LANDSCAPE[1]

7.2.1 Visual Distance and Observer Proximity

Nuleaf Planning and Environmental determined proximity offsets based on the anticipated visual experience of the observer over varying distances. In general, the severity of the visual impact on visual receptors decreases with increased distance from the proposed infrastructure. Therefore, in order to refine the visual exposure of the facility on surrounding areas/receptors, the principle of reduced impact over distance is applied in order to determine the core area of visual influence for the WEF. Proximity offsets for the proposed development footprint are thus established in order to indicate the scale and viewing distance of the facility and to determine the prominence of the structures in relation to their environment. These proximity offsets are based on the anticipated visual experience of the observer over varying distances. The distances are adjusted upwards for larger facilities and downwards for smaller facilities (i.e., depending on the size and nature of the proposed infrastructure). This rationale was developed in the absence of any known and/or acceptable standards for South African WEFs. Therefore, for the purpose of this study, proximity offsets have been calculated from the expected boundary of the site.

- 0 – 5km. Short distance view where the facility would dominate the frame of vision and constitute a very high visual prominence.
- 5 - 10km. Short to medium distance view where the structures would be easily and comfortably visible and constitute a high to moderate visual prominence.
- 10 - 20km. Medium to long distance view where the facility would become part of the visual environment, but would still be visible and recognisable. This zone constitutes a moderate visual prominence.
- > 20km. Long distance view of the facility where the structures are not expected to be immediately visible and not easily recognisable. This zone constitutes a lower visual prominence for the facility

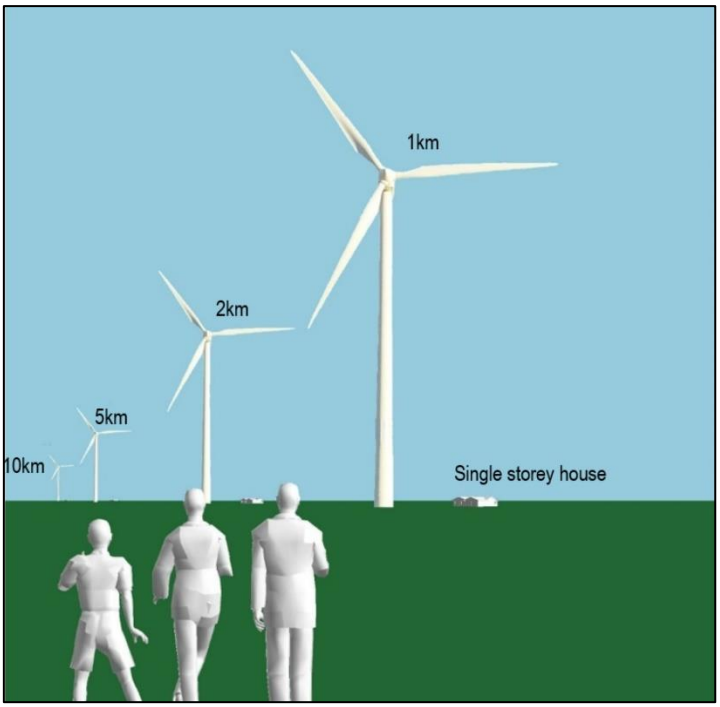

Figure 7-11: Visual experience of a 100m high wind turbine structure at a distance of 1km, 2km, 5km and 10km (represented from right to left

[1] Refer to: Nuleaf Planning and Environmental. 2023. Visual Impact Assessment for the Soyuz 5 Wind Energy Facility in the Northern Cape, South Africa

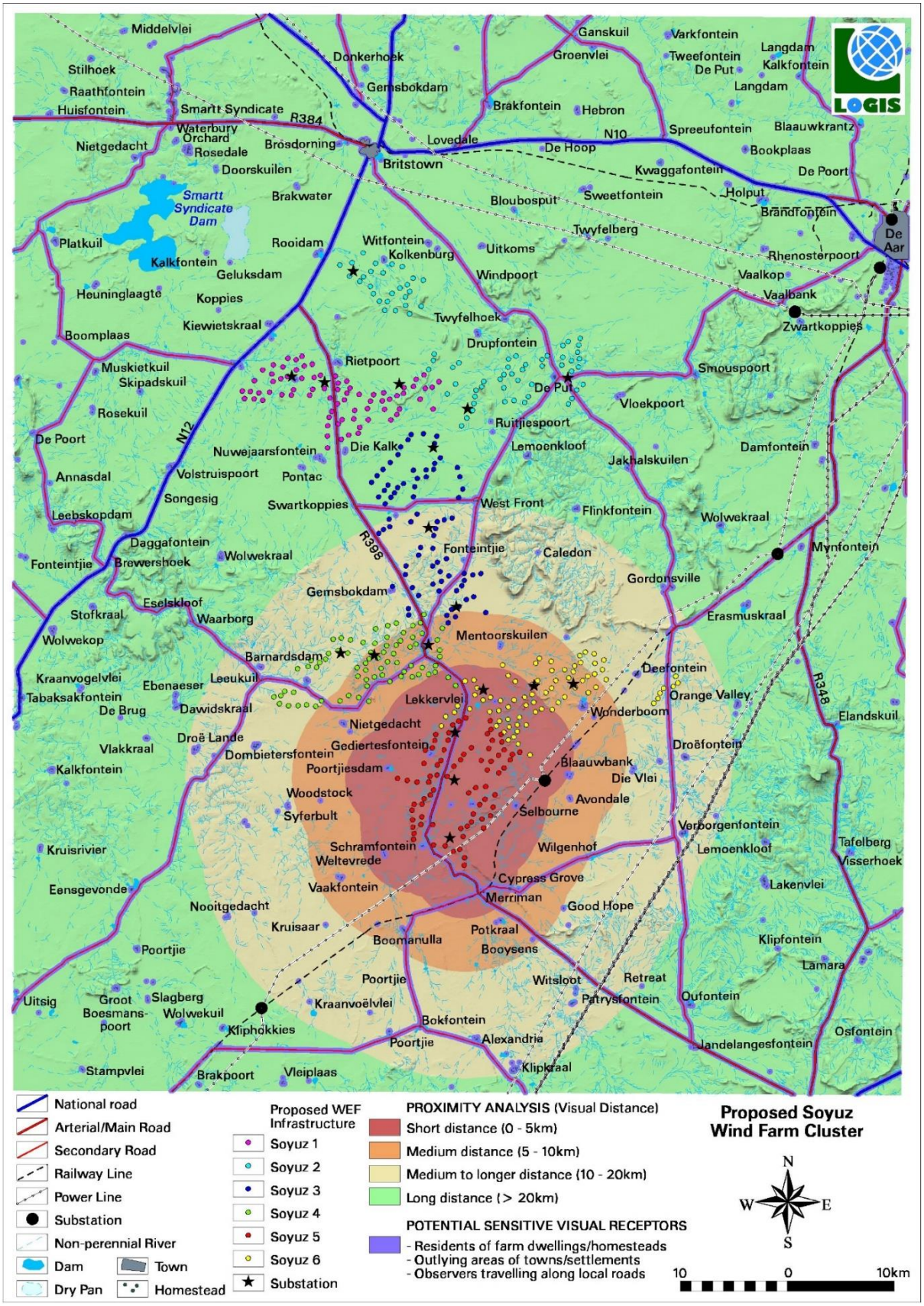

Figure 7-12: Visual proximity analysis, observer sensitivity and proximity of the proposed Soyuz 5 WEF.

7.2.2 Viewer incidence, Perception and Sensitivity

Since the number of potential sensitive receptors and their perception of the development in question ultimately determines the concept of a visual impact (i.e. without receptors there would be no impact), the visual distance theory and the receptors' proximity to the development works hand in hand, and is especially relevant, when considered from areas with a high viewer incidence and a potentially negative visual perception of the proposed facility. It is, therefore, necessary to identify areas of high viewer incidence and to classify certain areas according to the observer's visual sensitivity towards the proposed Soyuz 5 WEF. Homesteads, by virtue of their visually exposed nature, are considered to be sensitive visual receptors. Viewer incidence is calculated to be the highest for homesteads within the areas closest to the facility. Second to these are the users along the provincial and secondary roads within the study area. Commuters and possible tourists using these roads may be negatively impacted upon by visual exposure to the proposed infrastructure should they find themselves in the region. Residential receptors in natural contexts are more sensitive than those in more built-up contexts, due to the absence of visual clutter in these undeveloped and undisturbed areas. Receptors within built up areas are less sensitive to potential visual impact due to the presence of structures, infrastructure and general visual clutter. Those dwelling on the periphery may be more aware of visual intrusion and may thus be considered somewhat more sensitive. No specific report can be made on viewer perception regarding the proposed Soyuz 5 WEF, as no stakeholder feedback regarding visual concerns has been received by the EAP during the scoping phase public participation. However, considering the proximity of the proposed facilities to various homesteads and the rural nature of the surrounding area, it is expected that any potential visual impact could be viewed in a negative light. Therefore, overall viewer perception of receptors within the study area will be assumed to be mostly negative. It must be noted that while some sensitive receptors are identified based on homestead locations it is understood that the residents of these homesteads are not necessarily stationary at these identified points and that often these homesteads are associated with much larger properties or farms. Therefore, where these properties fall within the potential visual exposure it is assumed that the residents of these homesteads and any associated visitors to these homesteads will likely experience a visual impact as a result of the proposed development beyond the bounds of their homesteads.

7.2.3 Visual Absorption Capacity

Visual Absorption Capacity (VAC) is the capacity of the receiving environment to absorb the potential visual impact of the proposed development. VAC is primarily a function of the vegetation and will be high if the vegetation is tall, dense and continuous. Conversely, low growing sparse and patchy vegetation will have a low VAC. Since the land cover within the study area consists primarily of low shrubland, interspersed with naturally occurring bare rock and grassland, overall, the VAC of the receiving environment of the Soyuz 5 WEF is deemed to be low by virtue of the low growing nature of the vegetation, as well as the generally rural nature of the study area. The VAC would also be high where the environment can readily absorb the development in terms of texture, colour, form and light / shade characteristics. On the other hand, the VAC for a development contrasting markedly with one or more of the characteristics of the environment would be low. Since the significant height of turbines adds to the potential visual intrusion of the WEF in the landscape and against the background of the horizon, the scale and form of the structures mean that it is unlikely that the environment will visually absorb them in terms of texture, colour, form and light/shade characteristics, therefore VAC in this case would be considered low. The VAC also generally increases with distance, where discernible detail in visual characteristics of both environment and development decreases.

As a result of the low growing nature of the vegetation and the high contrast of the turbines with the surrounding receiving environment, VAC will not be taken into account for the visual impact assessment of the Soyuz 5 WEF thereby representing the worst-case scenario.

8 FINDINGS AND RESULTS

8.1 ARCHAEOLOGY AND THE CULTURAL LANDSCAPE

8.1.1 Desktop Appraisal: General Heritage Sensitivities

Data on the history and archaeology of the surroundings are primarily captured in heritage and archaeological studies associated with environmental impact assessments, the bulk of which are associated renewable energy facilities and particularly solar energy facilities and associated infrastructure. An appraisal of previous AIA's and HIAs, published literature coupled with a detailed analysis of historical aerial imagery, archive maps and topographical maps of the project area was conducted in order to inform on the final layout for the Soyuz 5 Wind Energy Facility project during the Scoping Phase. As such, the following observations on the heritage potential of the project area were made on Scoping Level based on desktop observations (refer to Figure 8-2) :

Archaeology:

- In the project area, shallow soils cover a combination of calcrete, shale and dolerite substrates, and large sections in the landscape are exposed to sheet erosion, specifically along low lying areas and drainage lines. Dolerite and sandstone are present, while exotic rocks occur in the gravel of the Orange River bed and terraces. These provide suitable material for stone tool production during the Earlier, Middle and Later Stone Ages. MSA and LSA tool scatters are known to occur along water courses, pans and dry river beds and such material have been found in the project area. These tools might include formal tools such as blades, scrapers, adzes and points and microliths as well as debitage.
- Mountain crests, small hills and foothills and rock outcrops occur in the project area for example Spioenkop, Kamrant, Tafelkop, Granaatkop, Uilskop, Wolwekop, Skerprant and Rooikop. Occupation sites dating to the Later Stone Age (LSA) associated with Hunter Gatherers and Herders are known to occur in such locales. Here, scatters of stone artefacts such as stone tools, ostrich eggshell, fragments of pottery and beads are common. Crudely built Herder stone wall enclosures might remain in these areas. In addition, Historical Period fortifications in the form of temporary stone barricades and defences are known to occur on low rises around Britstown and De Aar.
- MSA and LSA tool scatters are also known to be found near outcrops and geomorphological exposures where source rock was exploited for the manufacturing of stone tools. Large boulders, frequently dolerite occurring throughout the project area, are commonly associated with Hunter Gatherer and Herder rock art in the form of engravings. In addition, stone "gongs" are often found in these areas on koppies and rocky outcrops.
- All archaeological sites and artefacts are protected under the National Heritage Resource Act (NHRA 1999) and, depending on the range, extent and integrity of site and artefact contexts, the significance of archaeological remains in the project areas might range from low to high.

Colonial / Historical Period and Built Environment:

- In this landscape, farmsteads and werfs dating to the last centuries often hold historically significant buildings and features such as farm houses, corbelled huts, sheds, stone kraals, and "dorsvloers" (threshing floors). The old Poortjiesdam, Gediertesfontein, Beskuitkuil and Schramfontein farmsteads occur in the project area. An analysis of historical topographical maps and aerial photographs indicate the presence of the werfs from at least 1950 and the compounds are older than 60 years and generally protected under the National Heritage Resource Act (NHRA 1999). The sites might afford a better understanding of architectural, settlement and social developments in the Brittan landscape. Highly sensitive burial sites are also known to occur around farmstead complexes. Small-scale farming and

agriculture are prevalent around farmsteads in the project areas. Here, potential historical farmscapes might be encountered.

- Occasional remains of “veewagterhuise” or shepherds’ huts dating to the Colonial Period are scattered across farms in this landscape. These buildings are usually constructed out of undressed sandstone blocks and glass, rusted metal fragments, fragments of ceramics, earthenware and bone are often found in middens associated with these huts. Even though these occurrences are often poorly preserved, they might be protected under the National Heritage Resource Act (NHRA 1999) if older than 60 years.
- The remains and remnants of Anglo-Boer War battlegrounds, field hospitals, concentration camps and cemeteries are found in this landscape and such sites are protected under the National Heritage Resource Act (NHRA 1999) where they are of Provincial heritage significance. Anglo-Boer War remnants might be present in the project area.
- Digging and / or quarrying seem to have occurred at single localities in the project area. Here, one might encounter remnants of historical mining and quarrying but the significance of such sites is not always apparent.

Cultural Landscape

- Generally, the proposed project area and its surrounds are characterized by rural Karoo farmlands, flatter grass plains and low mountain vegetation. Mountains and hills on the target properties for the project are indicated on topographic maps with unique names such as "Spioenkop", "Kamrant", "Tafelkop", "Granaatkop", "Uilskop", "Wolwekop", "Skerprant" and "Rooikop" and other landscape features indicated include "Wonderdraai", "Visierkerf", "Rooidam" and "Wapoortjie". Cognisance should be taken of the fact that these features might hold certain intangible heritage value or they might be regarded as sites of “Living Heritage” in the cultural landscape.

Cemeteries / Burial Sites

- Burial sites frequently occur around farmstead complexes within family cemeteries, for example possibly at the Poortjiesdam, Gediertesfontein, Beskuitkuil and Schramfontein farmsteads but in some instances packed stones or rocks indicate the presence of informal pre-colonial burials in this landscape. In addition, human remains and burials are often found close to archaeological sites; they may be found in "lost" graveyards, or occur sporadically anywhere as a result of prehistoric activity, victims of conflict or crime. It therefore important to remember that it is often difficult to detect the presence of archaeological human remains on the landscape as these burials, in most cases, are not marked at the surface.
- Cemeteries, burial places and graves are viewed to have a high significance and they are protected under the National Heritage Resource Act (NHRA 1999).

8.1.2 Off-site Survey Findings

Although this area has been occupied by hominins and humans for at least 1.5 million years, the nomadic hunter-gatherer and, to a lesser extent, early pastoralist lifestyles of prehistoric inhabitants leave little to no physical evidence of their presence in the landscape and has an almost negligible modifying effect on it. This is in contrast to the significant alteration to the environment made over the past few hundred years by colonial agricultural and urban settlements of the area. Cultural landscapes are defined and informed by several elements including, but not limited to; natural landscape features, palaeontology, archaeology / anthropology, oral histories, public memory, the built environment and social and written histories. The value of cultural landscapes is determined through professional interpretation and opinion, community and public values as well as environmental and heritage legislation. The cultural landscape of the Soyuz 5 Wind Energy Facility project includes two broad layers, with the most recent, Colonial Period and more recent settlement and development over the past few hundred years having the most visually evident modifying effect on the landscape. Impacts related to this cultural layer

include roads and associated bridges, single vehicle tracks, railway lines and associated bridges and structures, agricultural clearings for grazing and cultivation, variety of farming activities, variety of farmsteads, structures and infrastructure, quarries, dams, fencing, overhead power lines, transmission/receiver masts and wind turbines. This layer also includes remnants of the Anglo Boer war.

The second layer underlying the historic period is comprised of the three Stone Age periods spanning the period from a few hundred years ago to the early periods of stone tool making archaic humans at least 1.5 million years ago. Although the prehistoric cultural landscape is the least evident and often invisible, temporally, it makes up for the overwhelming bulk of human occupation of the region. Given that most of the archaic human (ESA) and human (MSA to recent) occupation of this area involves the Stone Age era, it can be argued that a significant cultural layer in this area involves the pre-colonial cultural landscape and its sense of place.

An analysis of historical aerial imagery and archive maps of the Soyuz 5 Wind Energy Facility project area reveals the following (see Figure 5-1 to Figure 5-3):

- Britstown and surrounding farms and roads are indicated on early maps of the region dating to 1899 and 1908.
- Structures or buildings, farmsteads, dams and embankments are indicated on topographical maps of the project target farms dating to 1966 -1970.
- Single agricultural fields occur on these farms – mainly around farmsteads. No graves or cemeteries are indicated on these topographical maps in the project area.
- Early aerial imagery of the project area are unfortunately of limited use due to the low resolution of images and uniformity of the landscape (particularly because the images were captured in monochrome). Still, imagery dating to 1950 indicate that that project area seems to have remained pristine over the past decades with minor signs of historical activity.
- Human activity in the form of farms, homesteads and man-made structures and features seem to be visible on aerial imagery of the project landscape.

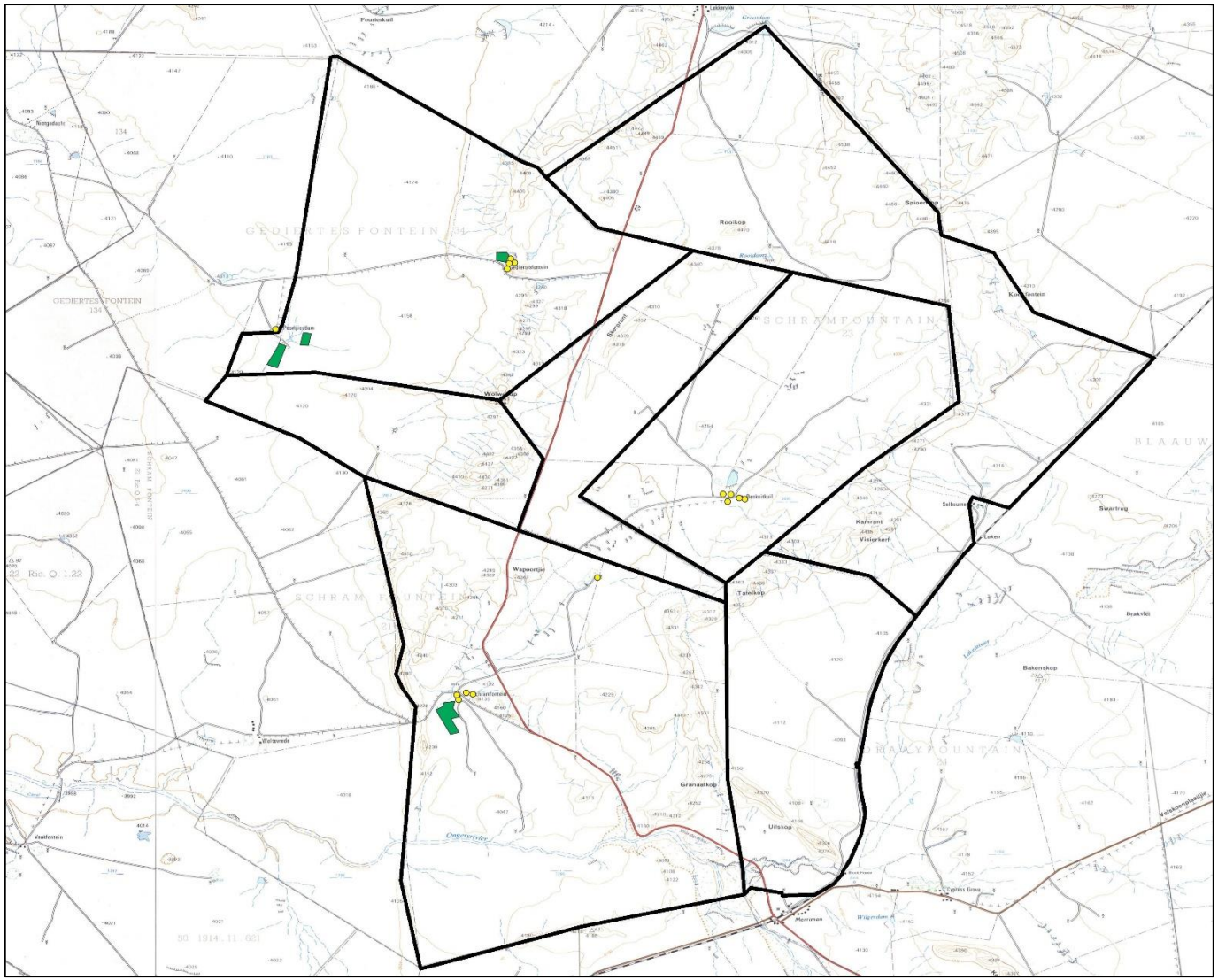

Figure 8-1: Remote sensing of potential heritage sites on a composite historical topographic map (1950 – 1970) of the project area (black outline). Yellow dots indicate farmsteads and man-made structures, green circles quarries / diggings and green polygons indicate cultivated fields.

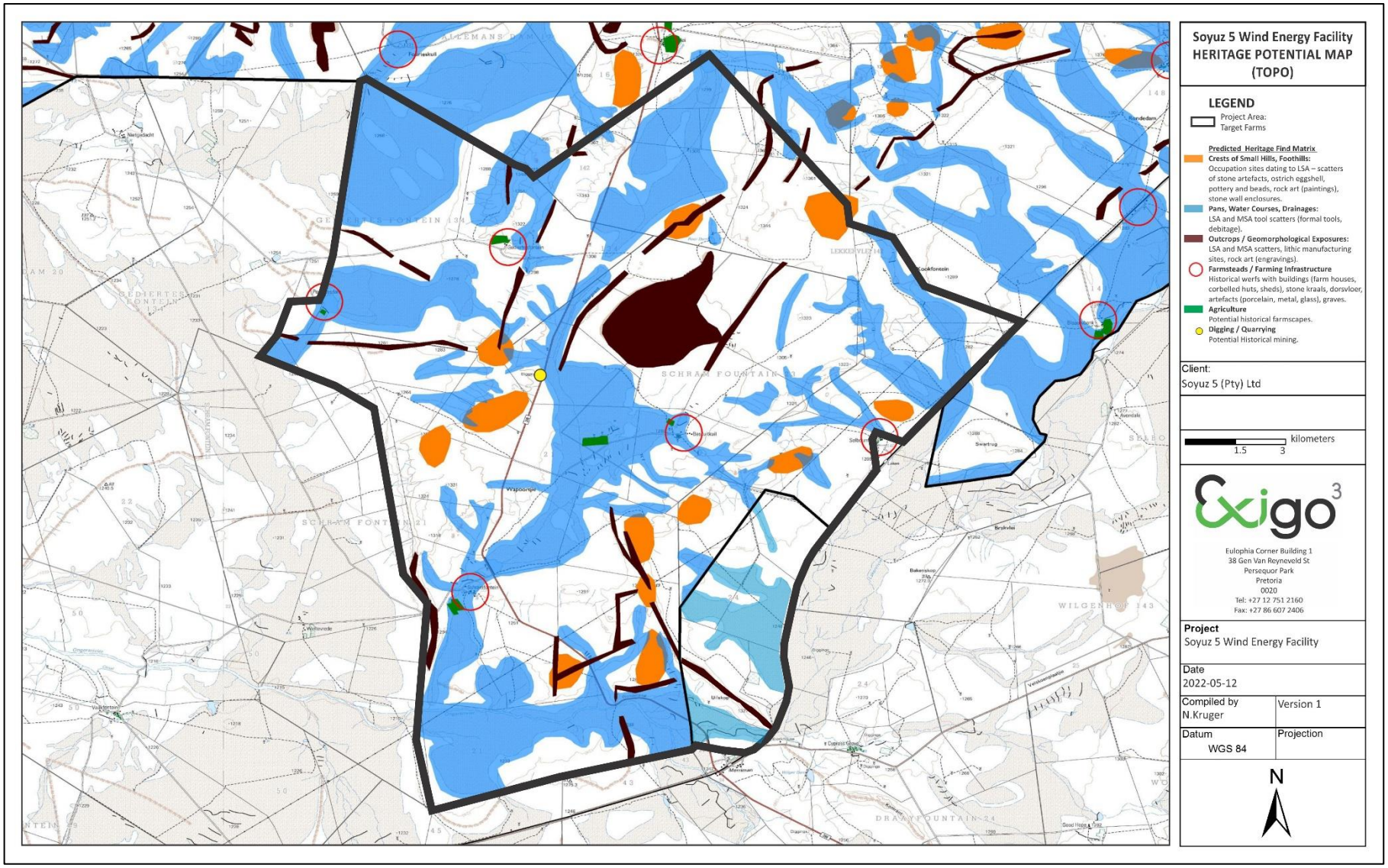

Figure 8-2: Map of the implied heritage potential of the Soyuz 5 Wind Energy Facility Project properties based on desktop appraisals (map courtesy of Exigo).

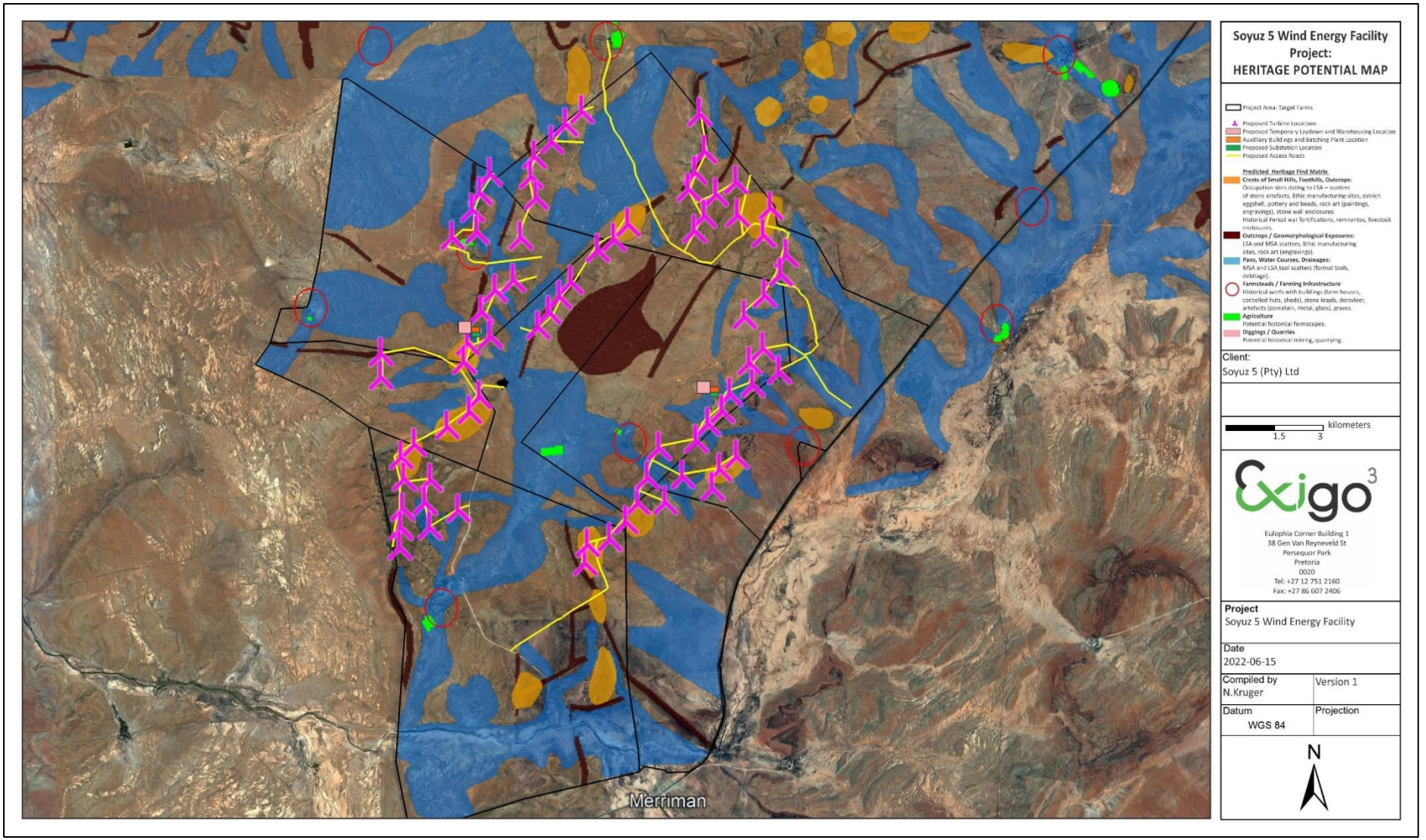

Figure 8-3: Map of the implied heritage potential of the Soyuz 5 Wind Energy Facility Project properties based on desktop appraisals (map courtesy of Exigo). The map indicates a conceptual layout of the WEF for the purpose of Scoping Assessment.

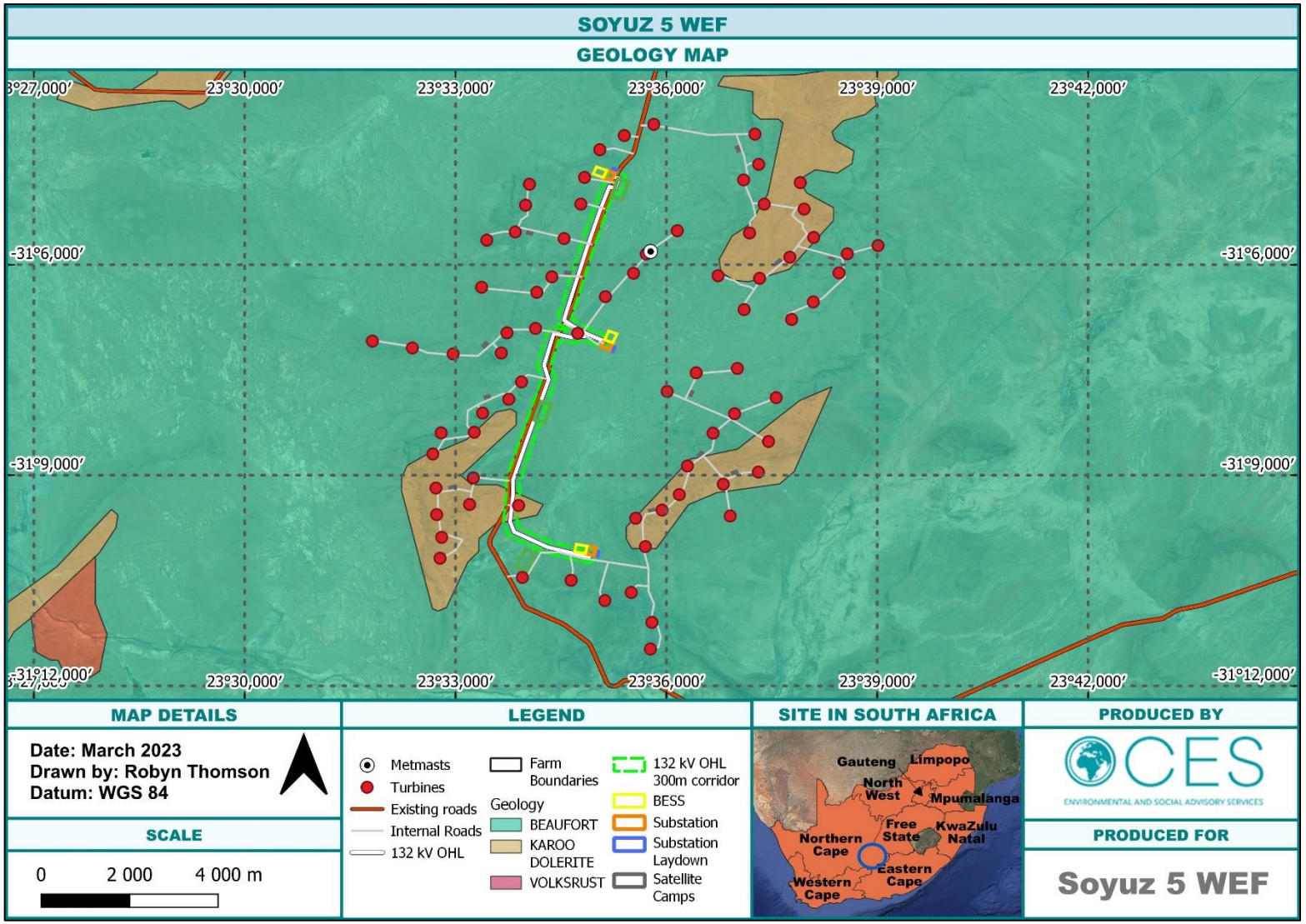

Figure 8-4: Geology map of the Soyuz 5 Wind Energy Facility Project area. Note the presence of dolerite, often used by Hunter Gatherers and Herders as rock art medium in the form of engravings. In addition, stone "gongs" are often found in these areas on koppies and rocky outcrops.

8.1.3 Site Survey Findings

As noted in the Desktop Survey, the cultural landscape of the Soyuz 5 Wind Energy Facility project includes two broad layers; the first are three Stone Age periods spanning the period from a few hundred years ago to the early periods of stone tool making archaic humans at least 1.5 million years ago and the second is the Colonial Period, the Anglo Boer war and more recent settlement over the past few hundred years - the latter having the most visually evident modifying effect on the landscape.

Stone Age remains occur abundantly in the project landscape where locally available raw material for the manufacture of stone tools is available in the geological setting. For this assessment, the density of the material scatters was arbitrarily estimated by placing a one-meter drawing frame, sub-divided into quadrants, on a randomly-selected area displaying higher amounts of surface lithics. By plotting the counts of all lithic elements present in the 1x1 metre square relative density per m^2 was established and rated on a scale of low (<10), medium (10-20) and high (>20). This method has been adapted as expedient and non-invasive sampling technique that is particularly useful in value assessment of lithic occurrences during Phase 1 AIA's (see Van Der Ryst 2012).

Stone artefact scatters are usually located in areas with fluvial gravels along drainage lines, pans and within decomposing calcretes, rocky outcrops or ridges. Within the project development areas wide-spread MSA tools were encountered (**S5WEF01 - S5WEF34**). Higher densities of artefacts were noted along large drainage lines within surface gravels and in other areas. Most of the artefacts are probably Middle Stone Age (MSA) lithics such as blades, scrapers, chunks and cores produced on locally sourced hornfels, dolerite and siltstones. Some of the stone artefacts contained cortex and others showed evidence of secondary retouch and edge-damage, although some of the edge-damage is recent and may have been caused by external environmental factors. The widespread ephemeral and higher density scatters are often of low heritage value due to temporally mixed contexts and the frequent absence of faunal, organic and other cultural remains which is scattered over thousands of square kilometres of the Karoo. Some of these scatters occur within infrastructure areas proposed for the Soyuz 5 WEF but the impact is considered to be inconsequential.

Khoekhoen pastoralist rock art is known to occur along dolerite hills and outcrops in the larger landscape around Britstown. Many of the dolerite hills and outcrops occurring in the project area have been removed from developable areas and layouts and no rock art was noted within the context of dolerite hills in the project areas.

Figure 8-5: View of sandy and gravel surfaces with flakes and debris inclusions encountered in a portion of the project area.

Figure 8-6: View of MSA tools on dolerite documented in the project area.

Figure 8-7: View of weathered MSA tools documented in the project area.

Figure 8-8: View of weathered MSA tools documented in the project area.

Figure 8-9: View of MSA tools documented in the project area.

The following table (Table 1) provides an inventory of heritage occurrences in the project area:

Table 1

Code	Coordinate S	Coordinate E	Description	Significance	Field Rating
S5WEF01	-31.068	23.59032	MSA Localities	Low-medium	2a. Low Significance
S5WEF02	-31.0892	23.56417	MSA Localities	Low-medium	2a. Low Significance
S5WEF03	-31.0918	23.55985	MSA Localities	Low-medium	2a. Low Significance
S5WEF04	-31.0965	23.55691	MSA Localities	Low-medium	2a. Low Significance
S5WEF05	-31.105	23.5684	MSA Localities	Low-medium	2a. Low Significance
S5WEF06	-31.1062	23.56972	MSA Localities	Low-medium	2a. Low Significance
S5WEF07	-31.1037	23.57375	MSA Localities	Low-medium	2a. Low Significance
S5WEF08	-31.1164	23.565	MSA Localities	Low-medium	2a. Low Significance
S5WEF09	-31.1237	23.56104	MSA Localities	Low-medium	2a. Low Significance
S5WEF10	-31.1224	23.56793	MSA Localities	Low-medium	2a. Low Significance
S5WEF11	-31.1205	23.57321	MSA Localities	Low-medium	2a. Low Significance
S5WEF12	-31.1364	23.55391	MSA Localities	Low-medium	2a. Low Significance
S5WEF13	-31.1332	23.55594	MSA Localities	Low-medium	2a. Low Significance
S5WEF14	-31.1424	23.54532	MSA Localities	Low-medium	2a. Low Significance
S5WEF15	-31.1403	23.55417	MSA Localities	Low-medium	2a. Low Significance
S5WEF16	-31.1518	23.54925	MSA Localities	Low-medium	2a. Low Significance
S5WEF17	-31.1556	23.55716	MSA Localities	Low-medium	2a. Low Significance
S5WEF18	-31.1588	23.5599	MSA Localities	Low-medium	2a. Low Significance
S5WEF19	-31.1547	23.58208	MSA Localities	Low-medium	2a. Low Significance
S5WEF20	-31.1569	23.59423	MSA Localities	Low-medium	2a. Low Significance
S5WEF21	-31.1601	23.59489	MSA Localities	Low-medium	2a. Low Significance
S5WEF22	-31.1566	23.60202	MSA Localities	Low-medium	2a. Low Significance
S5WEF23	-31.1412	23.60566	MSA Localities	Low-medium	2a. Low Significance
S5WEF24	-31.1502	23.60474	MSA Localities	Low-medium	2a. Low Significance
S5WEF25	-31.1466	23.62094	MSA Localities	Low-medium	2a. Low Significance
S5WEF26	-31.141	23.62461	MSA Localities	Low-medium	2a. Low Significance
S5WEF27	-31.1352	23.62221	MSA Localities	Low-medium	2a. Low Significance

S5WEF28	-31.1453	23.5654	MSA Localities	Low-medium	2a. Low Significance
S5WEF29	-31.1047	23.58411	MSA Localities	Low-medium	2a. Low Significance
S5WEF30	-31.0933	23.60639	MSA Localities	Low-medium	2a. Low Significance
S5WEF31	-31.1032	23.6402	MSA Localities	Low-medium	2a. Low Significance
S5WEF32	-31.088	23.62768	MSA Localities	Low-medium	2a. Low Significance
S5WEF33	-31.0824	23.62103	MSA Localities	Low-medium	2a. Low Significance
S5WEF34	-31.0716	23.61726	MSA Localities	Low-medium	2a. Low Significance

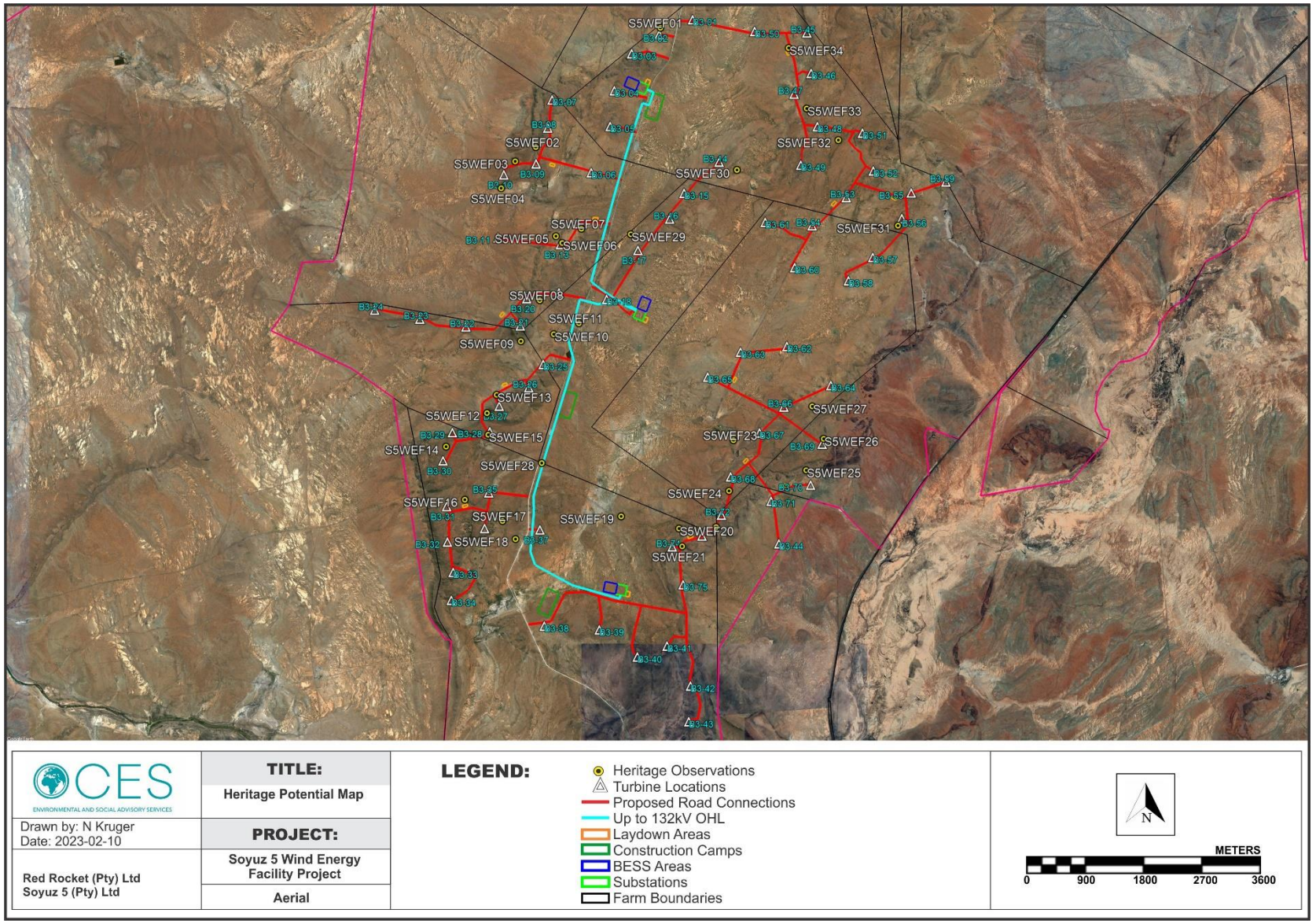

Figure 8-10: Aerial map indicating the location of heritage occurrences and landscape features discussed in the text..

8.2 THE VISUAL LANDSCAPE

8.2.1 Potential Visual Exposure

The result of the viewshed analysis for the proposed Soyuz 5 WEF has been undertaken from each proposed turbine position as indicated within the proposed development area of Soyuz 5 WEF only in order to determine the general visual exposure (visibility) of the area under investigation. A height of 260m was used in order to illustrate the anticipated visual exposure of the wind turbines (i.e., the approximate maximum blade tip height of the proposed wind turbines). Typically, structures of this height (i.e., 260m) may be visible from up to 20km away. In this respect, the anticipated Zone of Visual Influence for this facility as calculated from the development footprint (i.e., determined from the edge of the outer most turbines) has been indicated at 20km. The extent of visual exposure within this zone is very high. The result of the viewshed analysis displays the potential areas of visual exposure, as well as the potential frequency of exposure. The frequency of exposure indicates the number of turbines that may be exposed i.e. more turbines may be visible in the darker orange to red areas than in the yellow areas. Land that is more elevated is typically more exposed to the proposed WEF, whilst lower lying areas such as valleys are shielded, or not as exposed. The viewshed analysis does not include the effect of vegetation cover or existing structures on the exposure of the proposed facility, therefore signifying a worst-case scenario. The following is an overview of the findings of the viewshed, based on the layout illustrated on the Map provided:

- The proposed facility will have a large core area of potential visual exposure on the project site itself, and **within a 5km** radius thereof.
  Potential sensitive visual receptors within this visually exposed zone include observers travelling along the R398, as well as various secondary and internal farm roads. Additionally, residents of the following homestead / farmsteads[2] are likely to be affected
    - Lekkervlei
    - Gediertesfontein
    - Poortjiesdam
    - Beskuitkuil
    - Selbourne
    - Blaauwbank
    - Schramfontein
    - Weltevrede
    - Merriman
    - Cypress Grove

- Potential visual exposure remains high in the medium distance, **between 5 and 10km**, with visually screened areas predominantly associated with the lower lying areas beyond hills to the north west of the site.
  Sensitive visual receptors include users of the R398 and various secondary roads in the area, as well as residents of a number of homesteads. Residents of the following homestead / farmsteads are likely to be affected:
    - Boomanulla
    - Vaakfontein
    - Woodstock
    - Nietgedacht
    - Allemansdam

[2] The names listed here are of the homestead or farm dwelling as indicated on the SA 1: 50 000 topographical maps and do not refer to the registered farm name.

- Thomasgat
- Mentoorskuilen
- Wonderboom
- Avondale
- Wilgenhof
- Potkraal
- Booysens

- In the longer distance, **between 10 and 20km** offset, the extent of potential visual exposure is somewhat reduced, especially in the north beyond the escarpment of the Kombuisfontein Mountains, as well as to the south east and north west of the site. Visually exposed areas tend to be concentrated in the north, east and south / south western portions of the study area.
  Sensitive visual receptors comprise users of stretches of the R398 and various secondary roads located in and around the site. In addition, farm residents and homesteads, may be visually exposed. Residents of the following homesteads / farmsteads and settlements are likely to be affected:

  - Syferbult
  - Dombietersfontein
  - Droë Lande
  - Leeukuil
  - Barnardsdam
  - Altringham
  - Gemsbokdam
  - Fonteintjie
  - Deefontein
  - Die Vlei
  - Verborgenfontein
  - Good Hope
  - Witsloot
  - Patrysfontein
  - Klipkraal
  - Alexandria
  - Bokfontein
  - Poortjie
  - Poortjie
  - Kraanvoëlvlei
  - Kruisaar
  - Nooitgedacht

- The frequency of visual exposure **beyond 20km** from the turbine structures remains largely unchanged but slightly more scattered, though it is expected that most turbines will only be partially visible. Visibility of the turbine structures will be scattered throughout this area with visually screened areas lying predominately to the north, east, and south west.
  Sensitive visual receptors include users of stretches of the N12 and R398, as well as residents of the following homesteads / farmsteads which are likely to be affected:

  - Vleiplaas
  - Brakpoort
  - Slagberg
  - Groot Boesmanspoort

- Uitsig
- Stampvlei
- Vlakkraal
- Dawidskraal
- Ebenaeser
- De Brug
- Kalkfontein
- Kraanvogelvlei
- Wolwekop
- Tabaksakfontein
- Waarborg
- Swartkoppies
- West Front
- Pontac
- Nuwejaarsfontein
- Die Kalk
- De Poort
- Rosekuil
- Skilpadskuil
- Graafwater
- Kiewietskraal
- Muskietkuil
- Boomplaas
- Geluksdam
- Kalkfontein
- Brakwater
- Smart Syndicate
- Middelvlei
- Lovedale
- Langdam
- Langdam
- Mynfontein
- Erasmuskraal
- Orange Valley
- Elandskuil
- Lemoenkloof
- Retreat
- Jandelangesfontein

It must be noted that some, not all, of the sensitive visual receptors of farms and homesteads listed above who could be affected visually by the proposed Soyuz 5 WEF are in fact located on properties involved in either this WEF or for the proposed WEF developments associated with the collective Britstown Wind Farm Cluster. This is particularly relevant to sensitive visual receptors located within 10km of the proposed site. It is therefore assumed that these sensitive receptors are in fact aware of, and to a certain extent accepting of, the visual intrusion associated with WEFs in general as a result of their involvement.

In general, the Soyuz 5 WEF may constitute a very high visual prominence, potentially resulting in a very high visual impact.

8.2.2 Visual Impact Index

The combined results of visual exposure, viewer incidence / perception and visual distance of the proposed Soyuz 5 WEF have been indicated as a visual impact index. Values have been assigned for each potential visual impact per data category and merged in order to calculate the visual impact index. The criteria (previously discussed in this report) which inform the visual impact index are:

- Visibility or visual exposure of the structures
- Observer proximity or visual distance from the structures
- The presence of sensitive visual receptors
- The perceived negative perception or objections to the structures (if applicable)
- The visual absorption capacity of the vegetation cover or built structures (if applicable)

An area with short distance visual exposure to the proposed infrastructure, a high viewer incidence and a potentially negative perception (i.e. a sensitive visual receptor) would therefore have a **higher** value (greater impact) on the index. This helps in focussing the attention to the critical areas of potential impact and determining the potential **magnitude** of the visual impact. The index indicates that **potentially sensitive visual receptors** within a 5km radius of the WEF may experience a **very high** visual impact. The magnitude of visual impact on sensitive visual receptors subsequently subsides with distance to; **high** within a 5 – 10km radius (where sensitive receptors are present) and **moderate** within a 10 – 20km radius (where sensitive receptors are present). Receptors beyond 20km are expected to have a **low** potential visual impact. Likely areas of potential visual impact and potential sensitive visual receptors located the study area are displayed on Error! Reference source not found.. **The numbers assigned to the identified homestead as listed below coincide with the locations of the homesteads as numbered on** Error! Reference source not found.**.** The visual impact index for the proposed facility is further described as follows.

- The visual impact index map indicates a core zone of **high** visual impact within 5km of the proposed facility. While the identified receptors within 5km of the proposed WEF, as listed below, are likely to experience **very high** visual impact, should mitigation not be possible or not be undertaken. Sensitive visual receptors within this zone comprise mainly of the following:
    - Observers travelling along the R398, as well as various secondary and internal farm roads
    - Residents of the following homesteads:
        1. Lekkervlei
        2. Gediertesfontein
        3. Poortjiesdam
        4. Beskuitkuil
        5. Selbourne
        6. Blaauwbank
        7. Schramfontein
        8. Weltevrede
        9. Merriman
        10. Cypress Grove

    Note: *The location of the homesteads Lekkervlei, Gediertesfontein, Beskuitkuil, Blaauwbank and Schramfontein are on farm portions earmarked for the Britstown Wind Farm Cluster, thereby reducing the probability of this impact occurring (i.e. it is assumed that these landowners are supportive of WEF developments within the region).*

- Visual impact is prominently **moderate** between 5km and 10km of the proposed facility. The identified receptors between 5km and 10km of the proposed facility, as listed below, are likely to

experience **high** visual impact, should mitigation not be possible or not be undertaken. Sensitive visual receptors within this zone comprise mainly of the following:

- Users traveling along the R398 and various secondary roads in the area
- Residents of the following homesteads:
    11. Boomanulla
    12. Vaakfontein
    13. Woodstock
    14. Nietgedacht
    15. Allemansdam
    16. Thomasgat
    17. Mentoorskuilen
    18. Wonderboom
    19. Avondale
    20. Wilgenhof
    21. Potkraal
    22. Booysens

Note: *The location of the homesteads Allemansdam, Thomasgat, Mentoorskuilen, and Wonderboom are on farm portions earmarked for the Britstown Wind Farm Cluster, thereby reducing the probability of this impact occurring (i.e. it is assumed that these landowners are supportive of WEF developments within the region).*

- Visual impact is prominently **low** between 10 km and 20 km of the proposed facility. The identified receptors between 10km and 20km of the proposed facility, as listed below, are likely to experience **moderate** visual impact, should mitigation not be possible or not be undertaken. Sensitive visual receptors within this zone comprise mainly of the following:
    - Users traveling along portions of the R398 and various secondary roads, potential visibility is however scattered along the length of these roads and visual intrusion where possible will be brief.
    - Residents of the following homesteads:
        23. Syferbult
        24. Dombietersfontein
        25. Droë Lande
        26. Leeukuil
        27. Barnardsdam
        28. Altringham
        29. Gemsbokdam
        30. Fonteintjie
        31. Deefontein
        32. Die Vlei
        33. Verborgenfontein
        34. Good Hope
        35. Witsloot
        36. Patrysfontein
        37. Klipkraal
        38. Alexandria
        39. Bokfontein
        40. Poortjie
        41. Poortjie
        42. Kraanvoëlvlei

43. Kruisaar
44. Nooitgedacht

Note: *The location of Altringham, Gemsbokdam, Fonteintjie, and Deefontein are on farm portions earmarked for the Britstown Wind Farm Cluster, thereby reducing the probability of this impact occurring (i.e. it is assumed that these landowners are supportive of WEF developments within the region).*

- Beyond the 20km of the proposed facility, the extent of potential visual impact is somewhat reduced, and the magnitude is predominantly **very low**. The identified receptors beyond 20km of the proposed facility, as listed below, are likely to experience **low** visual impact, should mitigation not be possible or not be undertaken. Sensitive visual receptors within this zone comprise mainly of the following:
    - Users traveling along portions of the N12 and R398, potential visibility is however scattered along the length of these roads and visual intrusion where possible will be brief.
    - Residents of the following homesteads:
        45. Vleiplaas
        46. Brakpoort
        47. Slagberg
        48. Groot Boesmanspoort
        49. Uitsig
        50. Stampvlei
        51. Vlakkraal
        52. Dawidskraal
        53. Ebenaeser
        54. De Brug
        55. Kalkfontein
        56. Kraanvogelvlei
        57. Wolwekop
        58. Tabaksakfontein
        59. Waarborg
        60. Swartkoppies
        61. West Front
        62. Pontac
        63. Nuwejaarsfontein
        64. Die Kalk
        65. De Poort
        66. Rosekuil
        67. Skilpadskuil
        68. Graafwater
        69. Kiewietskraal
        70. Muskietkuil
        71. Boomplaas
        72. Geluksdam
        73. Kalkfontein
        74. Brakwater
        75. Smart Syndicate
        76. Middelvlei
        77. Lovedale
        78. Langdam
        79. Langdam

80. Mynfontein
81. Erasmuskraal
82. Orange Valley
83. Elandskuil
84. Lemoenkloof
85. Retreat
86. Jandelangesfontein

Note: *The location of Swartkoppies, West Front, Die Kalk and Lemoenkloof are on farm portions earmarked for the Britstown Wind Farm Cluster, thereby reducing the probability of this impact occurring (i.e. it is assumed that these landowners are supportive of WEF developments within the region).*

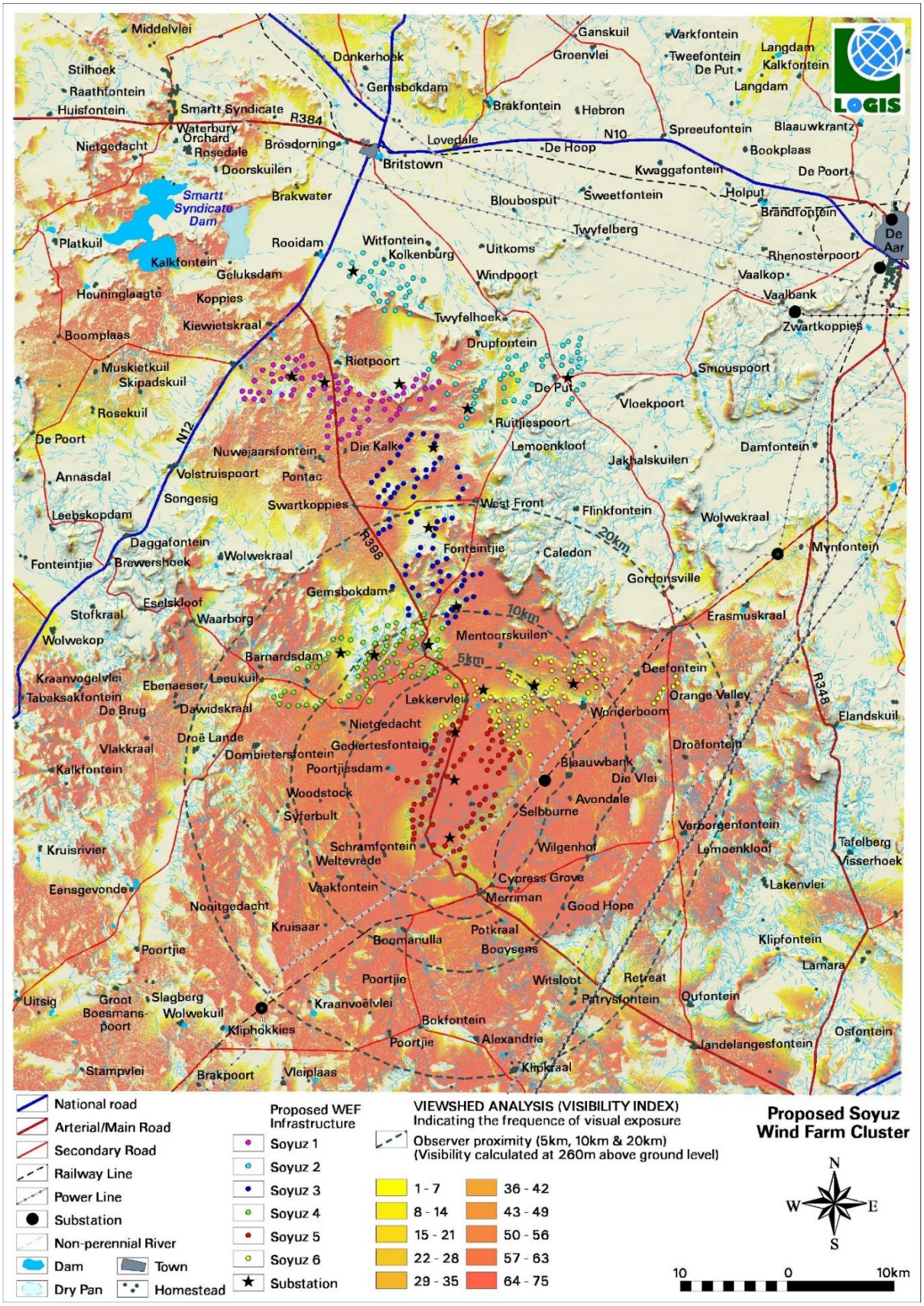

Figure 8-11: Potential visual exposure (viewshed analysis) of the proposed Soyuz 5 WEF

8.2.3 Shadow Flicker Assessment

Shadow flicker is an effect which is caused when the shadow of an object repeatedly passes or pulsates over the same point in the landscape. Shadow flicker can be caused by the wind turbines when the sun passes behind the hub or rotor blades of a wind turbine and casts a shadow that continually passes over the same point as the rotor blades of the wind turbine rotate. Shadow flicker only occurs when the sky is clear, and when the turbine rotor blades are between the sun and the receptor. De Gryse in Scenic Landscape Architecture (2006) notes that "*shadow flickering associated with the rotation of the rotor blades has the potential to alter the viewed landscape, and to detract from the experience of people …*". Therefore, the effect of shadow flicker is likely to be experienced by people situated directly within the shadow cast by the rotor blades of the wind turbine. As such, shadow flicker is expected to have an impact on people residing in homesteads located within close proximity of a wind turbine and at a specific orientation, particularly in areas where there is little screening present.

Since this proposed WEF is located in the Southern Hemisphere it can be expected that shadow flicker will be experienced by sensitive receptors who are predominately located on the southern half of the potential flicker zones, namely to the west, south west, south, south east and east following the traction of the sun from east to west. It is expected that the shadow flicker zone of influence will be its greatest early in the mornings and later afternoons when the sun is at its lowest casting a longer shadow. Shadow flicker may also be experienced by and impact on motorists if a wind turbine is located in close proximity to an existing road. It is however expected that the shadow flicker experienced by motorist traveling along roads will be fleeting and not constitute a shadow flicker visual impact of concern. The impact of shadow flicker can be effectively mitigated by choosing the correct site and layout for the wind turbines, taking the orientation of the turbines relative to the nearby homesteads / roads and the latitude of the site into consideration. Tall structures and trees will also obstruct shadows and prevent the effect of shadow flicker from impacting on surrounding sensitive receptors. However, since this is not a consistent factor or given to occur around any of the structures within the study area it will not be considered in this assessment.

De Gryse found that "*most shadow impact is associated with 3-4 times the height of the object. While shadows may extend further than this, they become insignificant in their visual intrusion because of the reduced intensity of the shadow at such distances.*" Based on this research, the shadow flicker assessment for the proposed **Soyuz 5 WEF** was undertaken on a likely 75 turbine layout using a 260m blade tip height (hub height of 160m and rotor diamter of 200m). As such, sensitive receptors are considered to be affected where shadows are predicted to occur within 1km of a turbine. Therefore, a 1km zone around each turbine has been identified as the zone within which there is a risk of shadow flicker occurring. This study found that seventeen (17) turbines shaded in purple and green**,** located on the central portion of the **Soyuz 5 WEF** are likely to have a shadow flicker impact on motorists using a portions of the R398. Other areas to potentially be impacted on by shadow flicker are loacted along the secondary and internal farm roads located in the designated development properties**.** These roads are likely to be affected by the eight (8) turbines shaded in yellow and blue. It is, however, expected that the number of motorists travelling on these roads will be very limited and the level of exposure will be brief, thereby not constituting a shadow flicker visual impact of concern for these receptors. Additionally, the residents of the homesteads known as Schramfontein, Gediertesfontein and Beskuitkuil are also likely to experience shadow flicker from four (4) different turbines shaded in green, blue and pink respectively. Gediertesfontein is exepceted to experience shadow flicker at different parts of the day by two (2) different turbines (shaded in blue). Of note is that these homesteads are located on properties involved in this development.

It must also be noted that Gediertesfontein and Beskuitkuil were identified during the scoping phase as the potential sensitive receptors likely to experience shadow flicker. As per the recommendations of the IFC Performance Standards, it was recommended that further consultation was undertaken as part of the Scoping Phase consultation process with these specific sensitive receptors in order to establish their understanding and concerns regarding this possible impact. Since no objections have been reported by the EAP or Applicant to the author of this report, it is assumed that the residents of this homestead are in fact aware of, and to a certain

extent accepting, of the shadow flicker associated with these turbines. As a result of the layout change between the Scoping and EIR Phases the additional residence of Schramfontein has been identified as likely to experience shadow flicker. Despite being located on a property involved in this development, since Schramfontein were not consulted during the Scoping Phase, as per the recommendations of the IFC Performance Standards, it is recommended that further consultation is undertaken as part of the EIR Phase consultation process with this specific sensitive receptor in order to establish their understanding and concerns regarding this possible impact. Should it be found during the consultation process that this specific receptor is concerned with the impact associated with shadow flicker, it is then recommended that the positioning of the specific turbine in question (shaded in green) be revised or removed.

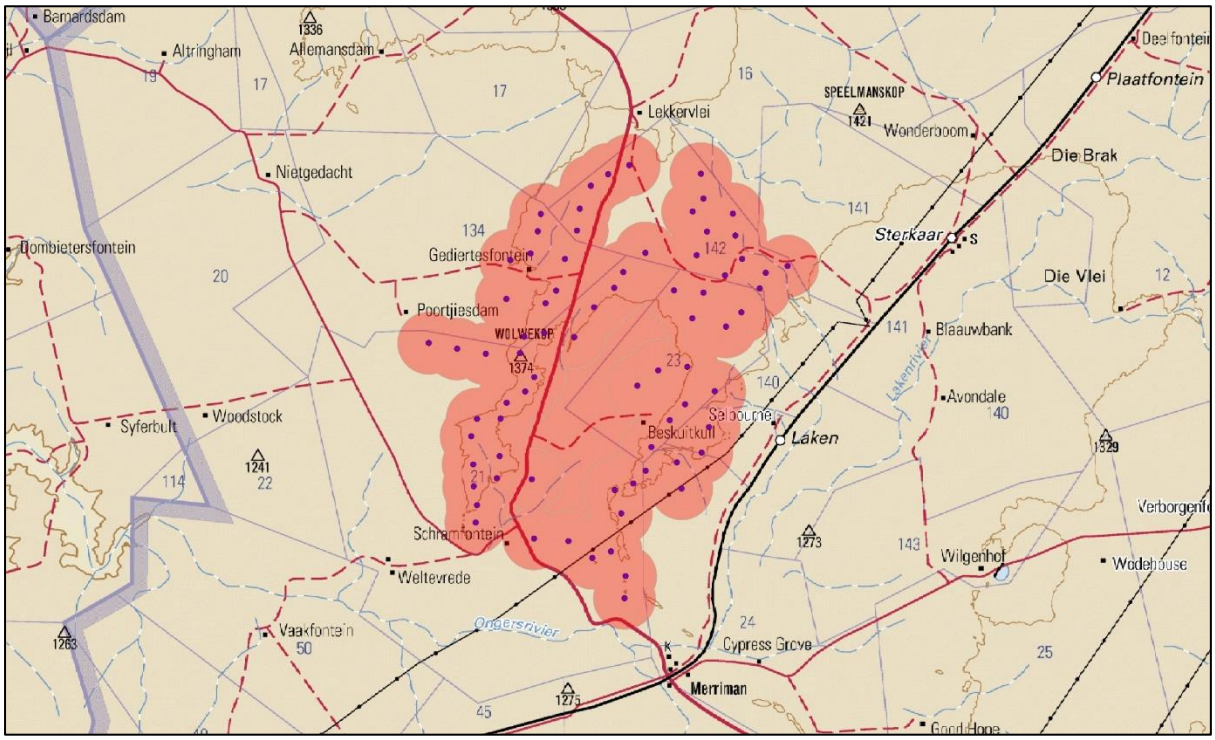

Figure 8-12: Potential sensitive receptors exposed to shadow flicker from the proposed Soyuz 5 WEF

8.2.4 Photo Simulations

Photo simulations were undertaken (in addition to the spatial analyses) in order to illustrate the potential visual impact of the proposed Soyuz 5 WEF only within the receiving environment. The purpose of the photo simulation exercise is to support the findings of the VIA, and is not an exercise to illustrate what the facility will look like from all directions. The photo simulations indicate the anticipated visual alteration of the landscape from various points located at different distances from the infrastructure. These points coincide with specific sensitive visual receptors noted during the site visit. The simulations are based on the turbines' actual dimensions and layout.

It is assumed that the necessary post-construction phase rehabilitation and mitigation measures, as proposed by the various specialists in the environmental impact assessment report, have been undertaken. These photographs can therefore be seen as an ideal operational scenario (from a visual impact point of view) that should be aspired to. It is however crucial that the natural vegetation be restored to its present status in order for these simulations to be as realistic as possible. Additional infrastructure (e.g. access roads, substations, etc.) associated with the facility are not included in the photo simulations. Each photographic simulation, as seen below, is preceded by a panoramic overview of the landscape (as it is presently), ultimately presenting a 'before' and 'after' scenario from the specified viewpoint being discussed. The simulated Soyuz 5 WEF, as shown on the

photographs, was adapted to the atmospheric conditions present when the original photographs were taken. This implies that factors such as haze and solar glare were also simulated in order to realistically represent the observer's potential view of the infrastructure.

Figure 8-13: Photo simulation in the project area before construction.

Figure 8-14: Photo simulation in the project area after construction

Figure 8-15: Photo simulation in the project area before construction.

Figure 8-16: Photo simulation in the project area after construction.

9 EXPECTED IMPACTS OF THE PROJECT

Generally, the value and significance of archaeological and other heritage sites might be impacted on by any activity that would result immediately or in the future in the destruction, damage, excavation, alteration, removal or collection from its original position, of any archaeological material or object (as indicated in the National Heritage Resources Act (No 25 of 1999)). Thus, the destructive impacts that are possible in terms of heritage resources would tend to be direct, once-off events occurring during the initial construction period. However, in the long run, the proximity of operations in any given area could result in secondary indirect impacts. Direct or primary effects on heritage resources occur at the same time and in the same space as the activity, e.g. loss of historical fabric through demolition work. Indirect effects or secondary effects on heritage resources occur later in time or at a different place from the causal activity, or as a result of a complex pathway, e.g. restriction of access to a heritage resource resulting in the gradual erosion of its significance, which is dependent on ritual patterns of access (refer to Section 10.3 in the Addendum for an outline of the relationship between the significance of a heritage context, the intensity of development and the significance of heritage impacts to be expected).

The EIA process therefore specifies impact assessment criteria which can be utilised from the perspective of a heritage specialist study which elucidates the overall extent of impacts. The following section provides a background to the identification and assessment of possible direct and indirect impacts and alternatives, as well as a range of risk situations and scenarios commonly associated with heritage resources management. A guideline for the rating of impacts and recommendation of management actions for areas of heritage potential within the study area is supplied in Addendum 3.

9.1 THE HERITAGE LANDSCAPE

9.1.1 Preconstruction Phase

Heritage risks and impacts are commonly associated with construction activities. WEF developments and OHL developments (linear and narrow) are generally considered to have a lower-risk impact potential since localised and spatially confined heritage resources can easily be avoided by project design of individual turbine, road and pylon placements and other infrastructure. No impact on archaeological sites, built environment features, human burials and the cultural landscape is foreseen during the preconstruction phase.

9.1.2 Construction Phase

Construction activities pose the greatest threat to tangible heritage resources within the cultural landscape and it is often during this Phase that heritage sites are lost. An array of archaeological areas occurs across the project landscape, many of which have been excluded from infrastructure development zones at Scoping Level. Still, Stone Age localities of low significance and not conservation-worthy occur in project footprints even though the resources may be destroyed during construction, the impact is inconsequential. Previously undetected cultural (archaeological) layers are usually superficial, subsoil layers and that makes them easily vulnerable to destruction and the likelihood for encountering additional cultural heritage sites as the land clearing process commences, or during construction of infrastructure should be considered. It should be noted that graves and cemeteries do not only occur around farmsteads in family burial grounds but they are also randomly scattered around archaeological and historical settlements in the rural areas of the Northern Cape Province. The probability of informal human burials encountered during the construction phase should thus not be excluded. Monitoring activities will be required throughout the construction phase of the Project in order to avoid the destruction of previously undetected heritage sites and human burials.

9.1.3 Operations Phase

It is understood that no new areas will be disturbed and/or impacted during the operations phase of the project and the risk and severity of heritage impacts should decrease once the projects activate. Furthermore, the majority of sites of archaeological and heritage significance would have been recorded and/or assessed in preceding phases. However, impact on previously undetected archaeological sites, human burials and the cultural landscape might occur as a result of operational activities (site access, movement, maintenance, trespassing, natural elements, hazards etc). During the Operations Phase, continuous ECO site monitoring will be required.

9.1.4 Decommissioning and Post-Closure Phase

The decommissioning phase will see the progressive downscaling and termination of operations. Similar to the Operations Phase, no new areas are expected to be disturbed and/or impacted and no additional sites of archaeological and heritage significance are expected to be impacted on during decommissioning. During the decommissioning and closure phase, it may be recommended that the ECO review management procedures for heritage sites and ensure that effective measures were implemented.

9.1.5 Cumulative Impacts

It is the opinion of the Specialist that the proposed Soyuz 5 Wind Energy Facility and its associated power line connection will have a low negative cumulative impact on the heritage value of the area for the following reasons:

- The low frequency of significant archaeological resources documented in the project area and in its immediate surroundings implies low-severity short and long-term impacts on the heritage landscape. In addition, localised and spatially confined heritage resources can easily be avoided by project design of individual turbines, pylon placements and service roads.
- The significance of the landscape in terms of its heritage is bound not to change during the course of construction, operation and decommissioning of the project.
- The proposed Soyuz 5 WEF is situated in region which has seen the rapid development of vast and large-scale renewable energy facilities such as the Maanhaarberg WEF, the Great Karoo Renewable Energy Facility, the Modderfontein WEF and many Solar PV Developments around the town of De Aar. The developments cumulatively add to a transformed landscape and sense of place where the character of this portion of the Karoo is evolving into a centre for renewable power generation.
- It should be noted that archaeological knowledge and the initiation of research projects into significant archaeological sites often result from Heritage Impact Assessments conducted for developments. Provided that significant archaeological sites are conserved and that appropriate heritage mitigation and management procedures are followed, the cumulative impact of development can be positive.

9.1.6 Heritage Impact Assessment Matrix

The following table (Table 2) summarizes impacts to known heritage resources of the project area:

Table 2 Impact Assessment Matrix

Pre-Construction Phase

Criteria	Nature	Temporal Scale	Spatial Scale	Severity	Probability	Overall Significance before mitigation	Reversibility	Irreplaceable Loss	Mitigation Potential	Overall Significance after mitigation
Impact 1: Loss of Heritage Resources										
S5WEF01 - S5WEF34	Negative	Short term	Study area	Slight/ Slightly Beneficial	Unlikely	LOW	Irreversible	Resource will not be lost	Easily achievable	LOW

Construction Phase

Criteria	Nature	Temporal Scale	Spatial Scale	Severity	Probability	Overall Significance before mitigation	Reversibility	Irreplaceable Loss	Mitigation Potential	Overall Significance after mitigation
Impact 1: Loss of Heritage Resources										
S5WEF01 - S5WEF34	Negative	Short term	Study area	Slight/ Slightly Beneficial	Unlikely	LOW	Irreversible	Resource will not be lost	Easily achievable	LOW

Operation Phase

Criteria	Nature	Temporal Scale	Spatial Scale	Severity	Probability	Overall Significance before mitigation	Reversibility	Irreplaceable Loss	Mitigation Potential	Overall Significance after mitigation
Impact 1: Loss of Heritage Resources										
S5WEF01 - S5WEF34	Negative	Short term	Study area	Slight/ Slightly Beneficial	Unlikely	LOW	Irreversible	Resource will not be lost	Easily achievable	LOW

Closure / Decommissioning Phase

Criteria	Nature	Temporal Scale	Spatial Scale	Severity	Probability	Overall Significance before mitigation	Reversibility	Irreplaceable Loss	Mitigation Potential	Overall Significance after mitigation
Impact 1: Loss of Heritage Resources										
S5WEF01 - S5WEF34	Negative	Short term	Study area	Slight/ Slightly Beneficial	Unlikely	LOW	Irreversible	Resource will not be lost	Easily achievable	LOW

9.2 THE VISUAL LANDSCAPE

9.2.1 Primary Impacts

The primary visual impacts of the proposed Soyuz 5 WEF are assessed as follows:

- **POTENTIAL VISUAL IMPACT OF CONSTRUCTION ON SENSITIVE VISUAL RECEPTORS IN CLOSE PROXIMITY TO THE FACILITY**

During the construction period, there will be an increase in heavy vehicles utilising the roads to the construction sites that may cause, at the very least, a visual nuisance to other road users and landowners in the area in close proximity (within 5km). Within the region, dust as a result of construction activities may also be visible, as such it will result in a visual impact occurring during construction. Sensitive receptors in this zone consist of observers travelling along the R398, various secondary and internal farm roads, as well as residents of various homesteads. This impact is likely to be of **high** significance before mitigation and **moderate** significance post mitigation on the identified sensitive visual receptors within this zone. Homesteads located on farm portions earmarked for the Britstown Wind Farm Cluster reduce the probability of this impact occurring on these specific receptors (i.e. it is assumed that these landowners are supportive of WEF developments and their associated visual impacts). Mitigation entails proper planning, management and rehabilitation of all construction sites to forego the visual impacts of the construction activities only.

Nature of Impact: Visual impact of construction on sensitive visual receptors in close proximity (< 5km) to the proposed development		
	No mitigation	***Mitigation considered***
Extent	Neighbourhood **(4)**	Neighbourhood **(4)**
Duration	Short term **(2)**	Short term **(2)**
Magnitude	Very High **(10)**	High **(8)**
Probability	Definite **(5)**	Highly probable **(4)**
Significance	High **(80)**	Moderate **(56)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, to a certain extent	
Mitigation potential	Achievable	

Mitigation / Management:

Construction:

- Ensure that vegetation is not unnecessarily removed during the construction period.
- Reduce the construction period through careful logistical planning and productive implementation of resources.
- Plan the placement of lay-down areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e., in already disturbed areas) wherever possible.
- Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.
- Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.
- Reduce and control construction dust using approved dust suppression techniques as and when required (i.e., whenever dust becomes apparent).
- Restrict construction activities to daylight hours whenever possible in order to reduce lighting impacts.
- Rehabilitate all disturbed areas immediately after the completion of construction works.

Cumulative impacts: No cumulative impacts as a result of the construction activities are expected.
Residual impacts: None, provided that rehabilitation works are carried out as specified.

- **POTENTIAL VISUAL IMPACT OF FACILITY OPERATIONS ON SENSITIVE VISUAL RECEPTORS IN CLOSE PROXIMITY (< 5KM) TO THE PROPOSED DEVELOPMENT**

The visual impacts of facility operations on sensitive visual receptors in close proximity to the proposed Soyuz 5 WEF (within 5km) is expected to be of **very high** significance. Sensitive receptors in this zone consist of observers travelling along the R398, various secondary and internal farm roads, as well as residents of various homesteads. Homesteads located on farm portions earmarked for the Britstown Wind Farm Cluster reduce the probability of this impact occurring on these specific receptors (i.e. it is assumed that these landowners are supportive of WEF developments and their associated visual impacts). No mitigation is possible for a facility of this scale, but measures have been included as best practice guidelines. The table below illustrates this impact assessment.

Nature of Impact:

Visual impact on sensitive receptors within 5km (residents of homesteads, as well as observers travelling along the various secondary roads), in close proximity to the proposed development.

	No mitigation	***Mitigation considered***
Extent	Neighbourhood **(4)**	Neighbourhood **(4)**
Duration	Long **(4)**	Long **(4)**
Magnitude	Very High **(10)**	Very High **(10)**
Probability	Definite **(5)**	Definite **(5)**
Significance	Very High **(90)**	Very High **(90)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mitigation potential	Very difficult	

Mitigation / Management:

Operations:

- Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint.
- Maintain the general neat and tidy appearance of the facility as a whole.
- Monitor rehabilitated areas, and implement remedial action as and when required.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site.
- Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.
- Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Cumulative impacts:

The construction of the Soyuz 5 WEF (75 turbines) together with the other five proposed facilities that form part of the Britstown Wind Farm Cluster is expected to contribute to the increased cumulative visual impact of renewable energy facilities in the region.

Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

- **POTENTIAL VISUAL IMPACT OF FACILITY OPERATIONS ON SENSITIVE VISUAL RECEPTORS WITHIN THE LOCAL AREA (BETWEEN 5 - 10KM) SURROUNDING THE PROPOSED DEVELOPMENT**

The visual impact of facility operations on sensitive visual receptors (i.e. users of the various roads and residents of homesteads) within the local area (between 5 - 10km offset) is expected to be of **high** significance. Sensitive visual receptors within this zone include users traveling along the R398 and various secondary roads in the area, as well as residents of various homesteads . Homesteads located on farm portions earmarked for the Britstown Wind Farm Cluster reduce the probability of this impact occurring on these specific receptors (i.e. it is assumed that these landowners are supportive of WEF developments and their associated visual impacts). No mitigation is possible within this environment and for a facility of this scale, but measures have been included as best practice guidelines. The table below illustrates this impact assessment.

Nature of Impact:

Visual impact on the users of various secondary roads, residents of homesteads and visitors to the local area (between 5 - 10km offset) surrounding the proposed development.

	No mitigation	***Mitigation considered***
Extent	Local **(3)**	Local **(3)**
Duration	Long **(4)**	Long **(4)**
Magnitude	High **(8)**	High **(8)**
Probability	Definite **(5)**	Definite **(5)**
Significance	High **(75)**	High **(75)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mitigation potential	Very difficult	

Mitigation / Management:

Site development & Operation:

- Retain / re-establish and maintain large trees, natural features and noteworthy natural vegetation in all areas outside of the activity footprint.
- Retain natural pockets (wetland, river and other sensitive vegetation zones) as buffers within the property and along the perimeter.
- Dust suppression techniques should be in place at all times during the site development and operational phases.
- Access roads will require an effective dust suppression management programme, such as regular wetting and/or the use of non-polluting chemicals that will retain moisture in the road surface.
- Keeping infrastructure at minimum heights.
- Introducing landscaping measures such as vegetating berms.
- Avoid the use of highly reflective material.
- Metal surfaces, where they occur, should be painted in natural soft colours that would blend in with the environment.
- Maintain the general neat and tidy appearance of the facility as a whole.

Lighting

- Lighting should be kept to a minimum wherever possible.
- Install light fixtures that provide precisely directed illumination to reduce light "spillage" beyond the immediate surrounds of the activity – this is especially relevant where the edge of the activity is exposed to residential properties.
- Wherever possible, lights should be directed downwards to avoid illuminating the sky.

➢ Avoid high pole top security lighting along the periphery of the site and use only lights that are activated on movement. Decommissioning: ➢ Remove infrastructure not required for the post-decommissioning use of the site. ➢ Rehabilitate all areas as per the rehabilitation plan undertaken. Consult an ecologist regarding rehabilitation specifications. ➢ Monitor rehabilitated areas post-decommissioning and implement remedial actions as required.
Cumulative impacts: The construction of the Soyuz 5 WEF (75 turbines) together with the other five proposed facilities that form part of the Britstown Wind Farm Cluster is expected to contribute to the increased cumulative visual impact of renewable energy facilities in the region.
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

- **POTENTIAL VISUAL IMPACT OF FACILITY OPERATIONS ON SENSITIVE VISUAL RECEPTORS WITHIN THE DISTRICT (BETWEEN 10 - 20KM) SURROUNDING THE PROPOSED DEVELOPMENT.**

The visual impact of facility operations on sensitive visual receptors within the district (between 10 - 20km offset) is expected to be of **moderate** significance. Sensitive visual receptors within this zone include users traveling along portions of the R398 and various secondary roads, as well as residents of various homesteads. Homesteads located on farm portions earmarked for the Britstown Wind Farm Cluster reduce the probability of this impact occurring on these specific receptors (i.e. it is assumed that these landowners are supportive of WEF developments and their associated visual impacts). No mitigation is possible within this environment and for a facility of this scale, but measures have been included as best practice guidelines. The table below illustrates this impact assessment.

Nature of Impact: Visual impact on the users of the various roads, residents of towns, visitors to the district and residents of homesteads (between 10 - 20km offset) surrounding the proposed development.		
	No mitigation	***Mitigation considered***
Extent	District **(2)**	District **(2)**
Duration	Long **(4)**	Long **(4)**
Magnitude	Moderate **(6)**	Moderate **(6)**
Probability	Highly Probable **(4)**	Highly Probable **(4)**
Significance	Moderate **(48)**	Moderate **(48)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mitigation potential	Very difficult	
Mitigation / Management: Site development & Operation: ➢ Retain / re-establish and maintain large trees, natural features and noteworthy natural vegetation in all areas outside of the activity footprint. ➢ Retain natural pockets (wetland, river and other sensitive vegetation zones) as buffers within the property and along the perimeter. ➢ Dust suppression techniques should be in place at all times during the site development and operational phases.		

➢ Access roads will require an effective dust suppression management programme, such as regular wetting and/or the use of non-polluting chemicals that will retain moisture in the road surface. ➢ Keeping infrastructure at minimum heights. ➢ Introducing landscaping measures such as vegetating berms. ➢ Avoid the use of highly reflective material. ➢ Metal surfaces, where they occur, should be painted in natural soft colours that would blend in with the environment. ➢ Maintain the general neat and tidy appearance of the facility as a whole. <u>Lighting</u> ➢ Lighting should be kept to a minimum wherever possible. ➢ Install light fixtures that provide precisely directed illumination to reduce light "spillage" beyond the immediate surrounds of the activity – this is especially relevant where the edge of the activity is exposed to residential properties. ➢ Wherever possible, lights should be directed downwards to avoid illuminating the sky. ➢ Avoid high pole top security lighting along the periphery of the site and use only lights that are activated on movement. <u>Decommissioning:</u> ➢ Remove infrastructure not required for the post-decommissioning use of the site. ➢ Rehabilitate all areas as per the rehabilitation plan undertaken. Consult an ecologist regarding rehabilitation specifications. ➢ Monitor rehabilitated areas post-decommissioning and implement remedial actions as required.
Cumulative impacts: The construction of the Soyuz 5 WEF (75 turbines) together with the other five proposed facilities that form part of the Britstown Wind Farm Cluster is expected to contribute to the increased cumulative visual impact of renewable energy facilities in the region.
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

- **POTENTIAL VISUAL IMPACT OF FACILITY OPERATIONS ON SENSITIVE VISUAL RECEPTORS WITHIN THE REGION (> 20KM)**

The visual impact of facility operations on sensitive visual receptors within the region (beyond the 20km offset) is expected to be of **low** significance. Sensitive visual receptors within this zone include users traveling along portions of the N12 and R398, as well as residents of various homesteads. Homesteads located on farm portions earmarked for the Britstown Wind Farm Cluster reduce the probability of this impact occurring on these specific receptors (i.e. it is assumed that these landowners are supportive of WEF developments and their associated visual impacts). No mitigation is possible within this environment and for a facility of this scale, but measures have been included as best practice guidelines. The table below illustrates this impact assessment.

Nature of Impact: Visual impact on the users of the various roads, visitors to the region, and residents of homesteads within the region (beyond the 20km offset)		
	No mitigation	***Mitigation considered***
Extent	Region **(1)**	Region **(1)**
Duration	Long **(4)**	Long **(4)**
Magnitude	Low **(4)**	Low **(4)**
Probability	Probable **(3)**	Probable **(3)**
Significance	Low **(27)**	Low **(27)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	

Mitigation potential	Very difficult

Mitigation / Management:

Site development & Operation:

- Retain / re-establish and maintain large trees, natural features and noteworthy natural vegetation in all areas outside of the activity footprint.
- Retain natural pockets (wetland, river and other sensitive vegetation zones) as buffers within the property and along the perimeter.
- Dust suppression techniques should be in place at all times during the site development and operational phases.
- Access roads will require an effective dust suppression management programme, such as regular wetting and/or the use of non-polluting chemicals that will retain moisture in the road surface.
- Keeping infrastructure at minimum heights.
- Introducing landscaping measures such as vegetating berms.
- Avoid the use of highly reflective material.
- Metal surfaces, where they occur, should be painted in natural soft colours that would blend in with the environment.
- Maintain the general neat and tidy appearance of the facility as a whole.

Lighting

- Lighting should be kept to a minimum wherever possible.
- Install light fixtures that provide precisely directed illumination to reduce light "spillage" beyond the immediate surrounds of the activity – this is especially relevant where the edge of the activity is exposed to residential properties.
- Wherever possible, lights should be directed downwards to avoid illuminating the sky.
- Avoid high pole top security lighting along the periphery of the site and use only lights that are activated on movement.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site.
- Rehabilitate all areas as per the rehabilitation plan undertaken. Consult an ecologist regarding rehabilitation specifications.
- Monitor rehabilitated areas post-decommissioning and implement remedial actions as required.

Cumulative impacts:

The construction of the Soyuz 5 WEF (75 turbines) together with the other five proposed facilities that form part of the Britstown Wind Farm Cluster is expected to contribute to the increased cumulative visual impact of renewable energy facilities in the region.

Residual impacts:

The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

- **POTENTIAL VISUAL IMPACT OF OPERATIONAL LIGHTING AT NIGHT ON SENSITIVE VISUAL RECEPTORS IN THE REGION**

The receiving environment has a relatively small number of populated places, and it can be expected that any light trespass and glare from the security and after-hours operational lighting for the facility will have some significance. In addition, the remote sense of place and rural ambiance of the local area increases its sensitivity to such lighting intrusions. Another source of glare light is the aircraft warning lights mounted on top of the hub of the wind turbines. While these lights are less aggravating due to the toned-down red colour, they do have the potential to be visible from a greater distance than general operational lighting, especially due to the strobing effect of the lights, a function specially designed to attract the viewers' attention. The Civil Aviation Authority (CAA) prescribes these warning lights and the potential to mitigate their visual impacts is low. The possibility of limiting aircraft warning lights to the turbines on the perimeter according to CAA requirements, thereby reducing the overall impact, is recommended to be investigated.

Some ground breaking new technology in the development of strobing lights that only activate when an aircraft is detected nearby. This may aid in restricting light pollution at night and should be investigated and implemented by the project proponent, if available and permissible by the CAA. This new technology is referred to as *needs-based night lights*, which basically deactivates a wind turbine's night lights when there is no flying object within the airspace of the WEF. The system relies on the active detection of aircraft by radar sensors, which relay a switch-on signal to the central wind farm control to activate the obstacle lights.

Last is the potential lighting impact is known as sky glow. Sky glow is the condition where the night sky is illuminated when light reflects off particles in the atmosphere such as moisture, dust or smog. The sky glow intensifies with the increase in the number of light sources. Each new light source, especially upwardly directed lighting, contributes to the increase in sky glow. The general lighting of the facility may contribute to the effect of sky glow in an otherwise dark environment. The visual impacts as a result of operational lighting at night on sensitive visual receptors in the region is likely to be of **high** significance and may be mitigated to **moderate** should the required CAA lighting be approved to be installed on the perimeter and/or the installation of *needs-based night lights* be allowed. Best practice guidelines for other general site lighting that may occur on the site have also been taken into consideration. The table below illustrates this impact assessment.

Nature of Impact: Visual impact of lighting at night on sensitive visual receptors in the region		
	No mitigation	***Mitigation considered***
Extent	Region **(1)**	Region **(1)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Very High **(10)**	High **(8)**
Probability	Definite **(5)**	Highly Probable **(3)**
Significance	High **(75)**	Moderate **(52)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation potential	Difficult	
Mitigation: Planning & operation: ➢ Aviation standards and CAA Regulations for turbine lighting must be followed. ➢ The possibility of limiting aircraft warning lights to the turbines on the perimeter according to CAA requirements, thereby reducing the overall impact, must be investigated. ➢ Install aircraft warning lights that only activate when the presence of an aircraft is detected, if permitted by CAA. ➢ Shield the sources of light by physical barriers (walls, vegetation, or the structure itself). ➢ Limit mounting heights of lighting fixtures, or alternatively use foot-lights or bollard level lights. ➢ Make use of minimum lumen or wattage in fixtures. ➢ Make use of down-lighters, or shielded fixtures. ➢ Make use of Low-Pressure Sodium lighting or other types of low impact lighting. ➢ Make use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.		
Cumulative impacts: The operation of the Soyuz 5 WEF (75 turbines) together with the other five proposed facilities that form part of the Britstown Wind Farm Cluster is expected to contribute to the increased lighting and light pollution in an otherwise natural area increasing the cumulative visual impact of renewable energy facilities in the region.		
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.		

- **POTENTIAL VISUAL IMPACT OF SHADOW FLICKER ON SENSITIVE VISUAL RECEPTORS IN CLOSE PROXIMITY TO THE PROPOSED DEVELOPMENT**

Shadow flicker only occurs when the sky is clear, and when the turbine rotor blades are between the sun and the receptor (i.e. when the sun is low). De Gryse in Scenic Landscape Architecture (2006) found that "most shadow impact is associated with 3-4 times the height of the object". Based on this research, a 1km zone around each turbine has been identified as the zone within which there is a risk of shadow flicker occurring. Three homesteads, Schramfontein, Gediertesfontein and Beskuitkuil, are located within the 1km buffer. Of note is that these homesteads are located on properties involved in this development, thereby reducing the probability of this impact occurring. It is expected that motorists travelling along roads within the 1km zone of a turbine could potentially experience shadow flicker, however the shadow flicker experienced by these motorists will be fleeting and not constitute a shadow flicker visual impact of concern. The significance of shadow flicker is therefore anticipated to be **high** before mitigation and **moderate** post mitigation.

Nature of Impact: Visual impact of shadow flicker on sensitive receptors in close proximity to the proposed development		
	No mitigation	***Mitigation considered***
Extent	Neighbourhood **(4)**	Neighbourhood **(4)**
Duration	Long **(4)**	Long **(4)**
Magnitude	High **(8)**	Moderate **(6)**
Probability	Highly Probable **(4)**	Probable **(3)**
Significance	High **(64)**	Moderate **(42)**
Status (positive or negative)	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mitigation potential	Difficult	
Mitigation / Management: Planning & operation: ➢ Adjust wind turbine locations to reduce the number of receptors likely to experience shadow flicker. ➢ Consult with participating landowners or identified receptors who may experience shadow flicker impacts to identify feasible and reasonable management and mitigation measures, should they be required. ➢ Installation of screening structures and/ or planting of trees to block shadows cast by the turbines on the identified affected receptors. Investigate the use of turbine control strategies which shut down the offending turbines when shadow flicker is likely to occur on identified receptors is investigated.		
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.		

- **ANCILLARY INFRASTRUCTURE**

On-site ancillary infrastructure associated with the Soyuz 5 WEF includes a permanent laydown area, Battery Energy Storage System (BESS), internal overhead lines between the substations, permanent met masts, three on-site substations, access roads to and between project components inclusive of stormwater infrastructure, as well as operation and maintenance buildings, including a gate house, security building, control centre, offices, warehouses and workshops, etc. No dedicated viewshed analyses have been generated for the ancillary

infrastructure, as the range of visual exposure will fall within (and be overshadowed by) that of the turbines. The anticipated visual impact resulting from this infrastructure is likely to be of **moderate** significance both before and after mitigation.

Nature of Impact: Visual impact of ancillary infrastructure on observers in close proximity to the proposed development		
	No mitigation	***Mitigation considered***
Extent	Neighbourhood **(4)**	Neighbourhood **(4)**
Duration	Long **(4)**	Long **(4)**
Magnitude	Moderate **(6)**	Moderate **(6)**
Probability	Probable **(3)**	Probable **(3)**
Significance	Moderate **(42)**	Moderate **(42)**
Status (positive or negative)	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mitigation potential	Difficult	
Mitigation / Management: Planning: ➢ Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site. Operations: ➢ Maintain the general neat and tidy appearance of the infrastructure. Decommissioning: ➢ Remove infrastructure not required for the post-decommissioning use. Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.		
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.		

9.2.2 Secondary Impacts

- **POTENTIAL VISUAL IMPACT OF FACILITY OPERATIONS ON THE VISUAL CHARACTER OF THE LANDSCAPE AND SENSE OF PLACE OF THE REGION**

Sense of place refers to a unique experience of an environment by a user, based on his or her cognitive experience of the place. Visual criteria and specifically the visual character of an area (informed by a combination of aspects such as topography, level of development, vegetation, noteworthy features, cultural / historical features, etc.) play a significant role. A visual impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light. In general, the landscape character of the greater study area and site itself presents as rural in character with wide open, undeveloped landscapes. The visual quality of the region is generally high with tracts of intact vegetation as well as, hills and rocky outcrops characterising most of the visual environment. As such, the entire study area is considered sensitive to visual impacts due to its generally low levels of

transformation. The anticipated visual impact on the visual character and sense of place of the study area is expected to be of **high** significance. No mitigation is possible within this environment and for a facility of this scale, but measures have been included as best practice guidelines. The table below illustrates the assessment of this anticipated impact.

Nature of Impact: Visual impact of the proposed development on the visual quality of the landscape and sense of place of the region		
	No mitigation	***Mitigation considered***
Extent	Region **(1)**	Region **(1)**
Duration	Long **(4)**	Long **(4)**
Magnitude	Very high **(10)**	Very high **(10)**
Probability	Definite **(5)**	Definite **(5)**
Significance	High **(75)**	High **(75)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mitigation potential	Very Difficult	

Mitigation / Management:

Planning:

- Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint.
- Plan ancillary infrastructure in such a way and in such a location that clearing of vegetation is minimised.
- Use existing roads wherever possible. Where new roads are required to be constructed, these should be planned carefully, taking due cognisance of the local topography. Roads should be laid out along the contour wherever possible, and should never traverse slopes at 90 degrees. Construction of roads should be undertaken properly, with adequate drainage structures in place to forego potential erosion problems.

Construction:

- Rehabilitate all construction areas.
- Ensure that vegetation is not cleared unnecessarily to make way for infrastructure.

Operations:

- Maintain the general neat and tidy appearance of the facility as a whole.
- Monitor rehabilitated areas, and implement remedial action as and when required.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site.
- Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.
- Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Cumulative impacts:

The construction and operation of the Soyuz 5 WEF (75 turbines) together with the other five proposed facilities that form part of the Britstown Wind Farm Cluster is expected to contribute to the increased cumulative visual impact of renewable energy facilities in the region.

Residual impacts:

The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

9.2.3 Cumulative Impact Assessment

Cumulative visual impacts can be defined as the additional changes caused by a proposed development in conjunction with other similar developments or as the combined effect of a set of developments. In practice, the terms 'effects' and 'impacts' are used interchangeably. Cumulative visual impacts may be:

- Combined, where the wind turbines of several WEFs are within the observer's arc of vision at the same time;
- Successive, where the observer has to turn his or her head to see the various WEF's wind turbines; and
- Sequential, when the observer has to move to another viewpoint to see different developments, or different views of the same development (such as when travelling along a route).

It is a requirement that a visual specialist identify and quantify the cumulative visual impacts of a proposed development, propose potential mitigating measures and conclude if the proposed development will result in any acceptable loss of visual resources taking into consideration the other proposed and operational projects in the area. A cumulative visual impact can be defined as the combined or incremental effects resulting from changes caused by a proposed development in conjunction with other existing or proposed activities. The cumulative impact assessed in the table below will consist of the combined impact of the proposed Soyuz 5 WEF and the five other proposed facilities that form part of the Britstown Wind Farm Cluster. Cumulative visual impacts may be experienced as a result of where a combination of several WEF's turbines is within a receptors line of sight at the same time, where the receptor has to turn their head to see several of the turbines of the different WEF's or when the receptor has to move from one viewpoint to another to either see different developments or different views of the same development (such as when travelling along a road). The cumulative visual impact is not just the totality of the impacts of two developments. The combined impact may be greater than the sum of the two individual developments, or in rare cases even less. The cumulative visual impact is assessed as the product of the distance between the individual WEFs (or turbines), the total distance over which the turbines are visible, the general character of the landscape and its sensitivity to that specific typology of development, the location and design of the WEFs themselves and lastly the way in which the landscape is experienced by the sensitive receptors. The table below illustrates the assessment of the anticipated cumulative visual impact of infrastructure on sensitive visual receptors within the region. The cumulative visual impacts are likely to be of **high** significance when the proposed Soyuz 5 WEF and the five other proposed facilities that form part of the Britstown Wind Farm Cluster are in operation.

Nature of Impact: The potential cumulative visual impact of the proposed Soyuz 5 WEF and the five other proposed facilities that form part of the Britstown Wind Farm Cluster on sensitive visual receptors within the region		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Region **(1)**	Region **(1)**
Duration	Long **(4)**	Long **(4)**
Magnitude	High **(8)**	Very High **(10)**
Probability	Highly Probable **(4)**	Definite **(5)**
Significance	Moderate **(52)**	High **(75)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	

Mitigation potential	Very Difficult
Mitigation / Management: Not Applicable	
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.	

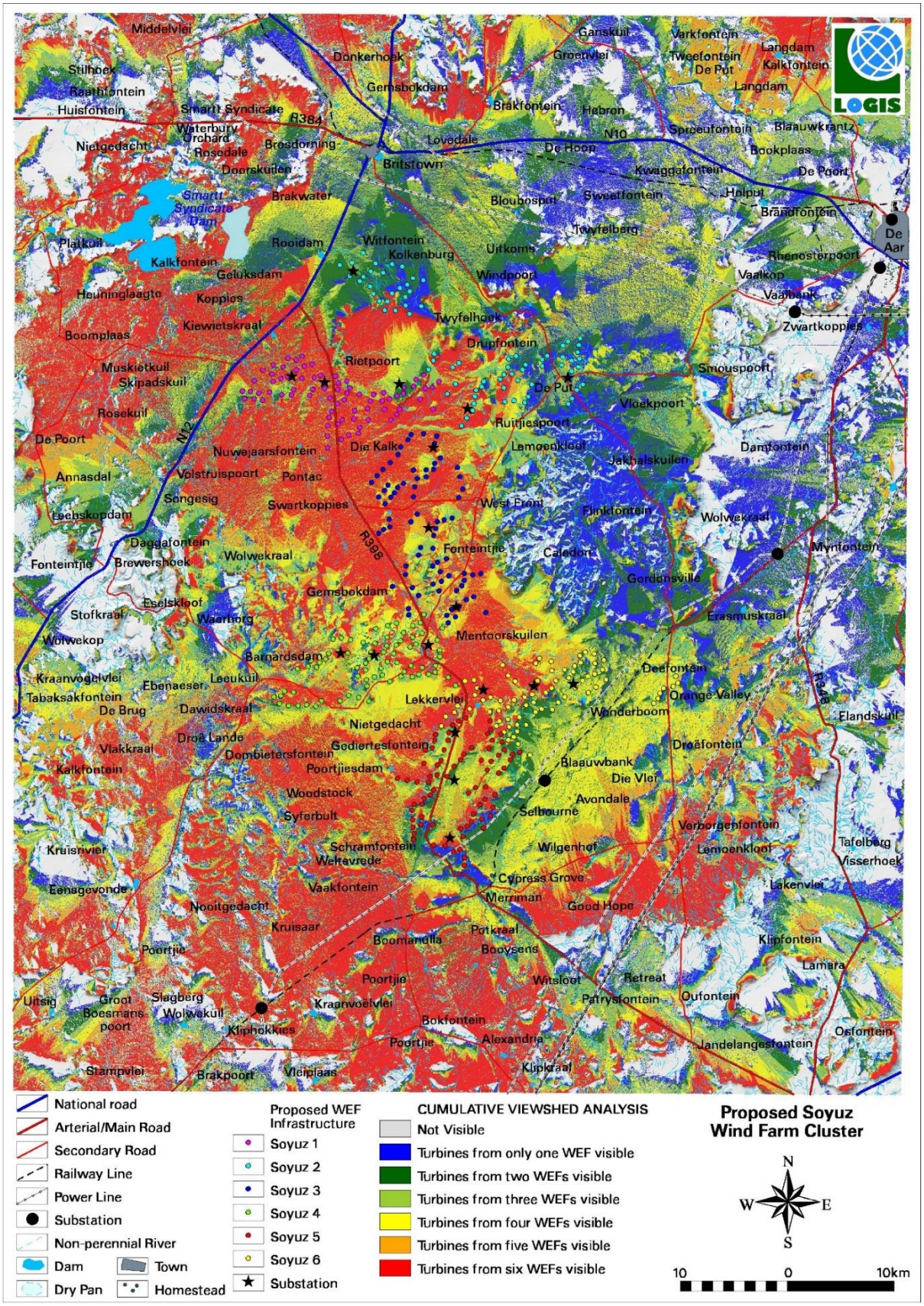

Figure 9-1: Cumulative viewshed analysis for Britstown Wind Farm Cluster

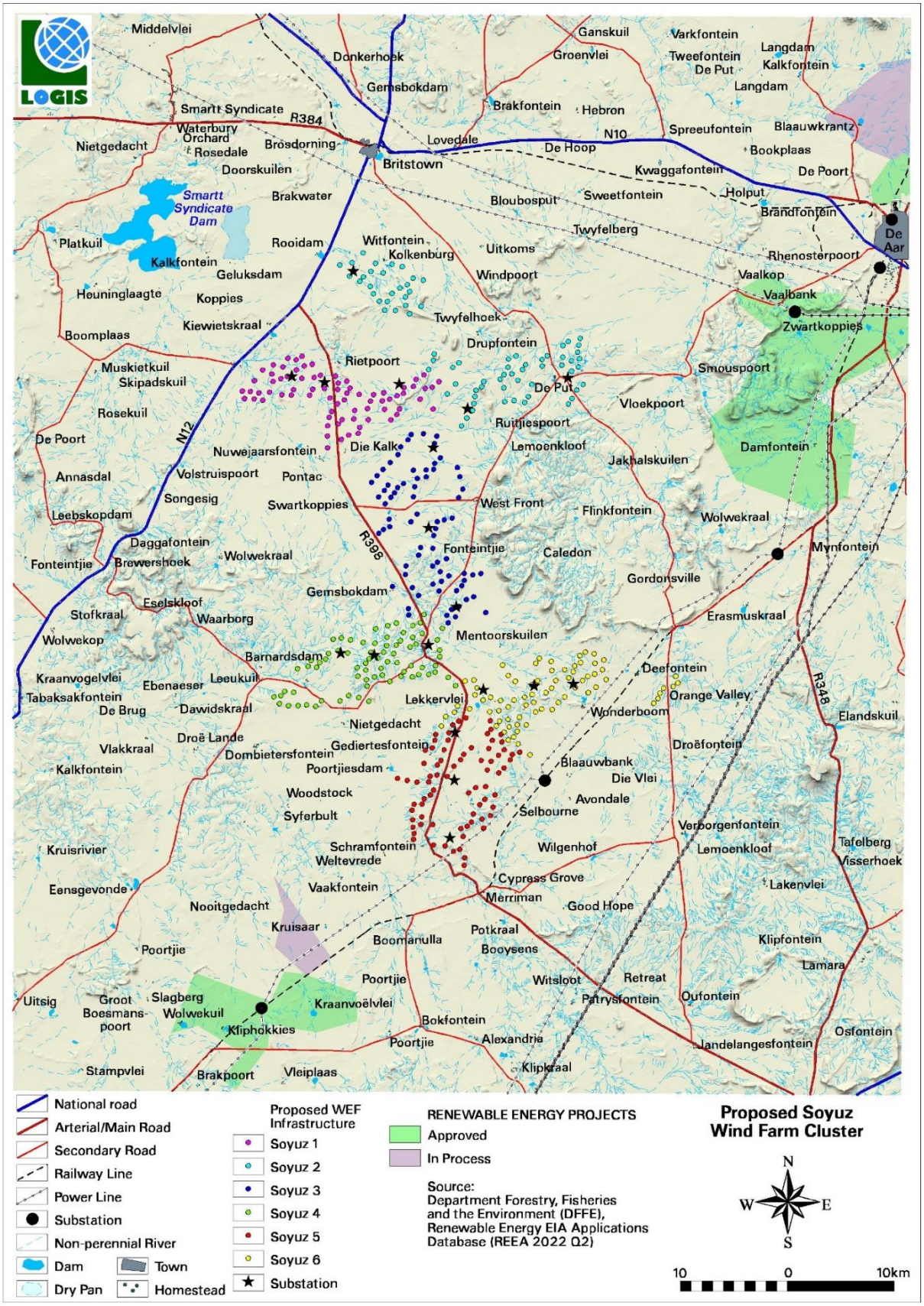

Figure 9-2: Authorized renewable energy projects within the region

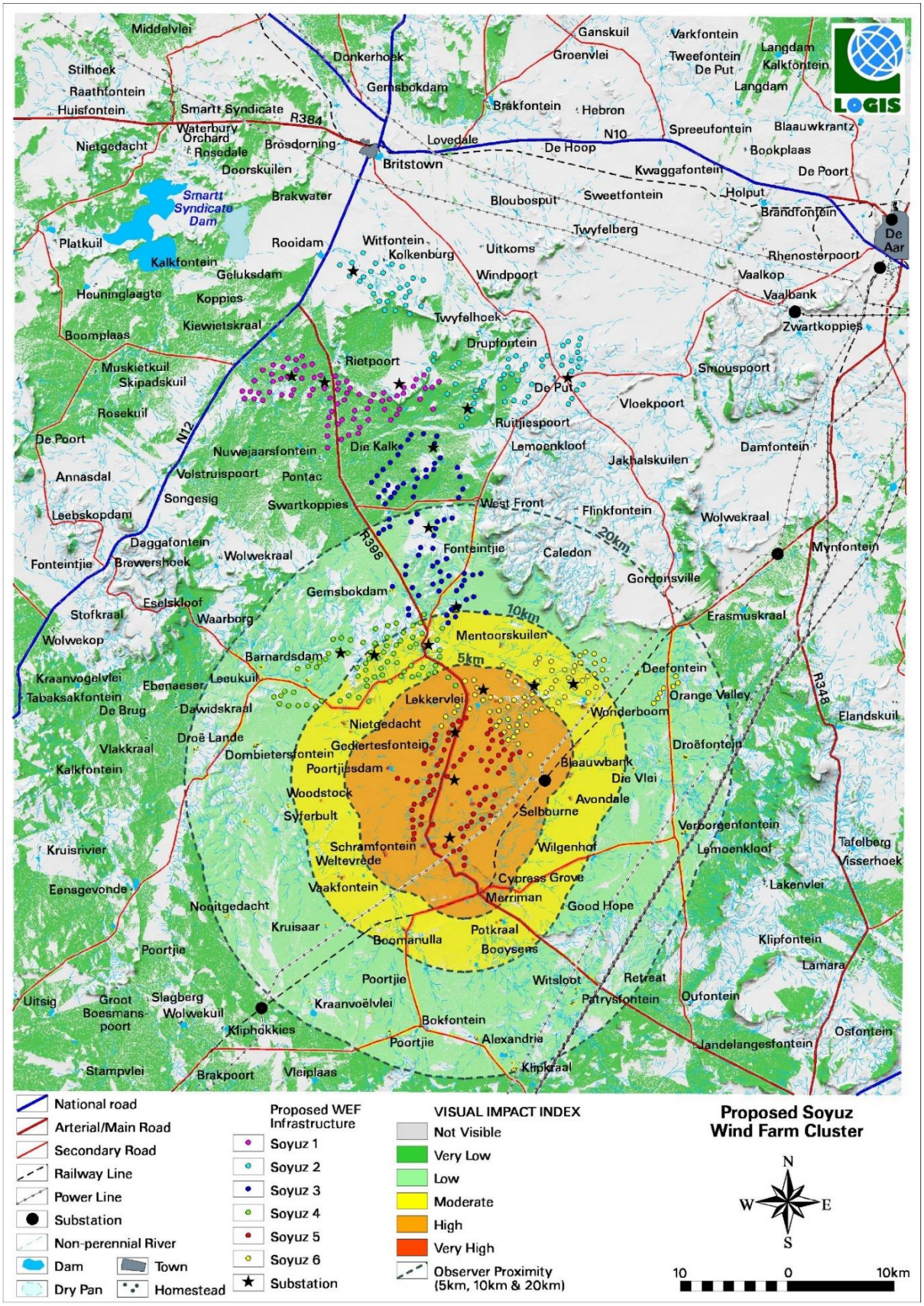

Figure 9-3: Visibility Index illustrating the frequency of exposure of the proposed Soyuz 5 WEF layout

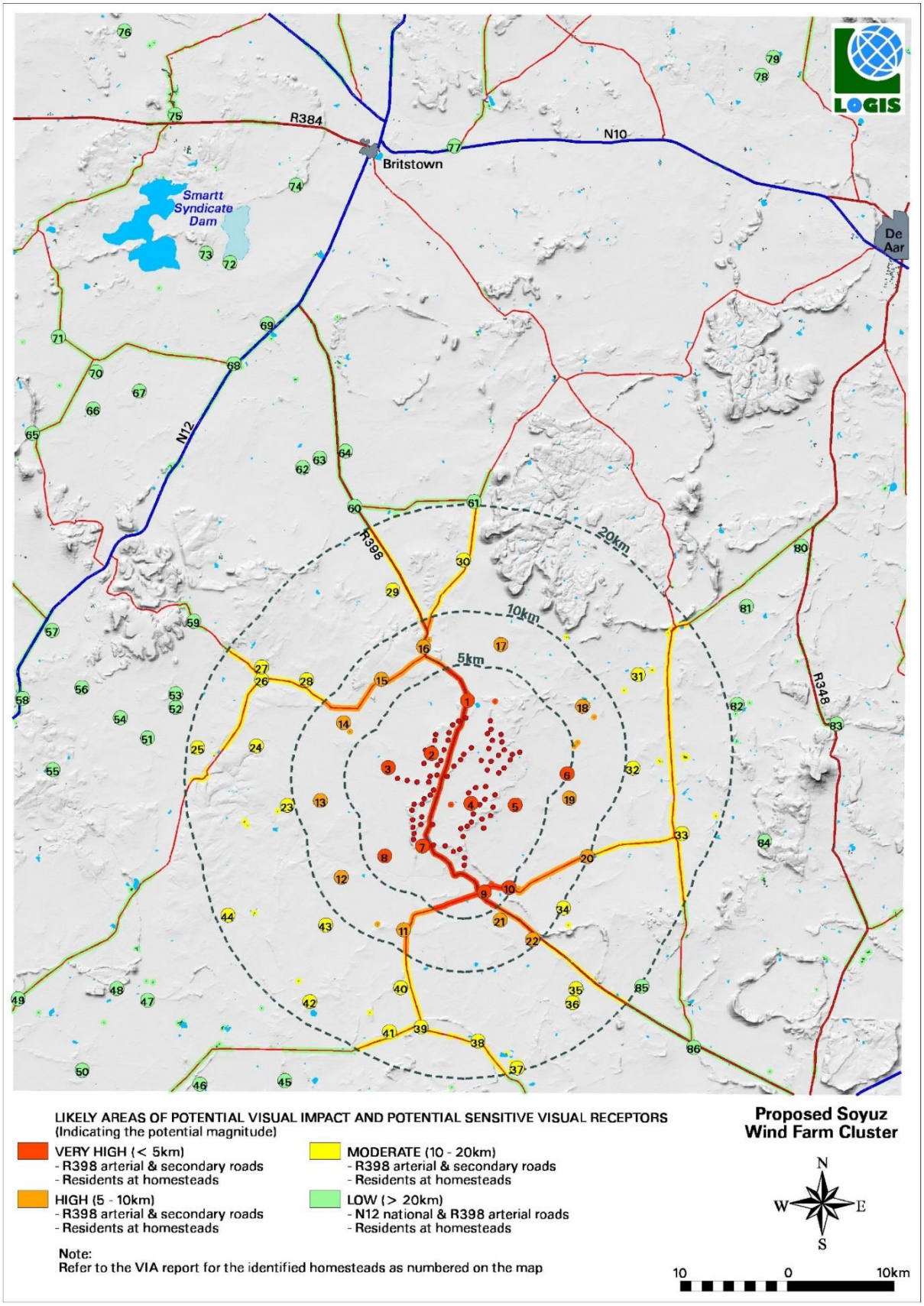

Figure 9-4: Likely areas of potential visual impact and potential sensitive visual receptors F

10 HERITAGE MANAGEMENT

10.1 HERITAGE SITE MANAGEMENT

Recommendations for relevant heritage resource management actions are vital to the conservation of heritage resources. A general guideline for recommended management actions is included in Section 10.4 of Addendum 3.

OBJECTIVE: ensure conservation of heritage resources of significance, prevent unnecessary disturbance and/or destruction of previously undetected heritage receptors.

*For the wide-spread Stone Age occurrences and observations of low significance (**S5WEF01 - S5WEF34**) across the project area the following are required in terms of heritage management and mitigation:*

POTENTIAL IMPACT	Damage/destruction of sites.		
ACTIVITY RISK/SOURCE	Digging foundations and trenches into sensitive deposits that are not visible at the surface.		
MITIGATION: TARGET/OBJECTIVE	To locate previously undetected heritage remains / graves as soon as possible after disturbance so as to maximize the chances of successful rescue/mitigation work.		
MITIGATION: ACTION/CONTROL		**RESPONSIBILITY**	**PROJECT COMPONENT/S**
Site Monitoring: General Site Monitoring in order to detect the presence of and limit impact on previously undocumented heritage receptors during construction / site clearing / earth moving.		ECO	**Construction**
Site Monitoring: General Site Monitoring in order to detect the presence of and limit impact on previously undocumented heritage receptors during construction / site clearing / earth moving.		ECO	**Operation**
Site Monitoring: General Site Monitoring in order to detect the presence of and limit impact on previously undocumented heritage receptors during construction / site clearing / earth moving.		ECO, HERITAGE ASSESSMENT PRACTITIONER	**Closure / Decommissioning**
PERFORMANCE INDICATOR	Archaeological sites are discovered and mitigated with the minimum amount of unnecessary disturbance.		

10.2 MITIGATION OF VISUAL IMPACTS

The primary visual impact, namely the appearance of the Wind Energy Facility (the wind turbines) is not possible to mitigate. The functional design of the turbines cannot be changed in order to reduce visual impacts. Alternative colour schemes (i.e., painting the turbines sky-blue, grey or darker shades of white) are not permissible as the CAA's *Marking of Obstacles* expressly states, "*Wind turbines shall be painted bright white to provide the maximum daytime conspicuousness*". Failure to adhere to the prescribed colour specifications will result in the fitting of supplementary daytime lighting to the wind turbines, once again aggravating the visual impact. The overall potential for mitigation is therefore generally low or non-existent. The following mitigations are however possible:

- Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint.

- Plan ancillary infrastructure (i.e., substation and workshop) in such a way and in such a location that clearing of vegetation is minimised. Consolidate existing infrastructure as much as possible, and make use of already disturbed areas rather than pristine sites wherever possible.
- Use existing roads wherever possible. Where new roads are required to be constructed, these should be planned carefully, taking due cognisance of the local topography. Roads should be laid out along the contour wherever possible, and should never traverse slopes at 90 degrees. Construction of roads should be undertaken properly, with adequate drainage structures in place to forego potential erosion problems.
- Access roads, which are not required post-construction, should be ripped and rehabilitated.
- The Civil Aviation Authority (CAA) prescribes that aircraft warning lights be mounted on the turbines. However, it is possible to obtain permission to mount these lights on the turbines representing the outer perimeter of the facility. In this manner, fewer warning lights can be utilised to delineate the facility as one large obstruction, thereby lessening the potential visual impact. It is therefore recommended that the possibility of this be investigated.
- Install aircraft warning lights that only activate when the presence of an aircraft is detected, if permitted by CAA.
- Mitigation of visual impacts associated with the construction phase, albeit temporary, entails proper planning, management and rehabilitation of all construction sites. Construction should be managed according to the following principles:
  - Ensure that vegetation is not unnecessarily cleared or removed during the construction period.
  - Reduce the construction period through careful logistical planning and productive implementation of resources.
  - Plan the placement of lay-down areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e., in already disturbed areas) wherever possible.
  - Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.
  - Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.
  - Reduce and control construction dust through the use of approved dust suppression techniques as and when required (i.e., whenever dust becomes apparent).
  - Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.
  - Ensure that all infrastructure and the site and general surrounds are maintained and kept neat.
  - Rehabilitate all disturbed areas, construction areas, roads, slopes etc. immediately after the completion of construction works. If necessary, an ecologist should be consulted to assist or give input into rehabilitation specifications.
  - Monitor all rehabilitated areas for at least a year for rehabilitation failure and implement remedial action as required. If necessary, an ecologist should be consulted to assist or give input into rehabilitation specifications.
- Mitigation of other lighting impacts includes the pro-active design, planning and specification lighting for the facility. The correct specification and placement of lighting and light fixtures will go far to contain rather than spread the light. Additional measures include the following:
  - Shielding the sources of light by physical barriers (walls, vegetation, or the structure itself);
  - Limiting mounting heights of lighting fixtures, or alternatively using foot-lights or bollard level lights;
  - Making use of minimum lumen or wattage in fixtures;
  - Making use of down-lighters, or shielded fixtures;
  - Making use of Low-Pressure Sodium lighting or other types of low impact lighting.

- Making use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.

- Mitigation of show flicker impacts of concern:
  - Adjust wind turbine locations to reduce the number of receptors likely to experience shadow flicker.
  - Consult with participating landowners or identified receptors who may experience shadow flicker impacts to identify feasible and reasonable management and mitigation measures, should they be required.
  - Installation of screening structures and/ or planting of trees to block shadows cast by the turbines on the identified affected receptors.
  - Investigate the use of turbine control strategies which shut down the offending turbines when shadow flicker is likely to occur on identified receptors is investigated.
- During Operations, monitor the general appearance of the facility as a whole, as well as all rehabilitated areas.
  - The maintenance of the turbines and ancillary structures and infrastructure will ensure that the facility does not degrade, thus aggravating visual impact. Implement remedial action where required.
  - Where sensitive visual receptors are likely to affected, it is recommended that the developer enter into negotiations regarding the potential screening of visual impacts at the receptor site. This may entail the planting of vegetation, trees or even the construction of screens. Ultimately, visual screening is most effective when placed at the receptor itself.
  - Roads must be maintained to forego erosion and to suppress dust, and rehabilitated areas must be monitored for rehabilitation failure. Remedial actions must be implemented as a when required.
- After decommissioning, all infrastructure should be removed and all disturbed areas appropriately rehabilitated. Monitor rehabilitated areas post-decommissioning and implement remedial actions and consult an ecologist regarding rehabilitation specifications if necessary.

The possible mitigation of both primary and secondary visual impacts as listed above should be implemented and maintained on an on-going basis.

11 CONCLUSION AND RECOMMENDATIONS

In terms of heritage potential, archaeological resources are abundant in the surroundings of Britstown where the project landscape holds the entire range of the Stone Age sequence including ESA, MSA and LSA materials. In addition, the landscape includes a Colonial frontier including signs of historical farming and battlegrounds. Cognisant thereof, the following recommendations are made based on general observations in the proposed Soyuz 5 Wind Energy Facility Project area:

- Stone Age remains occur abundantly in the project landscape (observations at **S5WEF01 - S5WEF34**) where locally available raw material for the manufacture of stone tools is available in the geological setting. Most of the artefacts are probably Middle Stone Age (MSA) lithics such as blades, scrapers, chunks and cores produced on locally sourced hornfels, dolerite and siltstones. Despite the high number of observations of artefacts and high densities in places, these resources are common and representative of similar scatters across widespread areas of the Karoo. The widespread but ephemeral scatters are often of low heritage value due to temporally mixed contexts and the frequent absence of faunal, organic and other cultural remains which is scattered over thousands of square kilometres of the Karoo. The Stone Age localities are not conservation-worthy and even though the resources may be destroyed during construction, the impact is inconsequential.
- Khoekhoen pastoralist rock art is known to occur along dolerite hills and outcrops in the larger landscape around Britstown. Many of the dolerite hills and outcrops occurring in the project area have been removed from developable areas and layouts and no rock art was noted within the context of dolerite hills in the project areas.
- The term “Living Heritage” can broadly refer to a place of cultural heritage and sacred nature; with cultural attributions that are not generally physically manifested. Ritual and symbolic spaces and practices, and the material residues thereof convey an intangible cultural significance beyond the physical site or artefact, where the meaning of the ritual area speaks directly of a sense of place and lived experience. Such sites might occur on the project area or it surroundings and due cognisance should be taken of these sites of “Living Heritage” in the cultural landscape. In addition, it is possible that groups, farmers and locals living in the area have occupied the region for many generations and have expressed long-term cultural associations with the region. Therefore, it is important to ascertain from these respondents whether there are any further undetected sites of cultural significance in the area to which they relate and / or attach cultural meaning.
- It is assumed that findings in this assessment provides an accurate representation of the heritage landscape and potential site sensitivities. Still, it is recommended that final site walkovers be conducted of potential heritage sensitive zones in areas where turbine positions and access road alignments have been changed significantly prior to construction. In addition, site walkovers of potential heritage sensitive zones in the proposed 132kV OHL line alignments, laydown areas, construction camps and BESS areas will be required prior to construction.
- Considering the localised nature of heritage remains, the general monitoring of the development progress by an ECO or by the heritage specialist is recommended for all stages of the project. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during construction activities, all activities should be suspended and the archaeological specialist should be notified immediately.

In addition to these site-specific recommendations, careful cognizance should be taken of the following:

- As Palaeontological remains occur where bedrock has been exposed, all geological features should be regarded as sensitive.

- Water sources such as drainage lines, fountains and pans would often have attracted human activity in the past. As Stone Age material occur in the larger landscape, such resources should be regarded as potentially sensitive in terms of possible subsurface deposits.

In light of the results and findings of the Visual Impact Assessment undertaken for the Soyuz 5 WEF proposed, it is acknowledged that the receiving environment will be significantly visually transformed for the entire operational lifespan of the facility. The following is a summary of the impacts assessed:

- The potential visual impact of construction on sensitive visual receptors in close proximity to the facility is likely to be of **high** significance before mitigation and **moderate** significance post mitigation.
- The potential visual impact of facility operations on sensitive visual receptors in close proximity (within 5km) to the proposed facility is likely to be of **very high** significance. No mitigation is possible for a facility of this scale.
- The potential visual impact of facility operations on sensitive visual receptors within the local area (between 5 - 10km offset) to the proposed facility is likely to be of **high** significance. No mitigation is possible for a facility of this scale.
- The potential visual impact of facility operations on sensitive visual receptors within the district (between 10 - 20km offset) to the proposed facility is likely to be of **moderate** significance. No mitigation is possible for a facility of this scale.
- The potential visual impact of facility operations on sensitive visual receptors within the region (beyond the 20km offset) to the proposed facility is likely to be of **low** significance. No mitigation is possible for a facility of this scale.
- The anticipated visual impact of operational lighting at night on sensitive visual receptors within the study area is likely to be of **high** significance and may be mitigated to **moderate** should the possible best practice mitigation measures be implemented and approval for changes to the CAA lighting is approved.
- The expected visual impact of shadow flicker on sensitive receptors in close proximity to the proposed development is likely to be of **high** significance before mitigation and **moderate** significance post mitigation.
- The expected visual impact of ancillary infrastructure on sensitive receptors in close proximity to the proposed development is likely to be of **moderate** significance.
- The potential visual impact of the proposed facility operations on the visual quality of the landscape and sense of place of the region is likely to be of **high** significance. No mitigation is possible for a facility of this scale.
- The cumulative visual impacts are likely to be of **high** significance when the proposed Soyuz 5 WEF and the five other proposed facilities that form part of the Britstown Wind Farm Cluster within the study area are in operation.

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13 ADDENDUM 1: SPECIALIST CV

NELIUS LE ROUX KRUGER

BHCS Hons. (Archaeology)

(Date compiled: 2023/01/10)

PERSONAL DETAILS

Nationality:	South African
Date of Birth:	3 April 1979
Postal Address:	Postnet Suite 74, Private Bag x04, Menlo Park, 0102
Work Address:	70 Regency Dr, Route 21 Business Park, Centurion, 0178
Telephone numbers:	W: +27 12 751 2160 C: +27 82 967 2131
Identity number:	790403 5029 087
Languages:	English, Afrikaans, Sepedi (Basic)

HIGHER EDUCATION

University Attended:	University of the Pretoria
Degree Obtained:	BA Archaeology *(Cum Laude)* 2002
Major Subjects:	Anthropology, Archaeology, English, Afrikaans
University Attended:	University of the Pretoria
Degree Obtained:	BHCS Hons. Archaeology (*Cum Laude)* 2004

PROFESSIONAL AFFILIATIONS

- Member of the Association for South African Professional Archaeologists (ASAPA).
- Member of the Council of the Association for South African Professional Archaeologists (ASAPA): CRM Portfolio
- Member of the CRM Section of the Association for South African Professional Archaeologists (ASAPA).
- Member of the Society of Africanist Archaeologists (SAFA).
- Member of the South African Museums Association (SAMA).
- Accredited Professional Archaeologist & CRM Practitioner by the Association for South African Professional Archaeologists (ASAPA) & Heritage Natal (AMAFA).

HONOURS AND AWARDS

Aage V. Jensen Development Foundation (Denmark) grant for participation in the joint SAFA/PAA Congress, Dakar, Senegal (2010).

Five Hundred Years Initiative (NRF) Research Grant (2008 – 2009).

University of Pretoria post-graduate Merit Grant for MA studies in Archaeology (2004 – 2008).

University of Pretoria (CINDEK) bursary for post-graduate studies awarded by the Centre of Indigenous Knowledge (2003).

South African Archaeological Society's Hanisch Award for best graduate student in the Department of Anthropology and Archaeology at the University of Pretoria (2003).

University of Pretoria Academic Honorary Colours (2002).

University of Pretoria Graduate Merit Grant (2002).

University of Pretoria honorarium for archaeological collections management at the Department of Archaeology and Anthropology (2001).

CURRENT STATUS

Heritage Resources Manager for CES

SPECIALITY FIELDS

- Integrated Heritage and Archaeological Impact Assessment (Phase 1, 2 & 3), complying to SAHRA, PHRA and industry standards for heritage impact assessments.

- Industry standard Heritage Resources Management Plans, complying to SAHRA & PHRA standards for heritage impact assessments.

- Heritage destruction / alteration / excavation permitting facilitation and associated research.

- General facilitation in consultation and negotiation with heritage resources authorities (SAHRA, PHRA's).

- Heritage-related social consultation and focus group facilitation (for example, with Interested and Affected parties).

- Historical and anthropological studies.

- Heritage and Social Spatial Development Frameworks & Strategic Development Area Frameworks for municipalities.

- Industry standard and compliant Social Impact Assessments (SIA's).

- Mine Social and Labour Plans (SLP's)and social facilitation.

- Socio-cultural baseline studies and research.

- GIS and geo-spatial referencing and data analysis, heritage and social mapping.

PROFESSIONAL SKILLS & EXPERIENCE

Nelius Le Roux Kruger is an accredited ASAPA (Association of Southern African Professional Archaeologists) archaeologist and Culture Resources Management (CRM) Practitioner with over 15 years' experience in the fields of heritage resources assessment, conservation management and social studies. In addition, he is involved in various aspects of social research and social impact assessment. He holds a BHCS (Hons) Archaeology degree from the University of Pretoria specializing in the Iron Age Farmer and Colonial Periods of South Africa. He has worked extensively on archaeological and heritage sites of the time periods and cultural contexts present in Southern Africa, both in the commercial and academics spheres and he holds vast experience in human remains relocation and related social consultation. Nelius has conducted social research projects across Southern Africa involving Social Impact Assessments as well as the compilation and monitoring of mining social and labor plans, public meeting facilitation and socio-cultural studies. His experience is not limited to South Africa and he has worked on archaeological and socio-cultural research projects across Africa and the Middle East. His publication record includes a number of academic publications in peer reviewed journals and books as well as a vast number of Heritage Management Reports. Nelius' expertise includes CRM assessment and management, applications in heritage legislation, Social Impact Assessment, social consulting as well as geospacing and Geographical Information Systems (GIS) applications in archaeology and CRM. Nelius is a conscientious and committed archaeologist and social scientist who is dedicated to the professionalism of the discipline of archaeology and social studies. He approaches all aspects of his specialst fields with enthusiasm, maintaining best practise at all times. When working with people, he strives to manage interpersonal communication and group dynamics with dedication, promoting positive group cohesion.

SELECTED PUBLICATIONS

Kruger, N. In Prep. Living the frontier: Ritual and Conflict in Ha-Tshirundu.
Kruger, N. 2016. Forthcoming. The Crocodile in his Pool: Notes on a significant find in the Ha-Tshirundu area, Limpopo Valley, South Africa. Nyame Akuma Bulletin of the Association of Africanist Archaeologists.
Antonites, A. & Kruger, N. et al. 2014. Report on excavations at Penge, a frst-millennium Doornkop settlement. Southern African Humanties 26:177-92
Antonites, A. & Kruger, N. 2012. **A Preliminary Assessment of Animal Distribution on a 19th Century VhaVenda Settlement. Nyame** Akuma Bulletin of the Association of Africanist Archaeologists. 2012:77
Kruger, N. In Prep. Living the frontier: Ritual and Conflict in Ha-Tshirundu.
Kruger, N. 2009. Forthcoming. The Crocodile in his Pool: Notes on a significant find in the Ha-Tshirundu area, Limpopo Valley, South Africa. Nyame Akuma Bulletin of the Association of Africanist Archaeologists.
Kruger, N. 2008. Ha Tshirundu: Landscape, Lived experience and Land Reform. Poster presented at the South African Association for Archaeologists Biannual Congress, Cape Town, March 2008.

Mathers, K. & Kruger, N. 2008. The Past is another Country: Archaeology in the Limpopo Province in Smith, A. & Gazin-Schwartz, A (Eds.). 2008. Landscapes of Clearance: Archaeological and Anthropological Perspectives. California: Left Coast Press

SELECTED PROJECTS

NATIONAL

- Phase 1 Heritage Impact Assessment (HIA) and further heritage management for the upgrading of the Warrenton Anglo Boer War blockhouse, Warrenton, Northern Cape Province

- Phase 1 Heritage Impact Assessment (HIA) and Phase 2 Site Investigation for the restoration of the old Johannesburg Fort, Constitution Hill, Johannesburg, Gauteng Province

- Phase 1 Heritage Impact Assessment (HIA) and further heritage management for the upgrading/refurbishment of the Burgershoop MPCC, Mogale City, Gauteng Province

- Phase 1 Heritage Impact Assessment (HIA) of historical period heritage sites on the farm Roodekrans, Dullstroom area, Mpumalanga Province

- Phase 1 Heritage Impact Assessment (HIA) of a historical bridge on the farm Pienaarspoort 339jr at Delfsand, Gauteng Province

- Phase 1 Heritage Impact Basements (HIAs) for 20 PV Solar Parks on location at Upington, Kimberley, Vryburg, Kuruman, Kathu, Hotazel, Douglas, Groblershoop and Prieska, Northern Cape Province, South Africa.

- Phase 1 Heritage Impact Assessments (HIAs) for 18 large scale water supply projects on location at East London, Mthatha, Ngcobo, Barley East, Elliot, Cathcart, King Williams Town and Mdantsane, Eastern Cape Province, South Africa.

- Phase 1 Heritage Impact Assessments (HIAs) for more than 40 residential infrastructure developments across South Africa.

INTERNATIONAL

- Heritage Impact Assessment for the Kitumba Copper-Gold Project (KCGP), Zambia

- Heritage Scoping Study for the BTR Kitumba Project, Mumbwa, Zambia

- Heritage Scoping Study for the Buckreef Gold Project, Geita, Tanzania

- Phase 2 mitigation and heritage assessment of the Koidu Monkey Hill Iron Age metallurgy site, Koidu Diamond Mine, Sierra Leone

- Phase 2 heritage site mitigation of the Sessenge archaeological site, Kibali Gold Mine,Democratic Republic of the Congo.

14 ADDENDUM 2: HERITAGE LEGISLATION

14.1 CRM: LEGISLATION, CONSERVATION AND HERITAGE MANAGEMENT

The broad generic term Cultural Heritage Resources refers to any physical and spiritual property associated with past and present human use or occupation of the environment, cultural activities and history. The term includes sites, structures, places, natural features and material of palaeontological, archaeological, historical, aesthetic, scientific, architectural, religious, symbolic or traditional importance to specific individuals or groups, traditional systems of cultural practice, belief or social interaction.

14.1.1 Legislation regarding archaeology and heritage sites

The South African Heritage Resources Agency (SAHRA) and their provincial offices aim to conserve and control the management, research, alteration and destruction of cultural resources of South Africa. It is therefore vitally important to adhere to heritage resource legislation at all times.

a. National Heritage Resources Act No 25 of 1999, section 35

According to the National Heritage Resources Act of 1999 a historical site is any identifiable building or part thereof, marker, milestone, gravestone, landmark or tell older than 60 years. This clause is commonly known as the "60-years clause". Buildings are amongst the most enduring features of human occupation, and this definition therefore includes all buildings older than 60 years, modern architecture as well as ruins, fortifications and Iron Age settlements. "Tell" refers to the evidence of human existence which is no longer above ground level, such as building foundations and buried remains of settlements (including artefacts).

The Act identifies heritage objects as:

- objects recovered from the soil or waters of South Africa including archaeological and palaeontological objects, meteorites and rare geological specimens
- visual art objects
- military objects
- numismatic objects
- objects of cultural and historical significance
- objects to which oral traditions are attached and which are associated with living heritage
- objects of scientific or technological interest
- any other prescribed category

With regards to activities and work on archaeological and heritage sites this Act states that:

"No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit by the relevant provincial heritage resources authority." (34. [1] 1999:58)

and

"No person may, without a permit issued by the responsible heritage resources authority-

(d) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;

(e) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;

(f) trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or

(g) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites. (35. [4] 1999:58)."

and

"No person may, without a permit issued by SAHRA or a provincial heritage resources agency-

(h) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;

(i) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority;

(j) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) and excavation equipment, or any equipment which assists in the detection or recovery of metals (36. [3] 1999:60)."

b. Human Tissue Act of 1983 and Ordinance on the Removal of Graves and Dead Bodies of 1925

Graves 60 years or older are heritage resources and fall under the jurisdiction of both the National Heritage Resources Act and the Human Tissues Act of 1983. However, graves younger than 60 years are specifically protected by the Human Tissues Act (Act 65 of 1983) and the Ordinance on the Removal of Graves and Dead Bodies (Ordinance 7 of 1925) as well as any local and regional provisions, laws and by-laws. Such burial places also fall under the jurisdiction of the National Department of Health and the Provincial Health Departments. Approval for the exhumation and re-burial must be obtained from the relevant Provincial MEC as well as the relevant Local Authorities.

14.1.2 Background to HIA and AIA Studies

South Africa's unique and non-renewable archaeological and palaeontological heritage sites are 'generally' protected in terms of the National Heritage Resources Act (Act No 25 of 1999, section 35) and may not be disturbed at all without a permit from the relevant heritage resources authority. Heritage sites are frequently threatened by development projects and both the environmental and heritage legislation require impact assessments (HIAs & AIAs) that identify all heritage resources in areas to be developed. Particularly, these assessments are required to make recommendations for protection or mitigation of the impact of the sites. HIAs and AIAs should be done by qualified professionals with adequate knowledge to (a) identify all heritage resources including archaeological and palaeontological sites that might occur in areas of developed and (b) make recommendations for protection or mitigation of the impact on the sites.

The National Heritage Resources Act (Act No. 25 of 1999, section 38) provides guidelines for Cultural Resources Management and prospective developments:

"38. *(1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as:*

(a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;

(b) the construction of a bridge or similar structure exceeding 50m in length;

(c) any development or other activity which will change the character of a site:

(i) exceeding 5 000 m^2 in extent; or

(ii) involving three or more existing erven or subdivisions thereof; or

(iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or

(iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;

(d) the re-zoning of a site exceeding 10 000 m^2 in extent; or

(e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority,

must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development."

And:

"The responsible heritage resources authority must specify the information to be provided in a report required in terms of subsection (2)(a): Provided that the following must be included:

(k) The identification and mapping of all heritage resources in the area affected;

(l) an assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 6(2) or prescribed under section 7;

(m) an assessment of the impact of the development on such heritage resources;

(n) an evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;

(o) the results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;

(p) if heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and

(q) plans for mitigation of any adverse effects during and after the completion of the proposed development (38. [3] 1999:64)."

Consequently, section 35 of the Act requires Heritage Impact Assessments (HIAs) or Archaeological Impact Assessments (AIAs) to be done for such developments in order for all heritage resources, that is, all places or objects of aesthetics, architectural, historic, scientific, social, spiritual, linguistic or technological value or significance to be protected. Thus any assessment should make provision for the protection of all these heritage components, including archaeology, shipwrecks, battlefields, graves, and structures older than 60 years, living heritage, historical settlements, landscapes, geological sites, palaeontological sites and objects. Heritage resources management and conservation.

14.2 ASSESSING THE SIGNIFICANCE OF HERITAGE RESOURCES

Archaeological sites, as previously defined in the National Heritage Resources Act (Act 25 of 1999) are places in the landscape where people have lived in the past – generally more than 60 years ago – and have left traces of their presence behind. In South Africa, archaeological sites include hominid fossil sites, places where people of the Earlier, Middle and Later Stone Age lived in open sites, river gravels, rock shelters and caves, Iron Age sites, graves, and a variety of historical sites and structures in rural areas, towns and cities. Palaeontological sites are those with fossil remains of plants and animals where people were not involved in the accumulation of the deposits. The basic principle of cultural heritage conservation is that archaeological and other heritage sites are valuable, scarce and *non-renewable.* Many such sites are unfortunately lost on a daily basis through development for housing, roads and infrastructure and once archaeological sites are damaged, they cannot be re-created as site integrity and authenticity is permanently lost. Archaeological sites have the potential to contribute to our understanding of the history of the region and of our country and continent. By preserving links with our past, we may not be able to revive lost cultural traditions, but it enables us to appreciate the role they have played in the history of our country.

- CATEGORIES OF SIGNIFICANCE

Rating the significance of archaeological sites, and consequently grading the potential impact on the resources is linked to the significance of the site itself. The significance of an archaeological site is based on the amount of deposit, the integrity of the context, the kind of deposit and the potential to help answer present research questions. Historical structures are defined by Section 34 of the National Heritage Resources Act, 1999, while other historical and cultural significant sites, places and features, are generally determined by community preferences. The guidelines as provided by the NHRA (Act No. 25 of 1999) in Section 3, with special reference to subsection 3 are used when determining the cultural significance or other special value of archaeological or historical sites. In addition, ICOMOS (the Australian Committee of the International Council on Monuments and Sites) highlights four cultural attributes, which are valuable to any given culture:

- *Aesthetic value:*

Aesthetic value includes aspects of sensory perception for which criteria can and should be stated. Such criteria include consideration of the form, scale, colour, texture and material of the fabric, the general atmosphere associated with the place and its uses and also the aesthetic values commonly assessed in the analysis of landscapes and townscape.

- *Historic value:*

Historic value encompasses the history of aesthetics, science and society and therefore to a large extent underlies all of the attributes discussed here. Usually a place has historical value because of some kind of influence by an event, person, phase or activity.

- *Scientific value:*

The scientific or research value of a place will depend upon the importance of the data involved, on its rarity, quality and on the degree to which the place may contribute further substantial information.

- *Social value:*

Social value includes the qualities for which a place has become a focus of spiritual, political, national or other cultural sentiment to a certain group.

It is important for heritage specialist input in the EIA process to take into account the heritage management structure set up by the NHR Act. It makes provision for a 3-tier system of management including the South Africa Heritage Resources Agency (SAHRA) at a national level, Provincial Heritage Resources Authorities (PHRAs) at a provincial and the local authority. The Act makes provision for two types or forms of protection of heritage resources; i.e. formally protected and generally protected sites:

Formally protected sites:

- Grade 1 or national heritage sites, which are managed by SAHRA
- Grade 2 or provincial heritage sites, which are managed by the provincial HRA (MP-PHRA).
- Grade 3 or local heritage sites.

Generally protected sites:

- Human burials older than 60 years.
- Archaeological and palaeontological sites.
- Shipwrecks and associated remains older than 60 years.
- Structures older than 60 years.

With reference to the evaluation of sites, the certainty of prediction is definite, unless stated otherwise and if the significance of the site is rated high, the significance of the impact will also result in a high rating. The same rule applies if the significance rating of the site is low. The significance of archaeological sites is generally ranked into the following categories.

Significance	Rating Action
No significance: sites that do not require mitigation.	None
Low significance: sites, which may require mitigation.	2a. Recording and documentation (Phase 1) of site; no further action required 2b. Controlled sampling (shovel test pits, auguring), mapping and documentation (Phase 2 investigation); permit required for sampling and destruction
Medium significance: sites, which require mitigation.	3. Excavation of representative sample, C14 dating, mapping and documentation (Phase 2 investigation); permit required for sampling and destruction [including 2a & 2b]
High significance: sites, where disturbance should be avoided.	4a. Nomination for listing on Heritage Register (National, Provincial or Local) (Phase 2 & 3 investigation); site management plan; permit required if utilised for education or tourism
High significance: Graves and burial places	4b. Locate demonstrable descendants through social consulting; obtain permits from applicable legislation, ordinances and regional by-laws; exhumation and reinternment [including 2a, 2b & 3]

Furthermore, the significance of archaeological sites was based on six main criteria:

- Site integrity (i.e. primary vs. secondary context),
- Amount of deposit, range of features (e.g., stonewalling, stone tools and enclosures),
- Density of scatter (dispersed scatter),
- Social value,
- Uniqueness, and
- Potential to answer current and future research questions.

15 ADDENDUM 2: IMPACT ASSESSMENT METHODOLOGY

15.1 ISSUES IDENTIFICATION MATRIX

Impacts were rated and assessed using an Impact and Risk Assessment Methodology provided by CES, for the Scoping Phase of the EIA process in accordance with the requirement of EIA Regulations. Here, two parameters and five factors are considered when assessing the significance of the identified issues, and each is scored. ***Significance*** is achieved by ranking the five criteria presented in Table 1 below, to determine the overall significance of an issue. The ranking for the "effect" (which includes scores for duration; extent; consequence and probability) and reversibility / mitigation are then read off the matrix presented in Table 2 below, to determine the overall significance of the issue. The overall significance is either negative or positive.

- ***Duration*** - The temporal scale defines the significance of the impact at various time scales, as an indication of the duration of the impact.

- ***Extent*** - The spatial scale defines the physical extent of the impact.

- ***Consequence*** - The consequence scale is used in order to, as far as possible, objectively evaluate how severe a number of negative impacts associated with the issue
under consideration might be, or how beneficial a number of positive impacts associated with the issue under consideration might be.

- The ***probability*** of the impact occurring - The likelihood of impacts taking place as a result of project actions arising from the various alternatives. There is no doubt that some impacts would occur (e.g. loss of vegetation), but other impacts are not as likely to occur (e.g. vehicle accident), and may or may not result from the proposed development and alternatives. Although some impacts may have a severe effect, the likelihood of them occurring may affect their overall significance.

- ***Reversibility / Mitigation*** – The degree of difficulty of reversing and/or mitigating the various impacts ranges from easily achievable to very difficult. The four categories used are listed and explained in Table 1 below. Both the practical feasibility of the measure, the potential cost and the potential effectiveness is taken into consideration when determining the appropriate degree of difficulty.

15.2 ASSESSING IMPACTS

The CES rating scale used in this assessment takes into consideration the following criteria, and includes the new criteria for assessing post mitigation significance (residual impacts), by incorporating the principles of reversibility and irreplaceability:

- **Nature of impact** (Negative or positive impact on the environment).
- **Type of impact** (Direct, indirect and/or cumulative effect of impact on the environment).
- **Duration, Extent, Probability** (see **Table 4** below)

Table 4: Duration, Extent, Probability

Duration (Temporal Scale)		Score
Short term	Less than 5 years	1
Medium term	Between 5-20 years	2
Long term	Between 20 and 40 years (a generation) and from a human perspective also permanent	3
Permanent	Over 40 years and resulting in a permanent and lasting change that will always be there	4
Extent (Spatial Scale)		
Localised	At localised scale and a few hectares in extent	1
Study Area	The proposed site and its immediate environs	2
Regional	District and Provincial level	3
National	Country	3
International	Internationally	4
Probability (Likelihood)		
Unlikely	The likelihood of these impacts occurring is slight	1
May Occur	The likelihood of these impacts occurring is possible	2
Probable	The likelihood of these impacts occurring is probable	3
Definite	The likelihood is that this impact will definitely occur	4

- Severity or benefits

Table 5: Severity of Benefits

Impact Severity (The severity of negative impacts, or how beneficial positive impacts would be on a particular affected system or affected party)		Score
Very severe	**Very beneficial**	4
An irreversible and permanent change to the affected system(s) or party(ies) which cannot be mitigated. For example the permanent loss of land.	A permanent and very substantial benefit to the affected system(s) or party(ies), with no real alternative to achieving this benefit. For example the vast improvement of sewage effluent quality.	
Severe	**Beneficial**	3
Long term impacts on the affected system(s) or party(ies) that could be mitigated. However, this mitigation would be difficult, expensive or time consuming, or some combination of these. For example, the clearing of forest vegetation.	A long term impact and substantial benefit to the affected system(s) or party(ies). Alternative ways of achieving this benefit would be difficult, expensive or time consuming, or some combination of these. For example an increase in the local economy.	
Moderately severe	**Moderately beneficial**	2
Medium to long term impacts on the affected system(s) or party (ies), which could be mitigated. For example constructing the sewage treatment facility where there was vegetation with a low conservation value.	A medium to long term impact of real benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are equally difficult, expensive and time consuming (or some combination of these), as achieving them in this way. For example a 'slight' improvement in sewage effluent quality.	
Slight	**Slightly beneficial**	1
Medium or short term impacts on the affected system(s) or party(ies). Mitigation is very easy, cheap, less time consuming or not necessary. For example a temporary fluctuation in the water table due to water abstraction.	A short to medium term impact and negligible benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are easier, cheaper and quicker, or some combination of these.	
No effect	**Don't know/Can't know**	
The system(s) or party(ies) is not affected by the proposed development.	In certain cases it may not be possible to determine the severity of an impact.	

** In certain cases it may not be possible to determine the severity of an impact thus it may be determined: Don't know/Can't know*

The scores for the three criteria in Table 4 and Table 5 above are added to obtain a composite score. They must then be considered against the severity rating to determine the overall significance of an activity. This is because

the severity of the impact is far more important than the other three criteria. The overall significance is then obtained by reading off the matrix presented in the table below. The overall significance is either negative or positive (Criterion 1) and direct, indirect or cumulative (Criterion 2).

Table 6: Composite Duration, Extent, Probability Scores

SEVERITY	COMPOSITE DURATION, EXTENT & PROBABILITY SCORE									
	3	4	5	6	7	8	9	10	11	12
Slight	3	4	5	6	7	8	9	10	11	12
Mod severe	3	4	5	6	7	8	9	10	11	12
Severe	3	4	5	6	7	8	9	10	11	12
Very severe	3	4	5	6	7	8	9	10	11	12

The **environmental significance** scale is an attempt to evaluate the importance of a particular impact. This evaluation needs to be undertaken in the relevant context, as an impact can either be ecological or social, or both. The evaluation of the significance of an impact relies heavily on the values of the person making the judgment. For this reason, impacts of especially a social nature need to reflect the values of the affected society.

Table 7: Overall Significance

OVERALL SIGNIFICANCE *(The combination of all the above criteria as an overall significance)*	
VERY HIGH NEGATIVE	**VERY BENEFICIAL**
These impacts would be considered by society as constituting a major and usually permanent change to the (natural and/or social) environment, and usually result in severe or very severe effects, or beneficial or very beneficial effects. *Example: The loss of a species would be viewed by informed society as being of VERY HIGH significance.* *Example: The establishment of a large amount of infrastructure in a rural area, which previously had very few services, would be regarded by the affected parties as resulting in benefits with VERY HIGH significance.*	
HIGH NEGATIVE	**BENEFICIAL**
These impacts will usually result in long term effects on the social and/or natural environment. Impacts rated as HIGH will need to be considered by society as constituting an important and usually long term change to the (natural and/or social) environment. Society would probably view these impacts in a serious light. *Example: The loss of a diverse vegetation type, which is fairly common elsewhere, would have a significance rating of HIGH over the long term, as the area could be rehabilitated.* *Example: The change to soil conditions will impact the natural system, and the impact on affected parties (such as people growing crops in the soil) would be HIGH.*	
MODERATE NEGATIVE	**SOME BENEFITS**
These impacts will usually result in medium to long term effects on the social and/or natural environment. Impacts rated as MODERATE will need to be considered by society as constituting a fairly important and usually medium term change to the (natural and/or social) environment. These impacts are real but not substantial. *Example: The loss of a sparse, open vegetation type of low diversity may be regarded as MODERATELY significant.*	
LOW NEGATIVE	**FEW BENEFITS**
These impacts will usually result in medium to short term effects on the social and/or natural environment. Impacts rated as LOW will need to be considered by the public and/or the specialist as constituting a fairly unimportant and usually short term change to the (natural and/or social) environment. These impacts are not substantial and are likely to have little real effect. *Example: The temporary changes in the water table of a wetland habitat, as these systems are adapted to fluctuating water levels.* *Example: The increased earning potential of people employed as a result of a development would only result in benefits of LOW significance to people who live some distance away.*	
NO SIGNIFICANCE	
There are no primary or secondary effects at all that are important to scientists or the public. *Example: A change to the geology of a particular formation may be regarded as severe from a geological perspective, but is of NO significance in the overall context.*	
DON'T KNOW	
In certain cases it may not be possible to determine the significance of an impact. For example, the primary or secondary impacts on the social or natural environment given the available information. *Example: The effect of a particular development on people's psychological perspective of the environment.*	

15.3 POST MITIGATION SIGNIFICANCE

Once mitigation measure is proposed, the following criteria are then used to determine the overall post mitigation significance of the impact:

- Reversibility: The degree to which an environment can be returned to its original/partially original state.
- Irreplaceable loss: The degree of loss which an impact may cause.

Mitigation potential: The degree of difficulty of reversing and/or mitigating the various impacts ranges from very difficult to easily achievable. The four categories used are listed and explained in Table 8 below. Both the practical feasibility of the measure, the potential cost and the potential effectiveness is taken into consideration when determining the appropriate degree of difficulty.

Table 8: Mitigation Potential

Reversibility	
Reversible	*The activity will lead to an impact that can be reversed provided appropriate mitigation measures are implemented.*
Irreversible	*The activity will lead to an impact that is permanent regardless of the implementation of mitigation measures.*
Irreplaceable loss	
Resource will not be lost	*The resource will not be lost/destroyed provided mitigation measures are implemented.*
Resource will be partly lost	*The resource will be partially destroyed even though mitigation measures are implemented.*
Resource will be lost	*The resource will be lost despite the implementation of mitigation measures.*
Mitigation potential	
Easily achievable	*The impact can be easily, effectively and cost effectively mitigated/reversed.*
Achievable	*The impact can be effectively mitigated/reversed without much difficulty or cost.*
Difficult	*The impact could be mitigated/reversed but there will be some difficultly in ensuring effectiveness and/or implementation, and significant costs.*
Very Difficult	*The impact could be mitigated/reversed but it would be very difficult to ensure effectiveness, technically very challenging and financially very costly.*

15.4 MANAGEMENT AND MITIGATION ACTIONS

The following table provides a guideline of relevant heritage resources management actions is vital to the conservation of heritage resources.

No further action / Monitoring

Where no heritage resources have been documented, heritage resources occur well outside the impact zone of any development or the primary context of the surroundings at a development footprint has been largely destroyed or altered, no further immediate action is required. Site monitoring during development, by an ECO or the heritage specialist are often added to this recommendation in order to ensure that no undetected heritage\ remains are destroyed.

Avoidance

This is appropriate where any type of development occurs within a formally protected or significant or sensitive heritage context and is likely to have a high negative impact. Mitigation is not acceptable or not possible. This measure often includes the change / alteration of development planning and therefore impact zones in order not to impact on resources.

Mitigation

This is appropriate where development occurs in a context of heritage significance and where the impact is such that it can be mitigated to a degree of medium to low significance, e.g. the high to medium impact of a development on an archaeological site could be mitigated through sampling/excavation of the remains. Not all negative impacts can be mitigated.

Compensation

Compensation is generally not an appropriate heritage management action. The main function of management actions should be to conserve the resource for the benefit of future generations. Once lost it cannot be renewed. The circumstances around the potential public or heritage benefits would need to be exceptional to warrant this type of action, especially in the case of where the impact was high.

Rehabilitation

Rehabilitation is considered in heritage management terms as an intervention typically involving the adding of a new heritage layer to enable a new sustainable use. It is not appropriate when the process necessitates the removal of previous historical layers, i.e. restoration of a building or place to the previous state/period. It is an appropriate heritage management action in the following cases:

- The heritage resource is degraded or in the process of degradation and would benefit from rehabilitation.

- Where rehabilitation implies appropriate conservation interventions, i.e. adaptive reuse, repair and maintenance, consolidation and minimal

loss of historical fabric.

- Where the rehabilitation process will not result in a negative impact on the intrinsic value of the resource.