



PGS HERITAGE

**PROPOSED ACWA POWER SOLAR RESERVE REDSTONE SOLAR
PHOTOVOLTAIC POWER PLANT ON THE REMAINING EXTENT OF THE
FARM NO. 469, HAY REGISTRATION DIVISION, TSANTSABANE LOCAL
MUNICIPALITY, ZF MGCWU DISTRICT MUNICIPALITY, NORTHERN
CAPE PROVINCE**

Palaeontological Desktop Assessment

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Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page ii

REVISION HISTORY

Version	Issue Date	Description of Changes
01	7 July 2026	First draft
1.1	9 July 2026	Amendment

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page iii

Specialist Declaration for assessments undertaken for application for authorisation in terms of the National Environmental Management Act (Act 107 of 1998) as amended and the Environmental Impact Assessment Regulations (Government Notice 982, Government Gazette 38282, 4 December 2014) as amended

I, Elize Butler declare that –

- I act as the independent specialist in this application;
- I am aware of the procedures and requirements for the assessment and minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the National Environmental Management Act (Act 107 of 1998) as amended, when applying for environmental authorisation which were promulgated in Government Notice 320 (Government Gazette 43110, 20 March 2020) and in Government Notice 1150 (Government Gazette 43855, 30 October 2020).
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing –
 - any decision to be taken with respect to the application by the competent authority; and;
 - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of the Environmental Impact Assessment Regulations (Government Notice R982, Government Gazette 38282, 4 December 2014) as amended and is punishable in terms of section 24F of the National Environmental Management Act (Act 107 of 1998).
- I will take into account, to the extent possible, the matters listed in section 38 of the National Heritage Resources Act (Act 25 of 1999) when preparing the application and any report relating to the application.

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SIGNATURE:



Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page iv

ACKNOWLEDGEMENT OF RECEIPT

Report Title	Proposed ACWA Power Solar Reserve Redstone Solar Photovoltaic Power Plant on the Remaining Extent of the Farm No. 469, Hay Registration Division, Tsantsabane Local Municipality, ZF Mgcwu District Municipality, Northern Cape Province		
Control	Name	Signature	Designation
Author	Elize Butler		PGS Heritage – Associate Palaeontologist
Reviewed			PGS Heritage -

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Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page v

This Palaeontological Impact Assessment report (as part of the Heritage Impact Assessment) has been compiled considering the Environmental Impact Assessment Regulations (Government Notice 982, Government Gazette 38282, 4 December 2014) Appendix 6 as amended by Government Notice 326 (Government Gazette 40772, 7 April 2017) requirements for specialist reports as indicated in the table below:

Requirements Environmental Impact Assessment Regulations (Government Notice 982, Government Gazette 38282, 4 December 2014) Appendix 6 as amended	The relevant section in the report
1. (1) (a) (i) Details of the specialist who prepared the report	Page iii and Section 1.2 of the Report – Contact details and company, and Appendix B
(ii) The expertise of that person to compile a specialist report, including a curriculum vitae	Section 1.2 – refer to Appendix B
(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 3 – Approach and Methodology
(cA) An indication of the quality and age of the base data used for the specialist report	Section 4.1 – Geological and Palaeontological History of the Baseline Environment
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development, and levels of acceptable change;	Section 5
(d) The duration, date, and season of the site investigation and the relevance of the season to the outcome of the assessment	Executive Summary and Section 6
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process, inclusive of equipment and modelling used	Section 3 – Assessment Methodology
(f) Details of an assessment of the specifically identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Sections 4
(g) An identification of any areas to be avoided, including buffers	Executive Summary and Sections 6
(h) A map superimposing the activity, including the associated structures and infrastructure, on the environmental sensitivities of the site, including areas to be avoided, including buffers;	Section 4 – Geological and Palaeontological History
(i) A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.3 – 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	Executive Summary and 6
(k) Any mitigation measures for inclusion in the EMPr	Executive Summary and Sections 6
(l) Any conditions for inclusion in the environmental authorisation	Executive Summary and Sections 6
(m) Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Executive Summary and Sections 6
(n)(i) A reasoned opinion as to whether the proposed activity, activities, or portions thereof should be authorised and	Executive Summary and Sections 6
(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	Executive Summary and Sections 6
(o) A description of any consultation process that was undertaken during the carrying out of the study	Not applicable. A public consultation process was handled as part of the Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) process.
(p) A summary and copies of any comments that were received during any consultation process	Not applicable. To date, no comments regarding heritage resources that require input from a specialist have been raised.

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page vi

Requirements Environmental Impact Assessment Regulations (Government Notice 982, Government Gazette 38282, 4 December 2014) Appendix 6 as amended	The relevant section in the report
(q) Any other information requested by the competent authority.	N/A
(2) Where a government notice by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	Section 1.4: Compliance with SAHRA guidelines

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page vii

EXECUTIVE SUMMARY

PGS Heritage (Pty) Ltd was appointed to conduct the Heritage Impact Assessment (HIA) (archaeology and palaeontology) for the proposed construction of the proposed ACWA Power Solar Reserve Redstone Solar Photovoltaic (PV) Power Plant on the Remaining Extent of the Farm No. 469, Hay Registration Division, Tsantsabane Local Municipality, ZF Mgcwu District Municipality, Northern Cape Province. This study is the Palaeontological Desktop Assessment (PDA) for the proposed project. In compliance with the National Environmental Management Act (Act No. 107 of 1998) (NEMA) and the National Heritage Resources Act (Act No. 25 of 1999, Section 38) (NHRA), this PDA aims to determine the potential presence of fossil material within the proposed development area, assess the likely impact of the project on palaeontological heritage, and recommend appropriate mitigation measures to protect any fossil resources that may be affected.

The Redstone PV development area is underlain by Quaternary to Tertiary sands (red to flesh-coloured, wind-blown sand and sand dune deposits), as well as by the Ongeluk Formation of the Postmasburg Group (amygdaloidal andesitic lava with interbeds of tuff, agglomerate, chert and red jasper) of the Griqualand West Sequence. According to the SAHRIS PalaeoMap, the entire Redstone PV site is assigned a **Moderate** Palaeontological Sensitivity (Almond & Pether, 2008; SAHRIS database). In addition, the DFFE National Environmental Screening Tool identifies the development footprint as having a **Medium Palaeontology Theme Sensitivity**.

The Quaternary to Tertiary sands of the Kalahari Group within the development footprint represent the youngest sedimentary cover in the study area and hold the greatest palaeontological potential. These wind-blown sand, dune and pan-associated deposits, together with associated calcretes, may preserve mammalian bones and teeth, horn cores, tortoise remains, freshwater and terrestrial molluscs, and trace fossils such as calcretised termite burrows, rhizoliths and mammalian trackways. By contrast, the underlying Ongeluk Formation, comprising amygdaloidal andesitic lava with interbedded tuff, agglomerate, chert and red jasper, is of Palaeoproterozoic age (approximately 2.2 billion years old) and therefore predates the evolution of shelled and skeletal life by well over a billion years. As an extrusive volcanic unit, it is not considered fossiliferous in the conventional sense, and any potential palaeobiological signal associated with rocks of this age and setting, such as microbial or stromatolitic evidence in associated chert horizons, falls outside the scope of a standard palaeontological impact assessment. The palaeontological sensitivity of the site is therefore considered to derive almost entirely from the overlying Quaternary to Tertiary cover, rather than from the underlying Ongeluk Formation itself.

In terms of Palaeontological Impacts, a Moderate Palaeontological Significance has been allocated for impacts associated with the construction phase of the PV and BESS development pre-mitigation, and a Low significance post-mitigation. The construction phase will be the only development phase with the potential of impacting Palaeontological Heritage, and no significant impacts are expected during the Operational and Decommissioning phases. As the No-Go Alternative considers the option of 'do nothing' and maintaining the status quo, it will have a Neutral impact on the Palaeontological Heritage of the development. The Cumulative

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page viii

impacts of the development are considered to be Medium to Low pre-and post - mitigation, and fall within the acceptable limits for the project. It is therefore considered that, provided the recommended mitigation measures are implemented, the proposed development will not lead to unacceptable impacts on the palaeontological resources of the area. The proposed Redstone PV and BESS development may thus be permitted, as the development footprint is not considered highly sensitive in terms of palaeontological resources. It is consequently recommended that no further palaeontological heritage studies or ground truthing are required prior to development.

However, in the unlikely event that fossil remains or trace fossils are discovered during any phase of construction, either on the surface or exposed by excavations the Environmental Control Officer (ECO)/site manager in charge of these activities is required to notify SAHRA immediately (contact information: SAHRA, 111 Harrington Street, Cape Town, PO Box 4637, Cape Town 8000, South Africa). Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Website: www.sahra.org.za) in order for a palaeontologist to do effective mitigation (recording and collection).

Before any fossil material can be collected from the development site, the specialist involved would need to apply for a collection permit from SAHRA. Fossil material must be housed in an official collection (museum or university), while all reports and fieldwork should meet the minimum standards for palaeontological impact studies proposed by SAHRA (2012).

These recommendations should be incorporated into the Environmental Management Plan for the proposed Redstone Solar PV and BESS in the Northern Cape Province.

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page ix

TABLE OF CONTENT

1	INTRODUCTION	13
1.1	Scope of the Study	13
1.2	Specialist Qualifications	13
1.3	Assumptions and Limitations	13
1.3.1	<i>Additional Information Consulted</i>	14
1.4	Legislative Context	14
1.4.1	<i>Government Notice 320 (Government Gazette 43110, 20 March 2020)</i>	14
1.4.2	<i>Environmental Impact Assessment Regulations (Government Notice 982, Government Gazette 38282, 4 December 2014) Appendix 6 as amended by Government Notice 326 (Government Gazette 40772, 7 April 2017) requirements</i>	15
1.4.3	<i>Heritage screening - Department of Forestry, Fisheries and the Environment</i>	15
1.4.4	<i>National Heritage Resources Act (Act 25 of 1999) as amended</i>	16
2	TECHNICAL DETAILS OF THE PROJECT	17
2.1	Locality	17
2.1.1	<i>Site description</i>	17
2.2	Technical Project Description	18
2.2.1	<i>Project description</i>	18
3	ASSESSMENT METHODOLOGY	19
3.1	Methodology for Assessing Heritage Site significance	19
3.2	Methodology used in determining the significance of environmental impacts	21
4	CURRENT STATUS QUO	21
4.1	Baseline Description of the Receiving Environment	21
4.1.1	<i>Geological and Palaeontological History</i>	21
4.1.2	<i>SAHRIS Palaeomap and the National Web-based Screening Tool</i>	29
4.2	Findings	30
5	MANAGEMENT RECOMMENDATIONS AND GUIDELINES	30
5.1	Construction phase	31
5.2	Heritage Management Plan for Environmental Management Plan	34
6	CONCLUSIONS AND RECOMMENDATIONS	35
7	REFERENCES	36

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page x

LIST OF FIGURES

<i>Figure 1 - Regional Locality of the proposed ACWA Power Solar Reserve Redstone Solar Photovoltaic Power Plant on the Remaining Extent of the Farm No. 469, Hay Registration Division, Tsantsabane Local Municipality, ZF Mgcwu District Municipality, Northern Cape Province</i>	<i>18</i>
<i>Figure 2 – Extract of the 1: 250 000 Postmasburg 2822 Geological Map (Council for Geoscience, Pretoria) indicating that the study area is underlain by Quaternary to Tertiary sands (Qs) (red to flesh coloured wind-blown sand and sand dune) as well as the Ongeluk Formation (Vo) of the Postmasburg Group.</i>	<i>25</i>
<i>Figure 3 – Updated Regional Geology of the Maremane Dome in the Northern Cape (from Smith & Beukes 2016). The approximate location of the proposed development is indicated by the yellow circle.</i>	<i>26</i>
<i>Figure 4 – Schematic regional geological map of the Griqualand West region, Northern Cape, showing the Postmasburg Group (Ongeluk and Makganyene Formations) and the Ghaap Group (Campbell Rand and Asbestos Hills Subgroups) relative to Postmasburg and the Maremane Dome, in the general vicinity of the Redstone PV site (red dot with yellow outline) (after Cairncross & Beukes, 2013).</i>	<i>27</i>
<i>Figure 5 – Extract of the SAHRIS PalaeoMap (Council for Geosciences, Pretoria) indicates that the study area is underlain by sediments with a Moderate (green) Palaeontological Sensitivity.</i>	<i>28</i>
<i>Figure 6 – Palaeontological Sensitivity of the study area by the National Environmental Web-based Screening Tool indicates a Medium (orange) Sensitivity</i>	<i>30</i>
<i>Figure 7 – Stratigraphy of the Kalahari Group (Image taken from Partridge et al., 2006).Error! Bookmark not defined.</i>	

LIST OF TABLES

<i>Table 1: Reporting requirements for GN 320.</i>	<i>14</i>
<i>Table 2: Palaeontological Sensitivity according to the SAHRIS PalaeoMap (Almond et al, 2013; SAHRIS website.</i>	<i>29</i>
<i>Table 3: Summary of Impact Tables</i>	<i>32</i>
<i>Table 4: Rating of Impacts Construction Phase – Redstone PV Project and associated infrastructure</i>	<i>33</i>
<i>Table 5: Heritage Management Plan for EMP implementation.....</i>	<i>34</i>

List of Appendices

<i>A</i>	<i>Impact Assessment Methodology</i>
<i>B</i>	<i>Project team CVs</i>

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page xi

ABBREVIATIONS AND TERMINOLOGY

Abbreviations	Description
BESS	Battery Energy Storage System
CA	National Competent Authority
CV	Curriculum Vitae
DEA	Department of Environmental Affairs
DFFE	Department of Forestry, Fisheries and the Environment
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EJV	Exploration Joint Venture
EMPr	Environmental Management Programme
ESO	Environmental Site Officer
GN	Government Notice
HIA	Heritage Impact Assessment
Ma	Millions of years ago
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PDA	Palaeontological Desktop Assessment
PIA	Palaeontological Impact Assessment
PSSA	Palaeontological Society of South Africa
PV	Photovoltaic
S&EIA	Scoping & Environmental Impact Assessment
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
ToR	Terms of Reference

Fossil

A fossil is the preserved remains or traces of an organism that lived in the distant past, typically millions of years ago. These remains may include shells, mineralised bones, and other hard parts of ancient animals and plants, as well as impressions, moulds, and casts left in sedimentary rocks where organic material has decayed. Fossils offer important insights into the history of life on Earth, enabling scientists to study the evolution, diversity, and distribution of past organisms and ecosystems.

Heritage

That which is inherited and forms part of the National Estate (historical places, objects, fossils as defined by the National Heritage Resources Act (Act 25 of 1999) as amended.

Heritage resources

This means any place or object of cultural significance and can include (but not limited to) as stated under section 3 of the National Heritage Resources Act (Act 25 of 1999) as amended,

- places, buildings, structures and equipment of cultural significance,
- places to which oral traditions are attached, or which are associated with living heritage,
- historical settlements and townscapes,
- landscapes and natural features of cultural significance,
- geological sites of scientific or cultural importance,

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page xii

- archaeological and palaeontological sites,
- graves and burial grounds and
- sites of significance relating to the history of slavery in South Africa.

Palaeontology

Palaeontology is the scientific study of ancient life through time and entails the examination of fossils—remains, traces, or impressions of organisms preserved in rocks. It seeks to understand the evolution, diversity, and interactions of past life forms, as well as the environmental conditions in which they lived. By integrating geology and biology, palaeontology provides crucial insights into the history of life on Earth over geological time.

The term palaeontology derives from the Latin palaeontologia, which in turn originates from the Greek words palaios (παλαιός), meaning “ancient,” and ontos (ὄντος), meaning “being” or “creature,” combined with the suffix -logia, meaning “study of.” The literal translation is therefore “the study of ancient beings.” In English usage, the classical Latin, British and South African spelling is palaeontology, while the American spelling omits the a after the p, rendering paleontology. In this report the Latin, English and South African spelling of Palaeontology will be used.

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 13

1 INTRODUCTION

PGS Heritage (Pty) Ltd was appointed to conduct the Heritage Impact Assessment (HIA) (archaeology and palaeontology) for the proposed construction of the proposed ACWA Power Solar Reserve Redstone Solar Photovoltaic Power Plant on the Remaining Extent of the Farm No. 469, Hay Registration Division, Tsantsabane Local Municipality, ZF Mgcwu District Municipality, Northern Cape Province.

This report constitutes the Palaeontological Desktop Assessment (PDA) for the project.

1.1 Scope of the Study

The aim of the study is to identify palaeontological sites/sensitivity that may occur in the proposed project area. The PDA aims to inform the Environmental Impact Assessment (EIA) to assist the developer in managing the discovered heritage resources in a responsible manner, in order to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act (Act 25 of 1999) as amended (NHRA).

1.2 Specialist Qualifications

This study has been conducted by Elize Butler. She has conducted approximately 900 palaeontological impact assessments for developments in the Free State, KwaZulu-Natal, Eastern, Western, and Northern Cape, Northwest, Gauteng, Limpopo, and Mpumalanga. She has an MSc (cum laude) in Zoology (specialising in Palaeontology) from the University of the Free State, South Africa and has been working in Palaeontology for more than thirty years. She has experience in locating, collecting, and curating fossils, including exploration field trips in search of new localities in the Karoo Basin. She has been a member of the Palaeontological Society of South Africa (PSSA) since 2006 and has been conducting PIAs since 2014.

A short CV is attached in **Appendix B**, while a detailed CV could be provided on request.

1.3 Assumptions and Limitations

Geological maps primarily focus on the lithology and structural geology of an area, and their accompanying sheet explanations were not intended to emphasise palaeontological heritage. Many remote regions of South Africa remain unexplored by palaeontologists, with available data often derived solely from aerial imagery. Furthermore, fossil locality and geological data stored in museum and university collections are frequently outdated or were historically recorded with limited accuracy.

To supplement these gaps, comparable Assemblage Zones and geological formations from better-studied regions are often referenced to infer the potential for fossil presence in previously undocumented areas. In

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 14

desktop studies, it is typically assumed that fossil heritage may be present where similar stratigraphy is exposed. However, a field-based assessment is essential to validate and refine these assumptions, thereby enhancing the accuracy of the palaeontological sensitivity rating.

1.3.1 Additional Information Consulted

In compiling this report the following sources were consulted:

- Geological map 1:100 000, Geology of the Republic of South Africa (Visser 1984)
- 1: 50 000 scale topographic maps.
- Palaeosensitivity map on SAHRIS (South African Heritage Resources Information System) website.
- DFFE Screening Tool of the study area
- A Google Earth kmz files and background information on the proposed development was supplied by PGS Heritage as received from the developer.
- 1:250 000 Postmasburg 2822 Geological Map (Council for Geosciences, Pretoria).
- Palaeontological Impact Assessments in the same area are studied
- Due to the Palaeontological Sensitivities of the Project, no site investigation was conducted for the Project.

1.4 Legislative Context

The identification, evaluation and assessment of any cultural heritage site, artefact or find in the South African context is required and governed by the following legislation:

- Government Notice 320 (Government Gazette 43110, 20 March 2020) (GN 320) - general requirements for undertaking an initial site sensitivity verification where no specific assessment protocol has been identified,
- EIA Regulations (Government Notice 982 (Government Gazette 38282, 4 December 2014)) Appendix 6 (GN 982) as amended by Government Notice 326 (Government Gazette 40772, 7 April 2017) (GN 326),
- NHRA.

1.4.1 Government Notice 320 (Government Gazette 43110, 20 March 2020)

Although minimum standards for Archaeological Impact Assessment (AIA) (2007) and Paleontological Impact Assessment (PIA) (2012) were published by the South African Heritage Resources Agency (SAHRA), GN 320 requires sensitivity verification for a site, for which no specific assessment protocol related to any theme has been identified, on the national web based environmental screening tool. The requirements for GN 320 are listed in **Table 1** and the applicable section in this report noted.

Table 1: Reporting requirements for GN 320.

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 15

GN 320	Relevant section in report	Where not applicable in this report
2.2 (a) a desktop analysis, using satellite imagery;	section 4.1	
2.2 (b) a preliminary on-site inspection to identify if there are any discrepancies with the current use of land and environmental status quo versus the environmental sensitivity as identified on the national web-based environmental screening tool, such as new developments, infrastructure, indigenous/pristine vegetation, etc.	Executive Summary and Section 7	
2.3(a) confirms or disputes the current use of the land and environmental sensitivity as identified by the national web-based environmental screening tool;	Section 1.4	
2.3(b) contains motivation and evidence (e.g. photographs) of either the verified or different use of the land and environmental sensitivity;	Section 1.4	

1.4.2 Environmental Impact Assessment Regulations (Government Notice 982, Government Gazette 38282, 4 December 2014) Appendix 6 as amended by Government Notice 326 (Government Gazette 40772, 7 April 2017) requirements

This HIA report has been compiled considering the GN 326 Appendix 6 requirements for specialist reports.

1.4.3 Heritage screening - Department of Forestry, Fisheries and the Environment

A heritage screening was conducted by means of the Department of Forestry, Fisheries and the Environment (DFFE) National Web-based Environmental Screening Tool as required by GN 982.

DFFE issued guidelines in April 2025 concerning the application of the screening tool in relation to cultural heritage, archaeology, and palaeontological themes. The guidelines indicate that the "theme layer represents a limited number of known" heritage and palaeontological resources. These resources are widely distributed and may be present at any development site within South Africa. The guidelines state the following in terms of -

- HIA *"Therefore, a Heritage Impact Assessment (HIA) must be undertaken for all developments, irrespective of the sensitivity shown on the archaeological and cultural heritage theme layer"*
- PIA *"Therefore, a Palaeontological Impact Assessments (PIAs) [sic] must be undertaken for all developments as per the PalaeoSensitivity Map provided on [South African Heritage Resources Information System] SAHRIS, irrespective of the sensitivity shown on the palaeontology theme layer."*

The guidelines further stipulate the requirements for both an HIA and PIA must:

HIA	PIA
▪ meet the requirements of section 38(3) of the NHRA or section 41(1) of the KwaZulu-Natal Amafa and Research	▪ meet the requirements of section 38(3) of the NHRA or section 41(1) of the KNARIA should the development be in KZN;

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 16

Institute Act, 2018 (Act No. 5 of 2018) (KNARIA), should the development be in KwaZulu-Natal (KZN); ▪ must be undertaken by a qualified heritage specialist; ▪ be undertaken in line with GN 326 Appendix 6; and ▪ for HIA submitted to SAHRA the report must also comply with the requirements of the “2007 Minimum Standards: Archaeological and Palaeontological Components of Impact Assessment Reports”, accessible at https://sahris.sahra.org.za.	▪ must be undertaken by a qualified palaeontological specialist; ▪ be undertaken in line with GN 326 Appendix 6; and ▪ for PIA submitted to SAHRA, the report must comply with the requirements of the “2012 Minimum Standards: Palaeontological Components of Heritage Impact Assessments” [sic], accessible at https://sahris.sahra.org.za.
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According to the heritage screening report, the palaeontological sensitivity of the development area is High (red). This High sensitivity classification signifies that a detailed palaeontological desktop assessment is required and based on the outcome a site investigation.

1.4.4 *National Heritage Resources Act (Act 25 of 1999) as amended*

- Protection of Heritage Resources – sections 34 to 36; and
- Heritage Resources Management – section 38.

The NHRA is utilised as the basis for the identification, evaluation, and management of heritage resources and in the case of Cultural Resources Management (CRM) those resources specifically impacted on by development as stipulated in section 38 of the NHRA. This study falls under section 38(8) and requires comment from the relevant heritage resources authority.

Section 24(2) of the National Environmental Management Act (Act 107 of 1998) as amended (NEMA) requires environmental authorisation from the environmental authority for certain activities that have been identified and must undergo an EIA or BA process. Similarly, section 38 of the NHRA lists specific development activities that require notice to the heritage resources authority to determine if an HIA process is necessary. Approval from the heritage authority is mandatory before proceeding with the development activities.

To avoid redundancy and facilitate co-ordination between NEMA and NHRA requirements, section 38(8) of the NHRA states that if the development activities listed in section 38(1) require an EIA under NEMA; a separate HIA and approval from the heritage resources authority are unnecessary. However, the environmental authority must ensure that the heritage resources authority's requirements for HIA are fulfilled and that its comments and recommendations are considered before granting environmental authorisation.

Therefore, if a NEMA EIA is required for the development activities listed under section 38 of the NHRA, separate HIA and EIA processes may not be followed, and different decisions may not be issued under

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 17

NHRA and NEMA. The EIA process will be followed, and if the heritage resources authority requires a HIA, it must be conducted as one of the EIA specialist studies.

The environmental authority must ensure that the heritage resources authority's requirements for the assessment are met. A separate heritage approval may not be issued, but the environmental authority must consider the heritage resources authority's comments and recommendations before granting or refusing environmental authorisation.

It must however be noted that if no environmental process is required, but the proposed development still triggers the requirements for and HIA under section 38(1) of the NHRA, SAHRA or the relevant provincial heritage authority will be the authorising authority. This entity could then require a full HIA taking into account the requirements for public participation and stakeholder engagement as stipulated by the regulations of the NHRA.

2 TECHNICAL DETAILS OF THE PROJECT

2.1 Locality

The proposed Redstone PV facility, along with its Battery Energy Storage System (BESS) area, is located on the Remaining Extent of Farm Humansrus No. 469 in the Hay Registration Division, within the Tsantsabane Local Municipality (ZF Mgcawu District Municipality), Northern Cape Province (Figure 1-2). The site is located on the Ghaap Plateau, roughly 28 km east-northeast of Postmasburg and 22 km southwest of Daniëlsskuil, with the fenced project footprint centred at approximately 28°18'18"S, 23°21'18"E.

2.1.1 Site description

The proposed Redstone Solar Photovoltaic (PV) Facility and Battery Energy Storage System (BESS) will be located on the Remaining Extent of Farm 469, Hay Registration Division, approximately 25–30 km east of Postmasburg within the Tsantsabane Local Municipality of the ZF Mgcawu District Municipality, Northern Cape Province. The development will be situated within the existing Redstone Concentrated Solar Power (CSP) facility property and will occupy an area of approximately 19.5 ha.

The site is located within a semi-arid region characterised by open plains and gently undulating terrain associated with the Olifantshoek Plains Thornveld vegetation type. The surrounding land use is dominated by renewable energy infrastructure, mining activities, and extensive livestock grazing. The proposed development area is adjacent to the operational Redstone CSP facility and benefits from existing access roads, electrical infrastructure, and support services.

Environmental studies have identified a largely intact terrestrial environment with moderate biodiversity sensitivity and the presence of a nearby unchannelled valley-bottom wetland. No protected areas or Critical Biodiversity Areas occur within the development footprint. The site is considered suitable for the proposed

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 18

development due to its location within an existing renewable energy precinct, the availability of supporting infrastructure, high solar irradiation levels, and the limited agricultural potential of the affected land.



Figure 1 - Regional Locality of the proposed ACWA Power Solar Reserve Redstone Solar Photovoltaic Power Plant on the Remaining Extent of the Farm No. 469, Hay Registration Division, Tsantsabane Local Municipality, ZF Mgcwu District Municipality, Northern Cape Province

2.2 Technical Project Description

2.2.1 Project description

The proposed Redstone Solar Photovoltaic (PV) Facility and Battery Energy Storage System (BESS) will be developed within the existing Redstone Concentrated Solar Power (CSP) project area on the Remaining Extent of Farm 469 near Postmasburg in the Northern Cape. The project is intended to provide a dedicated renewable energy source for the auxiliary electricity requirements of the operational Redstone CSP facility, thereby reducing reliance on externally supplied electricity and improving overall operational efficiency.

The PV facility will comprise a solar array with a generation capacity of up to approximately 19.5 MW (DC) and a design capacity of approximately 15 MW (AC), covering an area of approximately 19.5 ha. The facility will include associated electrical infrastructure such as inverter stations, transformers, underground cabling, and connection infrastructure linked to the CSP internal electrical network.

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 19

To enhance system reliability and operational flexibility, the project will include a Battery Energy Storage System (BESS) with a storage capacity of up to approximately 30 MWh. The BESS will store surplus solar energy generated during peak production periods and provide dispatchable power when required, ensuring a stable and reliable auxiliary power supply to the CSP facility. Battery units will be housed within containerised enclosures and integrated into the site's electrical infrastructure.

The project will utilise existing access roads, services, and operational infrastructure associated with the Redstone CSP facility wherever possible, thereby minimising the need for additional infrastructure development and reducing the overall environmental footprint of the development.

3 ASSESSMENT METHODOLOGY

The section below outlines the assessment methodologies utilised in the study.

3.1 Methodology for Assessing Heritage Site significance

This study forms part of the Heritage Impact Assessment Report. According to the “SAHRA APM Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports” the purpose of the PIA is:

- to identify the palaeontological importance of the rock formations in the footprint;
- to evaluate the palaeontological magnitude of the formations;
- to clarify the **impact** on fossil heritage; and
- to suggest how the developer might protect and lessen possible damage to fossil heritage.

The palaeontological status of each rock section is calculated, as well as the possible impact of the development on fossil heritage by a) the palaeontological importance of the rocks, b) the type of development, and c) the quantity of bedrock removed.

All possible information is consulted to compile a scoping report, and this includes the following: SAHRIS Palaeosensitivity map, Provisional DFFE Screening Tool, all Palaeontological Impact Assessment reports in the same area; aerial photos and Google Earth images, topographical and geological maps as well as scientific articles of specimens from the development area and Assemblage Zones.

A field-based assessment is necessary when the development footprint has a Very High to High paleontological sensitivity. The desktop and the field survey of the exposed rock determine the impact significance of the planned development, and recommendations for further studies or mitigation are made. Destructive impacts on palaeontological heritage usually only occur during the construction phase, while the excavations will change the current topography and destroy or permanently seal in fossils at or below the ground surface. Fossil Heritage will then no longer be accessible for scientific research.

During a site investigation, the palaeontologist surveys the development and tries to determine the density and diversity of fossils in the development area. Rock exposures that are investigated usually contain a large

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 20

portion of the stratigraphic unit, can be accessed easily and comprise of unweathered (fresh) exposed rock. These exposures may be natural (rocky outcrops in streams or riverbanks, cliffs, dongas) but could also be artificial (quarries, open building excavations, and even railway and road cuttings). It is common practice for palaeontologists to log well-preserved fossils (GPS, and stratigraphic data) during field assessment studies.

Mitigation usually precedes construction or may occur during construction when potentially fossiliferous bedrock is exposed. Mitigation comprises the collection and recording of fossils. Preceding excavation of any fossils, a permit from SAHRA must be obtained, and the material will have to be housed in a SAHRA approved fossil repository. When mitigation is applied correctly, a positive impact is possible as knowledge of local palaeontological heritage may be increased.

When a Site investigation is conducted, the fossil potential of the site will be determined by cross-crossing the development footprint and physically investigating bedrock outcrops to determine the lithology and fossil content of the outcrops. Fossils occurring at the surface are very unpredictable, and a **representative sample size** of the area has been investigated. However, it is important to note that the absence of fossils in a development footprint does not necessarily mean that palaeontological significant material is not present on site (on or beneath ground surface).

The terms of reference of a PIA are as follows:

General Requirements:

- Adherence to the content requirements for specialist reports following Appendix 6 of the EIA Regulations 2014, as amended;
- Adherence to all applicable best practice recommendations, appropriate legislation, and authority requirements;
- Submit a comprehensive overview of all appropriate legislation, guidelines;
- Description of the proposed project and provide information regarding the developer and consultant who commissioned the study.
- Description and location of the proposed development, and provide geological and topographical maps
- Provide the palaeontological and geological history of the affected area.
- Identification of sensitive areas to be avoided (providing shapefiles/kmls) in the proposed development;
- Evaluation of the significance of the planned development during the Pre-construction, Construction, Operation, Decommissioning Phases, and Cumulative impacts. Potential impacts should be rated in terms of the direct, indirect, and cumulative:
 - a. **Direct impacts** are impacts that are caused directly by the activity and generally occur at the same time and place as the activity.
 - b. **Indirect impacts** of an activity are indirect or induced changes that may occur as a result of the activity.

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 21

c. **Cumulative impacts** are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present, or reasonably foreseeable future activities.

- Fair assessment of alternatives (infrastructure alternatives have been provided);
- Recommend mitigation measures to minimise the impact of the proposed development; and
- Implications of specialist findings for the proposed development (such as permits, licenses, etc).

3.2 Methodology used in determining the significance of environmental impacts

The methodology used to determine the environmental impact significance is that by EIMS, and is explained in **Appendix A**.

4 CURRENT STATUS QUO

4.1 Baseline Description of the Receiving Environment

The study site is located on the Ghaap Plateau, with an elevation of roughly 1,495–1,510 m above sea level. The immediate landscape is a flat to gently undulating sandy plain, mantled by wind-blown sediments of the Cenozoic Kalahari Group, which cover older Paleoproterozoic quartzites, shales and lavas of the Olifantshoek Supergroup beneath (Moen, 2006, cited in Mthombeni, 2019).

The site falls entirely within Olifantshoek Plains Thornveld (SVk 13), a Savanna Biome unit described by Mucina & Rutherford (2006). It's classic open thornveld: scattered stands of *Vachellia erioloba* (camel thorn) and *Vachellia haematoxylon* rise above a shrub layer of *Searsia tridactyla*, *Diospyros lycioides*, *Grewia flava* and *Tarchonanthus camphoratus*, with *Vachellia hebeclada* forming low thickets in places. The ground layer is carried by grasses such as *Digitaria eriantha*, *Eragrostis lehmanniana*, *Stipagrostis* species and *Aristida congesta* (Mucina & Rutherford, 2006). Very little of this vegetation type has been transformed, though it remains poorly conserved and increasingly exposed to grazing pressure (Mucina & Rutherford, 2006).

4.1.1 Geological and Palaeontological History

The proposed Redstone PV and associated BESS development, near Postmasburg, in the Northern Cape, is shown on the 1:250 000 Postmasburg 2822 Geological Map (Council for Geoscience, Pretoria). The development area is underlain by Quaternary to Tertiary sands (red to flesh-coloured, wind-blown sand and sand dune deposits), as well as by the Ongeluk Formation of the Postmasburg Group (amygdaloidal andesitic lava with interbeds of tuff, agglomerate, chert and red jasper) of the Griqualand West Sequence (**Figure 2**). According to the SAHRIS PalaeoMap, the entire site is assigned a Moderate (green) Palaeontological Sensitivity (**Figure 5; Table 2**) (Almond & Pether, 2008; SAHRIS database), while the DFFE National Environmental Screening Tool identifies the development footprint as having a Medium Palaeontology Theme Sensitivity (**Figure 6**).

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 22

A short explanatory note accompanies the geological map sheet itself, but no detailed sheet explanation was ever published, and the map is now out of print. More recent work has refined the stratigraphic subdivision of the Precambrian rocks in the wider Kathu–Postmasburg area: Eriksson et al. (2006) revised the stratigraphy of the Transvaal Supergroup, while Moen (2006) did the same for the overlying Olifantshoek Supergroup.

A simplified regional geological map based on Cairncross & Beukes (2013) (**Figure 4**) shows that the development lies on the western flank of the Maremane Dome, a major north–south trending anticline within the early Proterozoic bedrock of the Ghaap Group (Transvaal Supergroup). The dome is cored by carbonate rocks of the Campbell Rand Subgroup, formerly grouped as the Ghaapplatto Formation, which are in turn overlain by the Kalahari Group. These shallow-marine carbonates, roughly 2.6 to 2.5 billion years old, were deposited on the shallow, submerged shelf of the Kaapvaal Craton and form a substantial platform 1.6 to 2.5 km thick, comprising mainly dolostones and dolomitic limestones with subordinate cherts, tuffs and siliciclastic material. Repeated sea-level changes drove shifting depositional cycles within these shallow-water facies, producing stromatolitic limestones and dolostones, oolites, laminated calcilutites and cherts, with lesser shales, siltstones and tuffs (Beukes, 1980, 1986; Sumner, 2002; Eriksson et al., 2006; Sumner & Beukes, 2006). The Campbell Rand carbonate bedrock in the study area is karstified and most likely does not crop out at surface.

On the western flank of the Maremane Dome, where the Campbell Rand carbonates, Asbestos Hills banded iron formation and Koegas quartzites and iron formation occur, a major unconformity at the base of the Palaeoproterozoic Elim Group (the basal unit of the Kheis Supergroup) truncates the folded Ghaap Group succession. Dated to roughly 2.2–2.0 billion years ago, this unconformity is closely associated with the manganese and iron ores long mined in the Sishen–Postmasburg area of Griqualand West (**Figure 3**). These ores occur within the palaeokarst-related Manganore Formation, which overlies the Campbell Rand Subgroup carbonates, and within the Gamagara Formation at the base of the Elim Group, itself formerly included within the Olifantshoek Group (Schalkwyk, 2005; Van Niekerk, 2006; Da Silva, 2011; Cairncross & Beukes, 2013; Smith & Beukes, 2016). In the greater Kathu region, the overlying Postmasburg Group is capped by the basaltic to andesitic lavas of the Ongeluk Formation, dated to approximately 2.2 billion years, which crop out south of the Gamagara River.

Around Sishen, these older Precambrian rocks are mantled by Late Cretaceous to Late Cenozoic aeolian sands, clays, calcretes and gravels of the Kalahari Group (roughly 65 to 2.5 million years old), which reach a thickness of about 80 m north-west of the development site (Haddon, 2005). The earliest Kalahari beds, the basal gravels of the Wessels Formation and the calcareous clays of the Budin Formation, are probably Late Cretaceous in age (Partridge et al., 2006).

The uppermost 15 m of the Kalahari sediments generally comprise clays, calcretised siltstones and pebbly horizons, with solution hollows along joint surfaces roughly 10 m below surface, and calcretised silcretes with in-situ brecciation close to the surface. Thick pedogenic calcretes of the Plio-Pleistocene Mokalanen

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 23

Formation, mapped along the Ga-Mogara drainage line, underlie the Kalahari sands in this region and point to seasonally arid conditions persisting over roughly the last five million years (Truter et al., 1938; Visser, 1958). Surface limestones may reach up to 20 m in thickness, are locally conglomeratic with reworked calcrete clasts and foreign pebbles, and may be secondarily silicified. Pleistocene Kalahari sands of the Gordonia Formation mantle thick calcretes and downwasted surface gravels across the wider region, with a range of calcrete facies, gravelly, brecciated, silicified and honeycomb, together with a karstified facies associated with sand- or gravel-infilled solution hollows (Almond, 2013). Older terrace gravels recorded along the Ga-Mogara drainage line to the north and east of the study area do not underlie the development footprint. Unconsolidated, reddish-brown aeolian sands of the Quaternary Gordonia Formation in the Sishen area are considered Late Pliocene to Early Pleistocene, or younger, in age, based on Middle to Later Stone Age tools recovered from them (Dingle et al., 1983, p. 291); recalibration of the Pliocene–Pleistocene boundary from 1.8 Ma to 2.588 Ma places the Gordonia Formation almost entirely within the Pleistocene Epoch.

Within this framework, the bedrock sequence comprises the Ghaap Group at the base, shallow-water carbonates of the Campbell Rand Subgroup overlain by the banded iron formations of the Asbestos Hills Subgroup (Kuruman and Daniëlskuil Formations), and the younger Postmasburg Group above, comprising the glacially-related Makganyene Formation diamictite and the overlying Ongeluk Formation lavas (Eriksson et al., 2006; McCarthy & Rubidge, 2005). It is this uppermost Postmasburg Group, and specifically the Ongeluk Formation, that the Postmasburg 2822 map already shows directly beneath the Redstone PV footprint, a reminder that, despite its age, the older map's basic lithological call for the site remains broadly consistent with the updated regional picture.

Quaternary superficial sands and calcretes of the Kalahari Group hold the greatest potential to preserve fossil material within the study area. These are the youngest sediments in the region, deposited over approximately the last 2.6 million years, typically as unconsolidated to weakly consolidated calcrete, sand, silt and clay in thin, discontinuous patches, with pedogenic calcrete horizons up to approximately 10 m thick locally displacing or replacing near-surface bedrock. Netterberg (1978, 1980) recognised several calcrete types in South Africa, including glaebular calcrete (discrete nodules), hardpan calcrete (massive limestone) and honeycomb calcrete formed by the coalescence of glaebules; these calcretes may be locally conglomeratic, incorporating exotic pebbles and reworked calcrete clasts. Fossil assemblages within these deposits are generally of low diversity but may be locally abundant, particularly in fluvial, pan or spring-related settings, and include diatoms, ostracods, freshwater gastropods and bivalves, coprolites, ostrich eggshell fragments, mammalian bones, teeth and horn cores, tortoise and reptile remains, plant microfossils, and trace fossils such as termite and insect burrows, rhizoliths and mammalian trackways; amphibian and crocodilian remains occur where past conditions were wetter. Fossils are most commonly exposed in erosion gullies and riverbanks, and reworked Middle to Later Stone Age artefacts have occasionally been recovered in association with fossil material (Churchill et al., 2000; Partridge et al., 2006; Moen, 2007; Almond & Pether, 2008); calcretes in parts of the Northern Cape may also locally host alluvial diamonds. Quaternary deposits are of particular scientific importance as archives of palaeoclimatic fluctuation and geomorphological change (Hunter et al., 2006): climatic variability throughout the Cenozoic strongly influenced southern African

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 24

landscapes (Maud, 2012), with the most pronounced changes occurring over roughly the last 1.8 million years (Barnosky, 2005), affecting river dynamics, sedimentation patterns and vegetation distribution (Tooth & McCarthy, 2004).

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 25

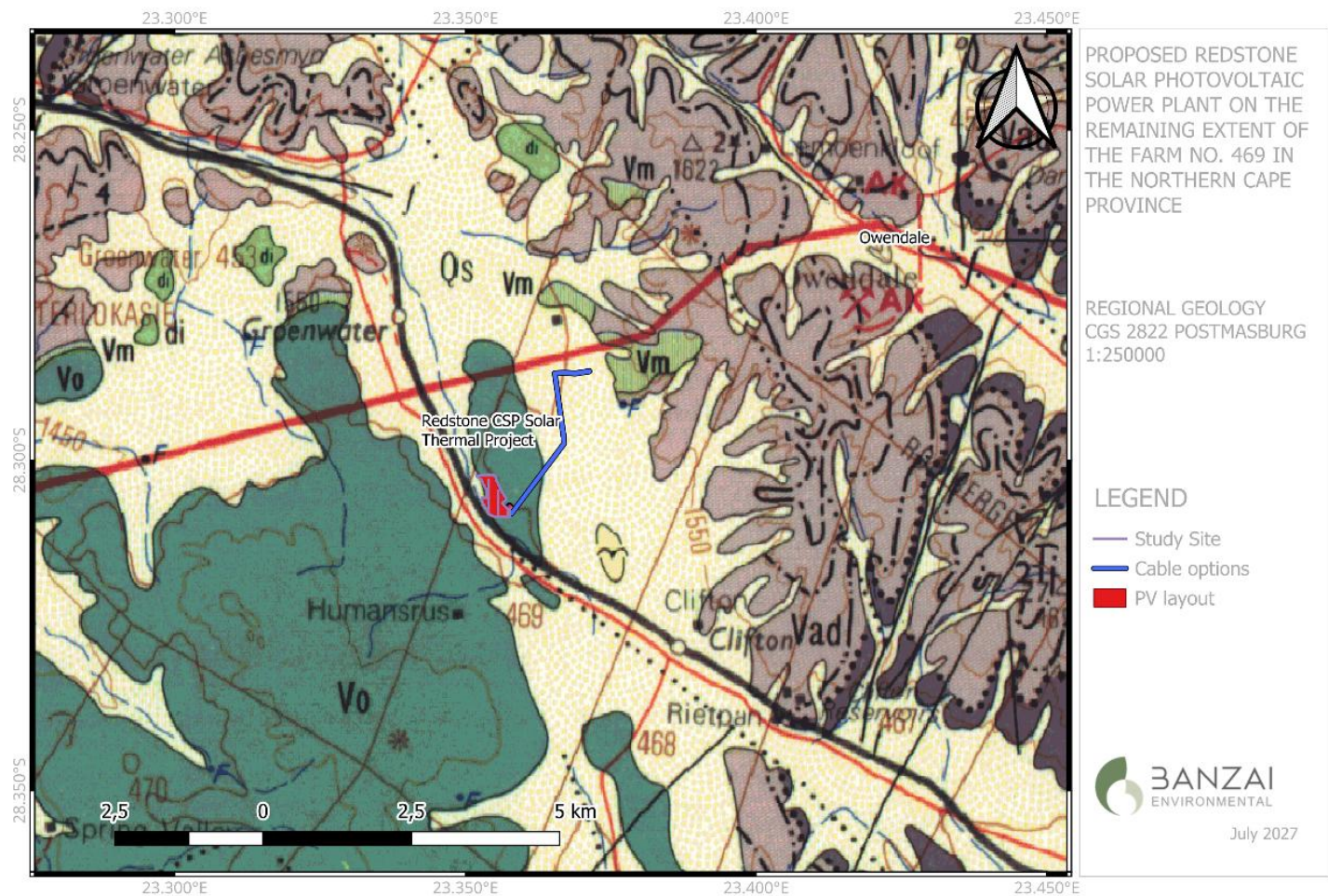


Figure 2 – Extract of the 1: 250 000 Postmasburg 2822 Geological Map (Council for Geoscience, Pretoria) indicating that the study area is underlain by Quaternary to Tertiary sands (Qs) (red to flesh coloured wind-blown sand and sand dune) as well as the Ongeluk Formation (Vo) of the Postmasburg Group.

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 26

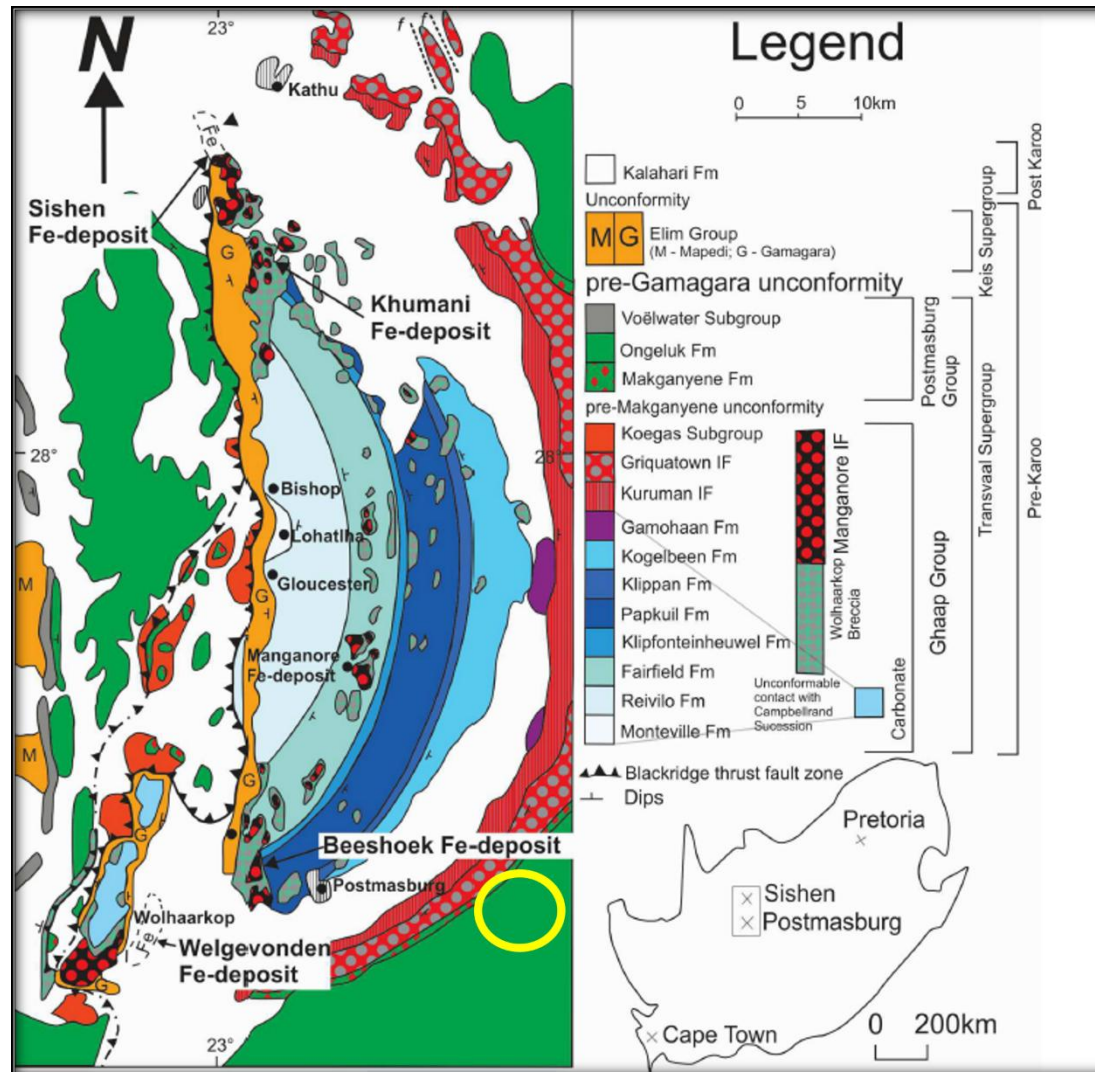


Figure 3 – Updated Regional Geology of the Maremane Dome in the Northern Cape (from Smith & Beukes 2016). The approximate location of the proposed development is indicated by the yellow circle.

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 27

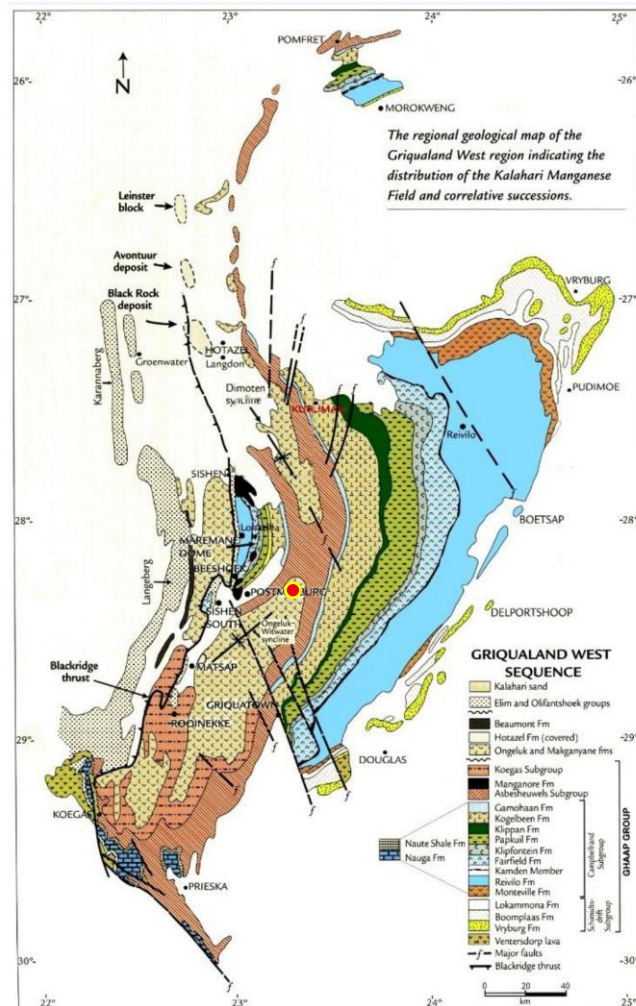


Figure 4 – Schematic regional geological map of the Griqualand West region, Northern Cape, showing the Postmasburg Group (Ongeluk and Makganyene Formations) and the Ghaap Group (Campbell Rand and Asbestos Hills Subgroups) relative to Postmasburg and the Maremane Dome, in the general vicinity of the Redstone PV site (red dot with yellow outline) (after Cairncross & Beukes, 2013).

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 28



Figure 5 – Extract of the SAHRIS PalaeoMap (Council for Geosciences, Pretoria) indicates that the study area is underlain by sediments with a Moderate (green) Palaeontological Sensitivity.

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 29

4.1.2 SAHRIS Palaeomap and the National Web-based Screening Tool

Table 2: Palaeontological Sensitivity according to the SAHRIS PalaeoMap (Almond et al, 2013; SAHRIS website.

Colour	Sensitivity	Required Action
RED	VERY HIGH	Field assessment and protocol for finds are required
ORANGE/YELLOW	HIGH	A desktop study is required, and based on the outcome of the desktop study, a field assessment is likely.
GREEN	MODERATE	A desktop study is required
BLUE	LOW	No palaeontological studies are required; however, a protocol for finds is required.
GREY	INSIGNIFICANT/ZERO	No palaeontological studies are required
WHITE/CLEAR	UNKNOWN	These areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

The overall Palaeontological Sensitivity of the area is classified as **Moderate**, as indicated by the SAHRIS Palaeomap (**Figure 5; Table 2**).

The SAHRIS PalaeoMap (**Figure 5**) and the National Environmental Web-based Screening Tool (**Figure 6**) both classify the development area as having Moderate/Medium Palaeontological Sensitivity. Due to this Sensitivity, no field-based palaeontological investigation was conducted at the site, and therefore the site's Palaeontological Sensitivity could not be verified on site. However, desktop-based research indicates that the palaeontological sensitivity of the area is **Low**.

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 31

5.1 Construction phase

The initial construction phase of the Redstone PV and BESS Project will include activities such as site clearance, and ground disturbances. During these activities, palaeontological material may be exposed.

While construction delays can be costly, mitigation measures should aim to minimise disruptions while ensuring compliance with heritage requirements. Excavations for foundations, and other ground disturbances, although primarily for solar PV and BESS infrastructure, may provide opportunities to document and rescue palaeontological heritage material.

During the construction phase, it is important to recognize any significant material being unearthed, making the correct judgment on which actions should be taken. However, in the unlikely event that fossil remains or trace fossils are discovered during any phase of construction, either on the surface or exposed by excavations the Environmental Control Officer (ECO)/site manager in charge of these activities is required to notify SAHRA (contact information: SAHRA, 111 Harrington Street, Cape Town, PO Box 4637, Cape Town 8000, South Africa). Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Website: www.sahra.org.za) in order for a palaeontologist to do effective mitigation (recording and collection).

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 32

Table 3: Summary of Impact Tables

	Identifier
Palaeontology	Discipline
Loss of fossil Heritage	Impact
No	Alternative
Construction	Phase
Normal Operation	Event
- 1	Pre-Nature
1	Pre-Extent
5	Pre-Duration
3	Pre-Magnitude
5	Pre-Reversibility
-3.5	Consequence
3	Pre-Probability
-10.5	Pre-Mitigation Significance
-Medium to High	Pre-Mitigation Significance
-1	Post-Nature
1	Post-Extent
5	Post-Duration
2	Post-Magnitude
5	Post-Reversibility
-3.25	Consequence2
2	Post-Probability
-6.5	Post-mitigation Significance
- Medium to Low	Post-Mitigation Significance
	Confidence
1	Cumulative Impact
3	Irreplaceable loss
-1.25	Priority Factor
-8.13	Final score
- Medium to Low	Post-Mitigation Significance

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 33

5.2 Cumulative Impacts

REFs in the Redstone PV development area (30 km range) will have a Low Palaeontological Sensitivity. If all the mitigation measures are carried out, a conservative estimate of the Cumulative impacts on fossil Heritage will be Low significance.

Table 4: Rating of Impacts Construction Phase – Redstone PV Project and associated infrastructure

Impact	Impact Criteria		Significance and Ranking (Pre-Mitigation)	Potential mitigation measures	Significance and Ranking (Post-Mitigation)	Confidence Level
CUMULATIVE IMPACT DURING CONSTRUCTION PHASE						
Loss of fossil Heritage	Status	Negative	Medium	Given the Low Palaeontological Sensitivity of the site, no formal chance find protocol is required. Should fossil material be exposed during construction, the Environmental Control Officer (ECO)/site manager must notify SAHRA	Low	High
	Spatial Extent	Site specific				
	Duration	Permanent				
	Consequence	Moderate				
	Probability	Unlikely				
	Reversibility	Non-reversible				
	Irreplaceability	Irreplaceable				

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 34

5.3 Heritage Management Plan for Environmental Management Plan

Table 5: Heritage Management Plan for EMPr implementation.

Area and site no.	Mitigation measures	Phase	Timeframe	The responsible party for implementation	Monitoring Party (frequency)	Target	Performance indicators (monitoring tool)
Palaeontological resources	Should fossil resources be discovered during construction, SAHRA should be contacted immediately.	Construction	During Construction	Applicant ECO /Palaeontologist	During construction and site clearance	Finding of fossils	Finding of fossils

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 35

6 CONCLUSIONS AND RECOMMENDATIONS

The Redstone PV and BESS development is underlain by Quaternary to Tertiary sands of the Kalahari Group and by the Palaeoproterozoic Ongeluk Formation of the Postmasburg Group. The overlying Quaternary to Tertiary sands holds the greatest palaeontological potential in the study area, whereas the underlying Ongeluk Formation, being of volcanic origin and predating the evolution of shelled and skeletal life, is not considered fossiliferous. Both the SAHRIS PalaeoMap and the DFFE National Environmental Screening Tool classify the site as having a Moderate to Medium Palaeontological Sensitivity (Almond & Pether, 2008; SAHRIS database).

A Medium Palaeontological Significance has been allocated to the construction phase pre-mitigation, reducing to Low significance post-mitigation; no significant impacts are expected during the Operational or Decommissioning phases, and the No-Go Alternative would have a Neutral impact. Cumulative impacts are considered Medium pre-mitigation and Low post-mitigation, within acceptable limits. The proposed Redstone PV and BESS development may therefore be permitted, as the footprint is not considered highly sensitive in terms of palaeontological resources, and no further palaeontological heritage studies or ground truthing are required prior to development.

Given the Low Palaeontological Sensitivity of the site, no formal chance find protocol is required. Should fossil remains or trace fossils nonetheless be exposed during construction, the Environmental Control Officer (ECO)/site manager must notify SAHRA immediately (SAHRA, 111 Harrington Street, Cape Town, PO Box 4637, Cape Town 8000; Tel: 021 462 4502; www.sahra.org.za), so that a palaeontologist can undertake appropriate mitigation (recording and collection). Any fossil material collected must be permitted through SAHRA and housed in an official repository, with reporting meeting SAHRA's (2012) minimum standards.

These recommendations should be incorporated into the Environmental Management Plan for the proposed Redstone Solar PV and BESS in the Northern Cape Province.

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 36

7 REFERENCES

ALMOND, J.E. & PETHER, J., 2008. *Palaeontological heritage of the Northern Cape*. Interim SAHRA technical report, 124 pp. Natura Viva cc, Cape Town.

ALMOND, J., PETHER, J. & GROENEWALD, G., 2013. *Palaeontological Impact Assessment Guidelines*. South African Heritage Resources Agency, Cape Town.

ALMOND, J.E., 2013. *Palaeontological specialist assessment: combined field-based and desktop study. Proposed 16 Mtpa Expansion of Transnet's Existing Manganese Ore Export Railway Line & Associated Infrastructure between Hotazel and the Port of Ngqura, Northern & Eastern Cape. Part 3: Kimberley to De Aar, Northern Cape*. Natura Viva cc, Cape Town.

BARNOSKY, A.D., 2005. Effects of Quaternary climatic change on speciation in mammals. *Journal of Mammalian Evolution* 12, 247–264.

BEUKES, N.J., 1980. Stratigrafie en litofasies van die Campbellrand-Subgroep van die Proterofitiese Ghaap-Group, Noord-Kaapland. *Transactions of the Geological Society of South Africa* 83, 141–170.

BEUKES, N.J., 1986. The Transvaal Sequence in Griqualand West. In: Anhaeusser, C.R. & Maske, S. (eds), *Mineral Deposits of Southern Africa, Volume 1*. Geological Society of South Africa, pp.819–828.

CAIRNCROSS, B. & BEUKES, N.J., 2013. *The Kalahari Manganese Field: The Adventure Continues*. Struik Nature, Cape Town, 384 pp.

COUNCIL FOR GEOSCIENCE, 1995. *1:250 000 Geological Map Series, Prieska 2922*. Council for Geoscience, Pretoria.

DE WIT, M.C.J., WARD, J.D. & HART, R.J., 2000. *Diamond-bearing deposits of the Vaal and Orange Rivers, South Africa*. Economic Geology Research Unit Information Circular, University of the Witwatersrand, Johannesburg.

DINGLE, R.V., SIESSER, W.G. & NEWTON, A.R., 1983. *Mesozoic and Tertiary Geology of Southern Africa*. A.A. Balkema, Rotterdam, 375 pp.

ERIKSSON, P.G., ALTERMANN, W. & HARTZER, F.J., 2006. The Transvaal Supergroup and its precursors. In: Johnson, M.R., Anhaeusser, C.R. & Thomas, R.J. (eds), *The Geology of South Africa*, pp. 237–260. Geological Society of South Africa, Marshalltown.

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 37

HADDON, I.G., 2005. *The sub-Kalahari geology and tectonic evolution of the Kalahari Basin, southern Africa*. PhD thesis, University of the Witwatersrand, Johannesburg.

MAUD, R.R., 2012. *The geomorphology of southern Africa*. Cambridge: Cambridge University Press.

MCCARTHY, T. & RUBIDGE, B., 2005. *The Story of Earth and Life: A Southern African Perspective on a 4.6-Billion-Year Journey*. Struik, Cape Town.

MOEN, H.F.G., 2006. The Olifantshoek Supergroup. In: Johnson, M.R., Anhaeusser, C.R. & Thomas, R.J. (eds), *The Geology of South Africa*, pp. 319–324. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria.

MTHOMBENI, T.F., 2019. *Vegetation Classification of the Witsand Nature Reserve, Northern Cape Province, South Africa*. MSc dissertation, University of the Free State, Bloemfontein.

MUCINA, L. & RUTHERFORD, M.C. (eds), 2006. *The Vegetation of South Africa, Lesotho and Swaziland*. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

NETTERBERG, F., 1978. Prospecting for calcrete road materials in South and South West Africa. *The Civil Engineer in South Africa* 20(1), 3–10.

NETTERBERG, F., 1980. Geology of southern African calcretes I: terminology, description, macrofeatures and classification. *Transactions of the Geological Society of South Africa* 83, 255–283.

PARTRIDGE, T.C. & BRINK, A.B.A., 1967. Gravels of the Vaal River Basin. *Transactions of the Geological Society of South Africa*, 70, 1–40.

PARTRIDGE, T.C., 1997. Late Neogene and Quaternary palaeoenvironments of the southern African interior: A review. *Quaternary Science Reviews*, 16(8), 807–833.

PARTRIDGE, T.C., BOTHA, G.A. & HADDON, I.G., 2006. Cenozoic deposits of southern Africa. In: Johnson, M.R., Anhaeusser, C.R. & Thomas, R.J. (eds). *The Geology of South Africa*. Johannesburg: Geological Society of South Africa, pp. 605–628.

PARTRIDGE, T.C., DOLLAR, E.S.J., MOOLMAN, J. & DOLLAR, L.H., 2010. *The geomorphic provinces of South Africa, Lesotho and Swaziland: A physiographic subdivision for earth and environmental scientists*. Transactions of the Royal Society of South Africa, 65(1), pp.1–47.

RUTHERFORD, M.C. & WESTFALL, R.H., 1994. Biomes of southern Africa: An objective categorization. *Memoirs of the Botanical Survey of South Africa*, 63, pp.1–94.

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 38

RUTHERFORD, M.C., MUCINA, L. & POWRIE, L.W., 2006. Biomes and bioregions of southern Africa. In: Mucina, L. & Rutherford, M.C. (eds.), *The vegetation of South Africa, Lesotho and Swaziland*. Pretoria: South African National Biodiversity Institute, pp.30–51.

SMITH, A.J.B. & BEUKES, N.J., 2016. Palaeoproterozoic banded iron formation-hosted high-grade hematite iron ore deposits of the Transvaal Supergroup, South Africa. *Episodes* 39(2), 269–284.

SUMNER, D.Y., 2002. Neoarchaeal carbonates – clues to early life and early ocean chemistry. Excursion A6, 1–6 July 2002, 24 pp. 16th International Sedimentological Congress, International Association of Sedimentologists, Rand Afrikaans University, Johannesburg.

SUMNER, D.Y. & BEUKES, N.J., 2006. Sequence stratigraphic development of the Neoarchaeal Transvaal carbonate platform, Kaapvaal Craton, South Africa. *South African Journal of Geology* 109, 11–22.

TOOTH, S. & MCCARTHY, T.S., 2004. Anabranching in mixed bedrock-alluvial rivers: the example of the Orange River above Augrabies Falls, Northern Cape Province, South Africa. *Geomorphology* 57, 235–262.

TRUTER, F.C., WASSERSTEIN, B., BOTHA, P.R., VISSER, D.L.J., BOARDMAN, L.G. & PAVER, G.L., 1938. *The geology and mineral deposits of the Olifantshoek area, Cape Province*. Explanation of Sheet 173 (Olifantshoek), Geological Survey, Pretoria.

VISSER, D.L.J., 1958. *The geology and mineral deposits of the Griquatown area, Cape Province*. Explanation of Sheet 175 (Griquatown), Geological Survey, Pretoria.

VISSER, D.J.L. (ED) 1984. Geological Map of South Africa 1:100 000. South African Committee for Stratigraphy, Council for Geoscience, Pretoria.

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 39

APPENDIX A

EIMS: IMPACT ASSESSMENT METHODOLOGY

Assessment Methodology

The impact significance rating methodology, as presented herein and utilised for all EIMS Impact Assessment Projects, is guided by the requirements of the NEMA EIA Regulations 2014 (as amended). The approach may be altered or substituted on a case-by-case basis if the specific aspect being assessed requires such- such instances require prior EIMS Project Manager approval. The broad approach to the significance rating methodology is to determine the significance (S) of an environmental risk or impact by considering the consequence (C) of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relating this to the probability/ likelihood (P) of the impact occurring. The S is determined for the pre- and post-mitigation scenario. In addition, other factors, including cumulative impacts and potential for irreplaceable loss of resources, are used to determine a prioritisation factor (PF) which is applied to the S to determine the overall final significance rating (FS). The impact assessment will be applied to all identified alternatives.

Determination of Significance

The final significance (FS) of an impact or risk is determined by applying a prioritisation factor (PF) to the post-mitigation environmental significance. The significance is dependent on the consequence (C) of the particular impact and the probability

(P) of the impact occurring. Consequence is determined through the consideration of the Nature (N), Extent (E), Duration (D), Magnitude (M), and Reversibility (R) applicable to the specific impact.

For the purpose of this methodology the consequence of the impact is represented by:

$$C = \frac{(E + D + M + R) * N}{4}$$

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in Table below.

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 40

Criteria for Determining Impact Consequence

Aspect	Score	Definition
Nature	- 1	Likely to result in a negative/ detrimental impact
	+1	Likely to result in a positive/ beneficial impact
Extent	1	Activity (i.e. Highly localised, limited to the area applicable to the specific activity)
	2	Site (i.e. within the development property or site boundary, or the area within a few hundred meters of the site)
	3	Local (i.e. beyond the site boundary within the Local administrative boundary (e.g. Local Municipality) or within consistent local geographical features, or the area within 5 km of the site)
	4	Regional (i.e. Far beyond the site boundary, beyond the Local administrative boundaries within the Regional administrative boundaries (e.g. District Municipality), or extends into different distinct geographical features, or extends between 5 and 50 km from the site).
	5	Provincial / National / International (i.e. extends into numerous distinct geographical features, or extends beyond 50 km from the site).
Duration	1	Immediate (<1 year, quickly reversible)
	2	Short term (1-5 years, less than project lifespan)
	3	Medium term (6-15 years)
	4	Long term (15-65 years, the impact will cease after the operational life span of the project)
	5	Permanent (>65 years, no mitigation measure of natural process will reduce the impact after construction/ operation/ decommissioning).
Magnitude/ Intensity	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected)
	2	Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected, or affected environmental components are already degraded)
	3	Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; moderate improvement for +ve impacts; or where change affects area of potential conservation or other value, or use of resources).
	4	High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease; high improvement for +ve impacts; or where change affects high conservation value areas or species of conservation concern)

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 41

	5	Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease, substantial improvement for +ve impacts; or disturbance to pristine areas of critical conservation value or critically endangered species)
Reversibility	1	Impact is reversible without any time and cost.

	2	Impact is reversible without incurring significant time and cost.
	3	Impact is reversible only by incurring significant time and cost.
	4	Impact is reversible only by incurring very high time and cost.
	5	Irreversible Impact.

Once the C has been determined, the significance is determined in accordance with the standard risk assessment relationship by multiplying the C and the P. Probability is rated/ scored as per Table below.

It is noted that both environmental risks as well as environmental impacts should be identified and assessed. Environmental Risk can be regarded as the potential for something harmful to happen to the environment, and in many instances is not regarded as something that is expected to occur during normal operations or events (e.g. unplanned fuel or oil spills at a construction site). Probability and likelihood are key determinants or variables of environmental risk. Environmental Impact can be regarded as the actual effect or change that happens to the environment because of an activity and is typically an effect that is expected from normal operations or events (e.g. vegetation clearance from site development results in loss of species of concern). Typically, the probability of an unmitigated environmental impact is regarded as highly likely or certain (management and mitigation measures would ideally aim to reduce this likelihood where possible). In summary, environmental risk is about what could happen, while environmental impact is about what does happen.

Probability/ Likelihood Scoring

Probability	1	Improbable (Rare, the event may occur only in exceptional circumstances, the possibility of the impact materialising is very low as a result of design, historic experience, or implementation of adequate corrective actions; <5% chance).
	2	Low probability (Unlikely, impact could occur but not realistically expected; >5% and <20% chance).
	3	Medium probability (Possible, the impact may occur; >20% and <50% chance).
	4	High probability (Likely, it is most probable that the impact will occur- > 50 and <90% chance).
	5	Definite (Almost certain, the impact is expected to, or will, occur, >90% chance).

The result is a qualitative representation of relative significance associated with the impact. Significance is therefore calculated as follows:

$$S = C \times P$$

Determination of Significance

5- Very High ¹	5	10	15	20	25
4- High	4	8	12	16	20

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 42

	3- Medium	3	6	9	12	15
	2- Low	2	4	6	8	10
	1- Very low	1	2	3	4	5

¹ In the event that an impact or risk has very high or catastrophic consequences, but the likelihood/probability is low, then the resultant significance would be Low-medium. This does in certain instances detract from the relative important of this impact or risk and must consequently be flagged for further specific consideration, management, mitigation, or contingency planning

		1- Improbable	2- Low	3- Medium/ Possible	4- High/ Probable	5- Highly likely/ Definite
		Probability				

The outcome of the significance assessment will result in a range of scores, ranging from 1 through to 25. These significance scores are then grouped into respective classes as described in Table below.

Significance Scores

S Score	Description
≤4.25	Low (i.e. where this impact is unlikely to be a significant environmental risk/ reward).
>4.25, ≤8.5	Low-Medium (i.e. where the impact could have a significant environmental risk/ reward).
>8.5, ≤13.75	High-Medium (i.e. where the impact could have a significant environmental risk/ reward).
>13.75	High (i.e. where the impact will have a significant environmental risk/ reward).

The impact significance will be determined for each impact without relevant management and mitigation measures (pre- mitigation significance), as well as post implementation of relevant management and mitigation measures (post-mitigation significance). This allows for a prediction in the degree to which the impact can be managed/mitigated.

Impact Prioritization

Further to the assessment criteria presented in the section above, it is necessary to consider each potentially significant impact in terms of:

Cumulative impacts; and

The degree to which the impact may cause irreplaceable loss of resources.

To ensure that these factors are considered, an impact prioritisation factor (PF) will be applied to each impacts' post-mitigation significance (post-mitigation). This prioritisation factor does not aim to

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 43

detract from the significance ratings but rather to focus the attention of the decision-making authority on the higher priority/significance issues and impacts. The PF will be applied to the post-mitigation significance based on the assumption that relevant suggested management/mitigation impacts are implemented.

Table 5: Criteria for Determining Prioritisation

Cumulative Impact (CI)	Low (1)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.
	Medium (2)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.
	High (3)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/ definite that the impact will result in spatial and temporal cumulative change.
	Low (1)	Where the impact is unlikely to result in irreplaceable loss of resources.

Irreplaceable Loss of Resources (LR)	Medium (2)	Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.
	High (3)	Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).

The value for the final impact priority is represented as a single consolidated priority, determined as the sum of each individual criteria represented in Table 5. The impact priority is therefore determined as follows:

$$Priority = CI + LR$$

The result is a priority score which ranges from 2 to 6 and a consequent PF ranging from 1 to 1.5 (Refer to Table below).

Determination of Prioritisation Factor

Priority	Prioritisation Factor
2	1
3	1.125
4	1.25
5	1.375
6	1.5

In order to determine the final impact significance (FS), the PF is multiplied by the post-mitigation significance scoring. The ultimate aim of the PF is an attempt to increase the post mitigation

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 44

environmental risk rating by a factor of 0.5, if all the priority attributes are high (i.e. if an impact comes out with a high medium environmental risk after the conventional impact rating, but there is significant cumulative impact potential and significant potential for irreplaceable loss of resources, then the net result would be to upscale the impact to a higher significance).

Final Environmental Significance Rating

Significance Rating	Description
<-25	Very High (Impacts in this class are extremely significant and pose a very high environmental risk. In certain instances these may represent a fatal flaw. They are likely to have a major influence on the decision and may be difficult or impossible to mitigate. Offset's may be necessary.
<-13.75 to -25	High negative (These impacts are significant and must be carefully considered in the decision-making process. They have a high environmental risk or impact and require extensive mitigation measures).
-8.5 to -13.75	Medium-High negative (i.e. Impacts in this class are more substantial and could have a significant environmental risk. They may influence the decision to develop in the area and require more robust mitigation measures).
<-4.25 to <-8.5	Medium- Low negative (i.e. These impacts are slightly more significant than low impacts but still do not pose a major environmental risk. They might require some mitigation measures but are generally manageable).

Significance Rating	Description
-1 to -4.25	Low negative (i.e. Impacts in this class are minor and unlikely to have a significant environmental risk. They do not influence the decision to develop in the area and are typically easily mitigated.
0	No impact
1 to 4.25	Low positive
>4.25 to <8.5	Medium-Low positive
8.5 to 13.75	Medium-High positive
>13.75	High positive

The significance ratings and additional considerations applied to each impact will be used to provide a quantitative comparative assessment of the alternatives being considered. In addition, professional expertise and opinion of the specialists and the environmental consultants will be applied to provide a qualitative comparison of the alternatives under consideration. This process will identify the best alternative for the proposed project.

Nature	-1	Likely to result in a negative/ detrimental impact	CONSEQUENCE ENVIRONMENTAL
	1	Likely to result in a positive/ beneficial impact	
Extent	1	Activity (i.e. Highly localised, limited to the area applicable to the specific activity)	

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 45

	2	Site (i.e. within the development property or site boundary, or the area within a few hundred meters of the site)		
	3	Local (i.e. beyond the site boundary within the Local administrative boundary (e.g. Local Municipality) or within consistent local geographical features, or the area within 5 km of the site)		
	4	Regional (i.e. Far beyond the site boundary, beyond the Local administrative boundaries within the Regional administrative boundaries (e.g. District Municipality), or extends into different distinct geographical features, or extends between 5 and 50 km from the site).		
	5	Provincial / National / International (i.e. extends into numerous distinct geographical features, or extends beyond 50 km from the site).		
Duration	1	Immediate (<1 year, quickly reversible)		
	2	Short term (1-5 years, less than project lifespan)		
	3	Medium term (6-15 years)		
	4	Long term (15-65 years, the impact will cease after the operational life span of the project)		
	5	Permanent (>65 years, no mitigation measure of natural process will reduce the impact after construction/ operation/ decommissioning).		
Magnitude/ Intensity	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected)		
	2	Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected, or affected environmental components are already degraded)		
	3	Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; moderate improvement for +ve impacts; or where change affects area of potential conservation or other value, or use of resources).		
	4	High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease; high improvement for +ve impacts; or where change affects high conservation value areas or species of conservation concern)		
	5	Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease, substantial improvement for +ve impacts; or disturbance to pristine areas of critical conservation value or critically endangered species)		
Reversibility	1	Impact is reversible without any time and cost.		
	2	Impact is reversible without incurring significant time and cost.		
	3	Impact is reversible only by incurring significant time and cost.		
	4	Impact is reversible only by incurring prohibitively high time and cost.		
	5	Irreversible Impact		
Probability	1	Improbable (Rare, the event may occur only in exceptional circumstances, the possibility of the impact materialising is very low as a result of design, historic experience, or implementation of adequate corrective actions; <5% chance).	PROBABILITY	
	2	Low probability (Unlikely, impact could occur but not realistically expected; >5% and <20% chance).		
	3	Medium probability (Possible, the impact may occur; >20% and <50% chance).		
	4	High probability (Likely, it is most probable that the impact will occur- > 50 and <90% chance).		

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 46

	5	Definite (Almost certain, the impact is expected to, or will, occur, >90% chance).		
Cumulative Impact	1	Low: Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.	PRIORITISATION FACTOR	
	2	Medium: Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.		
	3	High: Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.		
Irreplaceable loss of resources	1	Low: Where the impact is unlikely to result in irreplaceable loss of resources.		
	2	Medium: Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.		
	3	High: Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).		
Degree of Confidence	Low	<30% certain of impact prediction		
	Medium	>30 and < 60% certain of impact prediction		
	High	>60% certain of impact prediction		

Document	Project	Revision	Date	Page Number
1029HIA-002	Redstone PV	1.1	09/07/2026	Page 47

APPENDIX B

PGS TEAM CVs

ELIZE BUTLER

Associate

Palaeontologist

PROFILE

Elize has conducted approximately 900 Paleontological Impact Assessments for developments in the Free State, KwaZulu-Natal, Eastern, Northern and Western Cape, Northwest, Gauteng, Limpopo, and Mpumalanga. She has an MSc (cum laude) in Zoology (specializing in Palaeontology) from the University of the Free State, South Africa. She has experience in locating, collecting, and curating fossils. She has been a member of the Paleontological Society of South Africa (PSSA) since 2006 and has been conducting PIAs since 2014.

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EDUCATION

University of the Orange Free State
1988
B.Sc. Botany and Zoology

University of the Orange Free State
1991
B. Sc (Hons) Zoology

University of the Orange Free State
2009
M. Sc. Cum laude (Zoology)
Dissertation title: The postcranial skeleton of the Early Triassic non-mammalian Cynodont Galesaurus planiceps: implications for biology and lifestyle.

WORK EXPERIENCE

PGS Heritage Group of Companies

Associate – Palaeontologist
2025 - present
Appointed as Associate - Palaeontologist responsible for palaeontological impact studies

Banzai Environmental - Palaeontologist
2016 - present
Palaeontologist and Director responsible for palaeontological impact studies

National Museum, Bloemfontein - Principal Research Assistant and Collection Manager
1998 - 2022

National Museum, Bloemfontein - Research Assistant
1993-1997

PROFESSIONAL AFFILIATION

Professional Palaeontologist
Paleontological Society of South Africa (PSSA) – since 2006

