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ENVIRONMENTAL

Environmental Authorisation for the Nomalanga Estates Expansion Project, KwaZulu-Natal

Heritage Impact Assessment

Project Number:

NOM5486

Prepared for:

Nomalanga Property Holdings (Pty) Ltd

May 2019

Digby Wells and Associates (South Africa) (Pty) Ltd
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Project Name:	**Environmental Authorisation for the Nomalanga Estates Expansion Project, KwaZulu-Natal**
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I, Shannon Hardwick as duly authorised representative of Digby Wells and Associates (South Africa) (Pty) Ltd., hereby confirm my independence (as well as that of Digby Wells and Associates (South Africa) (Pty) Ltd.) and declare that neither I nor Digby Wells and Associates (South Africa) (Pty) Ltd. have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of Nomalanga Property Holdings (Pty) Ltd, other than fair remuneration for work performed, specifically in connection with the Heritage Resources Management (HRM) Process for the Nomalanga Estates Expansion Project.

_____

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I, Justin du Piesanie as duly authorised representative of Digby Wells and Associates (South Africa) (Pty) Ltd., hereby confirm my independence (as well as that of Digby Wells and Associates (South Africa) (Pty) Ltd.) and declare that neither I nor Digby Wells and Associates (South Africa) (Pty) Ltd. have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of Nomalanga Property Holdings (Pty) Ltd, other than fair remuneration for work performed, specifically in connection with the Heritage Resources Management (HRM) Process for the Nomalanga Estates Expansion Project.

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EXECUTIVE SUMMARY

Nomalanga Property Holdings (Pty) Ltd (hereinafter Nomalanga) propose to expand their current agricultural estate (Nomalanga Estate) and associated agro-processing operation ("the Project") near Greytown in the KwaZulu-Natal province. Nomalanga appointed Digby Wells Environmental (hereinafter Digby Wells) to undertake an Environmental Impact Assessment (EIA) process in support of the Environmental Authorisation (EA) required in terms of the South African national legislative framework.

This report constitutes the specialist Heritage Impact Assessment (HIA) report as one component of the Heritage Resources Management (HRM) process undertaken in support of the EIA process. Digby Wells completed the HRM process in compliance with Section 38 of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) and Section 41 of the KwaZulu-Natal Amafa and Research Institute Act, 2018[1] (Act No 5 of 2018) (KZNARIA).

Digby Wells completed the following activities for the HIA process:

- Description of the predominant cultural landscape supported through primary and secondary data collection;
- Identification (as far as possible) of heritage resources within the Project area which may be impacted upon by Project-related activities and the assessment of the Cultural Significance (CS) of these heritage resources;
- Identification of the potential impacts to heritage resources based on Project activities;
- Recommendation of feasible management and mitigation measures to avoid and/or minimise negative impacts and enhance potential benefits; and
- Consideration of the socio-economic benefits of the Project.

Through an understanding of various heritage resources distribution within the site-specific study area, the statement of CS as presented in the table below demonstrates an average low significance rating for the defined cultural landscape.

[1] Extraordinary Provincial Gazette No. 2029, dated 14 December 2018. Notice 11 of 2018.

Summary of the CS of Identified Heritage Resources

Resource ID	Description	INTEGRITY	CS
Vryheid Formation	Geological strata with palaeontological sensitivity	4	Very High
BGG-001, BGG-002 and BGG-03	Burial grounds and graves	4	Very High
HST-001, HST-002, HST-003 and HLP-002	Historical structures	2	Low
LFC-003	Stonewalling	6	Low
HST-004 and HST-005	Historical structures	1, 2	Negligible
LFC-001 and LFC-002	Stonewalling	3	Negligible

The Project includes several activities and associated infrastructure. The infrastructure design and site layout has not been finalised at the time of assessment and will be, in part, informed by the outcomes of this assessment. It is therefore anticipated that all heritage resources will be affected by the Project. The table below presents a summary of the impact assessment.

The table below presents an overview of the potential risks to unidentified heritage resources within the Project area in the main text.

Summary of the potential risk to heritage resources

Unplanned event	Potential impact
Accidental exposure of fossil bearing material implementation of the Project.	Damage or destruction of heritage resources generally protected under Section 35 of the NHRA and Section 40 of the KZNARIA.
Accidental exposure of *in situ* LFC settlement sites (or other archaeological material) during the implementation of the Project.	
Accidental exposure of *in situ* historical built environment sites during the implementation of the Project.	Damage or destruction of heritage resources generally protected under Section 34 of the NHRA and Section 37 of the KZNARIA
Accidental exposure of *in situ* burial grounds or graves during the implementation of the Project.	Damage or destruction of heritage resources generally protected under Section 36 of the NHRA and Sections 38 and 39 of the KZNARIA.
Accidental exposure of human remains during the construction phase of the Project.	

Summary of the Impact Assessment

Impact	Duration	Extent	Intensity	Consequence	Probability	Significance
	Pre-mitigation:					
Direct impact to BGG	Permanent	International	Extremely high - negative	Extremely detrimental	Highly probable	Major - negative
Direct impact to LFC Stonewalling of Low CS	Permanent	Province/ Region	Very low - negative	Moderately detrimental	Highly probable	Moderate - negative
Direct impact to Historical Structures of Low CS	Permanent	Province/ Region	Very low - negative	Moderately detrimental	Highly probable	Moderate - negative
Impact	**Post-mitigation:**					
Direct impact to BGG	Beyond project life	Limited	High - positive	Moderately beneficial	Certain	Moderate - positive
Direct impact to LFC Stonewalling of Low CS	Beyond project life	Limited	Very low - positive	Slightly beneficial	Certain	Minor - positive
Direct impact to Historical Structures of Low CS	Beyond project life	Local	Very low - positive	Moderately beneficial	Certain	Minor - positive

To mitigate against the identified impacts against cultural and fossil heritage resources as described in Section 6.2, Digby Wells has made the following recommendations:

Based on Digby Wells' understanding of the Project (refer to Section 1.1), while considering the defined cultural landscape and known heritage resources (refer to Section 6), Digby Wells recommends the following:

- Nomalanga must amend the infrastructure design where possible to avoid identified heritage resources within the Project area. Digby Wells acknowledges that it may not be feasible to avoid all the identified heritage resources;
- Where burial grounds and graves will be impacted upon by the proposed infrastructure, Nomalanga must undertake mitigation measures (inclusive of a BGGC, permit application process and GRP) in accordance with Section 36 of the NHRA and Chapter IX and XI of the NHRA Regulations as well as additional requirements encapsulated in Section 38 and 39 of the KZNARIA;
- Where archaeological sites will be impacted upon by the proposed infrastructure, Nomalanga must undertake mitigation measures (so-called Archaeological Phase 2 Mitigations, which will include detailed mapping and which may include surface collections) in accordance with Section 35 of the NHRA and Chapter IV of the NHRA Regulations as well as additional requirements encapsulated in Section 38 and 39 of the KZNARIA;
- Where historical structures will be impacted upon by the proposed infrastructure, Nomalanga must undertake mitigation measures (inclusive of a permit application process) in accordance with Section 34 of the NHRA and Chapter III of the NHRA Regulations as well as additional requirements encapsulated in Section 37 of the KZNARIA;
- Where identified heritage resources are avoided, Nomalanga must develop and implement a CMP to conserve the heritage resource and its CS value as described in Section 6.1. The CMP will include mitigation measures, management strategies and proposed monitoring schedules and will outline the roles and responsibilities of those involved in the conservation of the heritage resources. This document must be submitted to the HRAs for Statutory Comment before it can be implemented;
- A project-specific Chance Find Protocol (CFP) must be developed, approved by the HRAs and implemented prior to the commencement of the construction of Project-related infrastructure; and
- The project-specific Fossil Finds Protocol (FFP) must be approved and implemented prior to the commencement of the construction phase of the Project.

Where these recommendations are adopted, Digby Wells does not object to the implementation of the Project.

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1 Introduction

Nomalanga Property Holdings (Pty) Ltd (hereinafter Nomalanga) are proposing to expand their current agricultural estate (Nomalanga Estate) located near Greytown in the KwaZulu-Natal province ("the Project"). Nomalanga require Environmental Authorisation (EA) to comply with the national South African legislative framework.

To this effect, Nomalanga appointed Digby Wells Environmental (hereinafter Digby Wells) to undertake an Environmental Impact Assessment (EIA) process in compliance with:

- The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA)'
- The NEMA EIA Regulations, 2017 (Government Notice Regulations [GN R] 982 as amended by GN R 326); and
- The National Water Act, 1998 (Act No. 36 of 1998) (NWA).

Digby Wells undertook a Heritage Resources Management (HRM) process in support of the EIA process and to comply with Section 38 of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) and the KwaZulu-Natal Amafa and Research Institute Act, 2018[2] (Act No 5 of 2018) (KZNARIA). This report constitutes the Heritage Impact Assessment (HIA) report for submission to the South African Heritage Resources Agency (SAHRA) and KwaZulu-Natal Amafa and Research Institute ("the Institute").

1.1 Project background and description

Nomalanga Estate is located in Rietvlei, between Greytown and Mooi River in the KwaZulu-Natal Midlands. This area is within the Umvoti Local Municipality (ULM) of the Umzinyathi District Municipality (UDM).

Plan 1 presents the regional and local setting within which the Project is located. The Project area consists of the following properties:

- Portion 3 of the farm Scheepers Daal No. 1798;
- Portion 2 of the farm Springfield No. 1832;
- Portion 17 of the farm Umvoti Heights No. 1353; and
- Portion 1, remainder of Portion 3 and Portion 4 and the Remaining Extent of the farm Vermaaks Kraal No. 1061.

The properties include a proclaimed nature reserve, the Nomalanga Nature Reserve, which extends across 2 648 hectares (ha) (refer to Plan 1). This was considered during the heritage assessment but did not form the focus as the nature reserve component is outside the scope of this assessment. Ezemvelo KwaZulu-Natal Wildlife appointed Nomalanga as

[2] Extraordinary Provincial Gazette No. 2029, dated 14 December 2018. Notice 11 of 2018.

the Management Authority for the nature reserve, which is recognised as one of the nine Priority Stewardship Areas in the province.

Nomalanga Estate currently includes a 5 ha shade cloth used for crops which are cultivated using drip irrigation and fertigation. Agricultural products are packaged in a pack house which includes cooling facilities. This facility covers 200 m^2. The property also includes a leased afforested area of approximately 273 ha and the following water-related infrastructure:

- A small reservoir adjacent to a fertilizer dosing house;
- A furrow constructed of stone and cement;
- Two dams that are currently dry: Monyane and Msabeni. These are located behind the farm house; and
- A large dam, named Mzolo, which feeds the furrow that channels water to the two dry dams.

The Project will include the following proposed activities:

- Intense commercial agriculture which will include the expansion of the shade-cloth production area to 25 ha, an open-crop area of approximately 156 ha and the establishment of fruit and nut orchards;
- The construction of a greenhouse. This structure will extend approximately 62 ha, of which 2 ha will comprise a nursery with an irrigation and precision-farming system;
- The development of a 4 000 m^2 food processing facility;
- Upgrading the existing furrow;
- Upgrading all three dams on the property: Mzolo, Monyane and Msabeni;
- The construction of a new river dam, which will include piping links to supply water to the irrigation zone;
- Construction of a pipeline and connections to the uMzinyathi Craigie Burn bulk water pipeline;
- The construction of two water treatment facilities and a processing water effluent treatment plant;
- The construction of an additional three or four boreholes to supply water; and
- Staff and management housing to accommodate 500 people.

The food processing facility will process bulk fruit and vegetables for sale as bulk produce, ready-to-eat meals and/or Individually Quick Frozen (IQF) products. The facility will therefore be constructed to the specifications required for a High Care, High Risk Food Processing Facility. Power to the facility will be provided by the national grid as well as solar panels.

Nomalanga propose to undertake these activities within a 300 ha area earmarked for additional agricultural activities.

Plan 2 presents an overview of the existing infrastructure within the Estate. The final infrastructure layout will be influenced by the results of EIA and supporting specialist studies and, as such, have not been finalised. They are therefore not included in the plan.

1.2 Project alternatives

Nomalanga is presently considering alternatives in terms of the Project design and layout within the earmarked 300 ha. The final infrastructure layout will aim to avoid or reduce significant impacts identified in specialist studies, specifically:

- Soil forms and agricultural potential;
- Topography;
- Heritage resources;
- Rank 2 National Freshwater Ecosystem Priority Area (NFEPA) wetlands[3]; and
- Fauna, flora and freshwater species of conservation concern.

Another alternative to be considered is the “no-go” alternative. Should the Project not obtain approval, or not go ahead for any reason, the potential environmental impacts associated with the construction, installation and operation of the infrastructure described in Section 1.1 would not occur. However, the potential benefits associated with the Project would also not occur.

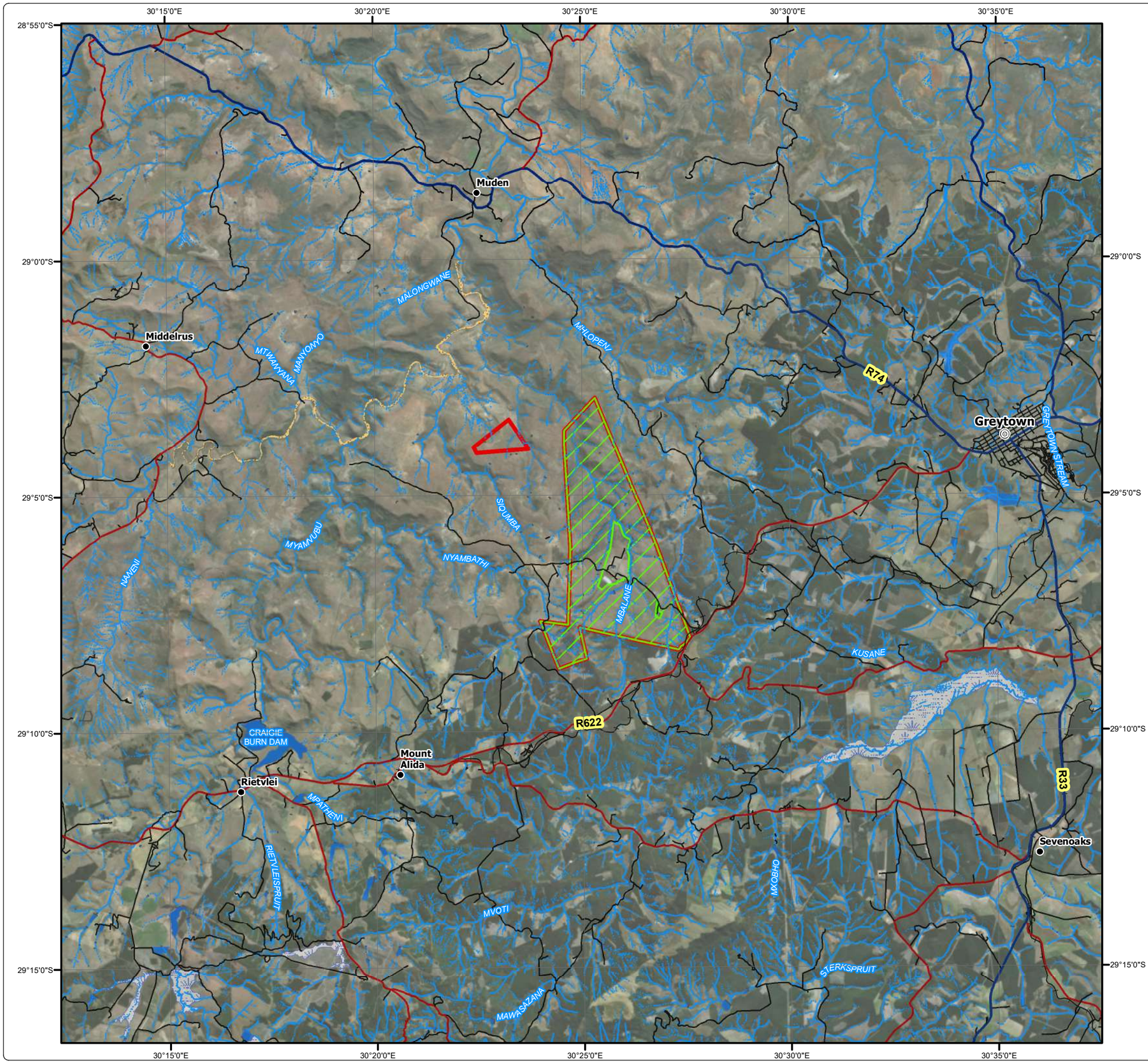
The foreseen impacts are described in Section 6, the potential socio-economic benefits of the Project are presented in Section 0 and recommendations regarding the placement of infrastructure are outlined in Section 9.

[3] These include wetlands in proximity to threatened frog or waterbird species or specific crane species, wetlands with exceptional biodiversity and wetlands that are good, intact examples within sub-quaternary catchments. These wetlands have specific conservation criteria. Refer to the wetlands specialist study for more information.

Plan 1

Nomalanga Estates Agricultural Development EIA

Local Setting



Legend

- Project Area
- Nature Reserve Boundary
- Secondary Town
- Settlement
- Arterial / National Route
- Main Road
- Minor Road
- Railway Line
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Non-Perennial Pan / Stream
- Wetland

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Projection: Transverse Mercator	Ref #: kam.NOM5486.201810.152
Datum: WGS 1984	Revision Number: 1
Central Meridian: 31°E	Date: 25/10/2018

N

0 2 4 8

Kilometres

1:150 000

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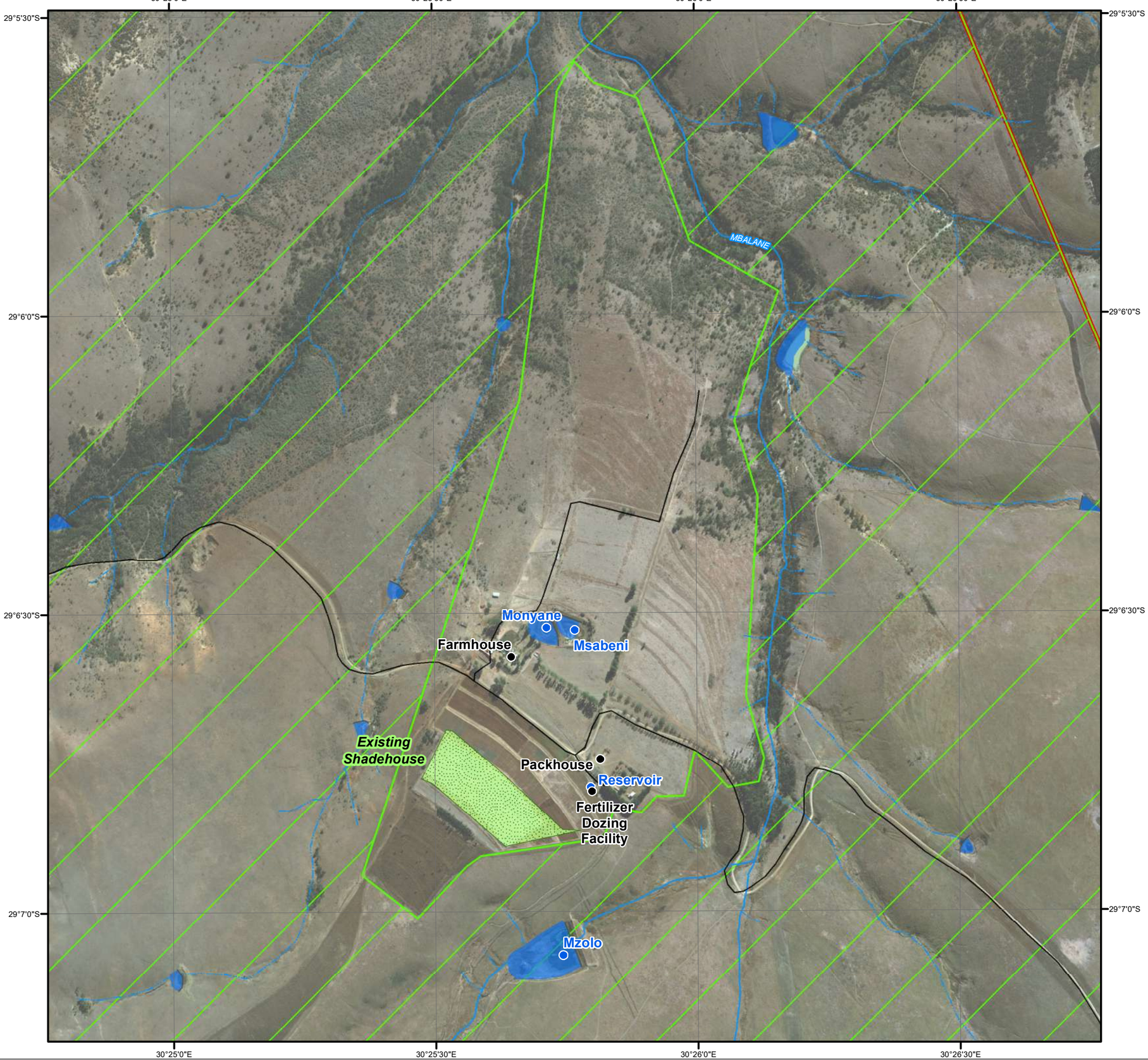
Plan 2

Nomalanga Estates Agricultural Development EIA

Infrastructure & Features on Site



Legend

- Project
- Nature Reserve Boundary
- Minor Road
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Non-Perennial Pan / Stream
- Wetland

Infrastructure & Features on Site

- Other Infrastructure
- Water Features
- Shadehouse (Existing)

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Datum: WGS 1984	Revision Number: 1
Central Meridian: 31°E	Date: 25/10/2018

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0 100 200 400 600

Metres

1:12 000

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1.3 Terms of Reference

The Terms of Reference (ToR) for the specialist heritage study were to conduct an HRM process in support of the EA application applicable to this Project. Digby Wells completed the HRM process in accordance with Section 38(8) of the NHRA and Section 41 of the KZNARIA.

1.4 Scope of Work

The Scope of Work (SoW) for the specialist HRM process included the compilation of an HIA report to comply with the requirements encapsulated in Section 38(3) of the NHRA and the KZNARIA. Digby Wells completed the following activities as part of the SoW:

- Description of the predominant cultural landscape supported through primary and secondary data collection;
- Undertaking historical layering to identify potential structures older than 60 years that are afforded general protection under Section 34 of the NHRA and Section 37 of the KZNARIA, or any other tangible heritage resources;
- Assessment of the Cultural Significance (CS) of the identified heritage resources;
- Identification of potential impacts to heritage resources based on the Project description and Project activities;
- An evaluation of the potential impacts to heritage resources relative to the sustainable socio-economic benefits that may result from the Project;
- Recommending feasible management measures and/or mitigation strategies to avoid and/or minimise negative impacts and enhance potential benefits resulting from the Project; and
- Submission of the HIA report to SAHRA and the Institute for Statutory Comment as required under Section 38(8) of the NHRA and Section 41 of the KZNARIA.

1.5 Expertise of the specialist

Table 1-1 presents a summary of the expertise of the specialists involved in the compilation of this report. The full CVs of these specialists are included in Appendix A.

Table 1-1: Expertise of the specialists

Team Member	Bio Sketch
Shannon Hardwick ASAPA Member: 451 Years' Experience: 2	Shannon joined the Digby Wells team in May 2017 as a Heritage Management Intern and has subsequently been appointed as a Junior Heritage Resources Management Consultant. Shannon is an archaeologist who obtained a Master of Science (MSc) degree from the University of the Witwatersrand in 2013, specialising in historical archaeobotany in the Limpopo Province. She is a published co-author of one paper in *Journal of Ethnobiology*. Since joining Digby Wells, Shannon has gained generalist experience through the compilation of Notification of Intent to Develop (NID) applications as well as Heritage Scoping Reports (HSRs) and HIAs. Her other experience includes compiling a Community Health, Safety and Security Management Plan (CHSSMP) and researching Artisanal and Small-Scale Mining for input into a Livelihood Restoration Framework (LRF). Shannon's experience in the field includes pre-disturbance surveys in South Africa and fieldwork in Malawi.
Justin du Piesanie ASAPA Member 270 ASAPA CRM Unit ICOMOS Member 14274 IAIAsa Member Years' Experience: 12	Justin is the Divisional Manager for Social and Heritage Services at Digby Wells. Justin joined the company in August 2011 as an archaeologist and was subsequently made HRM Manager in 2016 and Divisional Manager in 2018. He obtained his Master of Science (MSc) degree in Archaeology from the University of the Witwatersrand in 2008, specialising in the Southern African Iron Age. Justin also attended courses in architectural and urban conservation through the University of Cape Town's Faculty of Engineering and the Built Environment Continuing Professional Development Programme in 2013. Justin is a professional member of the Association of Southern African Professional Archaeologists (ASAPA), and accredited by the association's Cultural Resources Management (CRM) section. He is also a member of the International Council on Monuments and Sites (ICOMOS), an advisory body to the UNESCO World Heritage Convention. He has over 12 years combined experience in HRM in South Africa, including heritage assessments, archaeological mitigation, grave relocation, NHRA Section 34 application processes, and Conservation Management Plans (CMPs). Justin has gained further generalist experience since his appointment at Digby Wells in Botswana, Burkina Faso, Cameroon, the Democratic Republic of Congo, Liberia, Malawi, Mali and Senegal on projects that have required compliance with IFC requirements such as Performance Standard 8: Cultural Heritage. Furthermore, Justin has acted as a technical expert reviewer of HRM projects undertaken in Cameroon, Malawi and Senegal. Justin's current focus at Digby Wells is to develop the HRM process as an integrated discipline following international HRM principles and standards. This approach aims to provide clients with comprehensive, project-specific solutions that promote ethical heritage management and assist in achieving strategic objectives.

1.6 Compliance and structure of the report

Table 1-2 presents the structure for the remainder of the report and indicates where each section meets the information requirements encapsulated in the NHRA and Appendix 6 of Government Notice Regulation (GN R) 326 of 07 April 2017.

Table 1-2: Structure of the report

Description	App. 6	NHRA	Section
Declaration that the report author(s) is (are) independent.	(b)	-	Page ii and iii
An indication of the scope of, and the purpose for which, the report was prepared.	(c)	-	1.3 1.4
Details of the person who prepared the report and their expertise to carry out the specialist study.	(a)	-	1.5
Outlines the legislative framework relevant to the specialist heritage study.	-	-	2
Identifies the specific constraints and limitations of the HIA, including any assumptions made and any uncertainties or gaps in knowledge.	(i)	-	3
Describes the methodology employed in the compilation of this HIA.	(e)	-	4 Appendix B
An indication of the quality and age of base data used for the specialist report.	(cA)	-	4.4
The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment.	(d)	-	4.5
Provides the baseline cultural landscape.	-	38(3)(a)	5
Motivates for the defined CS of the identified heritage resources and landscape.	-	38(3)(b)	6
A description of the potential impacts to heritage resources by project related activities, including: - Existing impacts on the site; - Possible risks to heritage resources; - Cumulative impacts of the proposed development; - Acceptable levels of change; and - Heritage-related risks to the project.	(cB)	38(3)(c)-	6

Description	App. 6	NHRA	Section
A description of the findings and potential implications of such findings on the impact of the proposed activity or activities.	(j)	38(3)(c)	
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.	(f)	-	
Considers the development context to assess the socio-economic benefits of the project in relation to the presented impacts and risks.	-	38(3)(d)	0
A description of any consultation process that was undertaken during the course of preparing the specialist report and the results of such consultation.	(o)	38(3)(e)	8
A summary and copies of any comments received during any consultation process and where applicable all responses thereto.	(p)	38(3)(e)	
Details the specific recommendations based on the contents of the HIA.	-	38(3)(g)	9
An identification of any areas to be avoided, including buffers.	(g)		
Any mitigation measures for inclusion in the Environmental Management Programme (EMPr)	(k)		
Any conditions for inclusion in the environmental authorisation.	(l)		
Any monitoring requirements for inclusion in the EMPr or environmental authorisation.	(m)		
A reasoned opinion— (i) whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and (ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	(n)	38(3)(g)	9 10
Collates the most salient points of the HIA and concludes with the specific outcomes and recommendations of the study.	-	38(3)(f) 38(3)(g)	10

Description	App. 6	NHRA	Section
Lists the source material used in the development of the report.	(cA)	-	11
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	(h)	-	Plan 4
Any other information requested by the competent authority.	(q)	-	-

2 Legislative and policy framework

The HRM process is governed by the national legislative framework. This section provides a summary of the relevant legislation pertaining to the conservation and responsible management of heritage resources.

Table 2-1: Applicable legislation considered in the HRM process

Applicable legislation used to compile the report	Reference where applied
Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) Section 24 of the Constitution states that everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures, that – i. Prevent pollution and ecological degradation; ii. Promote conservation; and iii. Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development	The HRM process was undertaken to identify heritage resources and determine heritage impacts associated with the Project. As part of the HRM process, applicable mitigation measures, monitoring plans and/or remediation were recommended to ensure that any potential impacts are managed to acceptable levels to support the rights as enshrined in the Constitution.
National Environmental Management Act, 1998 (Act No. 107 of 1998) The NEMA, as amended, was set in place in accordance with section 24 of the Constitution of the Republic of South Africa. Certain environmental principles under NEMA have to be adhered to, to inform decision making on issues affecting the environment. Section 24 (1)(a), (b) and (c) of NEMA state that:	The application process was undertaken in accordance with the principles of Section 2 of NEMA as well as with the EIA 2017 Regulations, promulgated in terms of NEMA.

Applicable legislation used to compile the report	Reference where applied
The potential impact on the environment, socio-economic conditions and cultural heritage of activities that require authorisation or permission by law and which may significantly affect the environment, must be considered, investigated and assessed prior to their implementation and reported to the organ of state charged by law with authorizing, permitting, or otherwise allowing the implementation of an activity. The Environmental Impact Assessment (EIA) Regulations, Government Notice Regulation (GN) R.982 were published on 04 December 2014 and promulgated on 08 December 2014. Together with the EIA Regulations, the Minister also published GN R.983 (Listing Notice No. 1), GN R.984 (Listing Notice No. 2) and GN R.985 (Listing Notice No. 3) in terms of Sections 24(2) and 24D of the NEMA, as amended.	
GN R. 982: Environmental Impact Assessment Regulations, 2014 (as amended by GN R 326 of 7 April 2017) These three listing notices set out a list of identified activities which may not commence without an Environmental Authorisation from the relevant Competent Authority through one of the following processes: ▪ Regulation GN R. 983 (as amended by GN R 327) - Listing Notice 1: This listing notice provides a list of various activities which require environmental authorisation and which must follow a basic assessment process. ▪ Regulation GN R. 984 (as amended by GN R 325) – Listing Notice 2: This listing notice provides a list of various activities which require environmental authorisation and which must follow an environmental impact assessment process. ▪ Regulation GN R. 985 (as amended by GN R 324) – Listing Notice 3: This notice provides a list of various environmental activities which have been identified by provincial governmental bodies which if undertaken within the stipulated provincial boundaries will require environmental authorisation. The basic assessment process will need to be followed.	Refer to the Application for Environmental Authorisation and the EIA report for a full description of the Listed Activities triggered by the proposed Project. To comply with the regulations, an EIA process must be completed in support of Environmental Authorisation in terms of Listing Notice 2. This HIA was completed to inform the EIA process to comply with Section 24 of the NEMA.

Applicable legislation used to compile the report	Reference where applied
National Water Act, 1998 (Act No. 36 of 1998) (NWA) Part 7 of the NWA outlines the requirements for individual applications for licences and Part 8 outlines the requirements in terms of compulsory licences for water use in respect of a specific resource. The responsible authority may request additional information from an applicant in terms of Part 7 or Part 8. Such additional information may include an environmental or other assessment to be undertaken in terms of the NEMA and which is to be considered alongside the application.	An environmental assessment was undertaken in compliance with the NEMA and NEMA EIA Regulations, which also satisfies the requirements of the NWA and may supplement the Water Use Application (WUL). This HIA was completed to inform the environmental assessment and comply with Section 24 of the NEMA and Section 38(8) of the NHRA.
National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003) (NEM: PAA) The NEM: PAA provides for South Africa's system of protected areas. The Act establishes mechanisms for the conservation and management of ecologically-viable areas that represent South Africa's diversity and natural landscapes. The Act further makes provision for intergovernmental cooperation and public consultation in matters concerning protected areas to promote the continued existence, governance and functions of protected areas.	The Nomalanga Nature Reserve is considered a protected area. Although the Nomalanga Nature Reserve is beyond of the scope of this assessment, requirements in terms of this Act have been considered in this assessment.
National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) The NHRA is the overarching legislation that protects and regulates the management of heritage resources in South Africa, with specific reference to the following Sections: ▪ 5. General principles for HRM ▪ 6. Principles for management of heritage resources ▪ 7. Heritage assessment criteria and grading ▪ 38. Heritage resources management The Act requires that Heritage Resources Authorities (HRAs), be notified as early as possible of any developments that may exceed certain minimum thresholds in terms of Section 38(1), or when assessments of impacts on heritage resources are required by other legislation in terms of Section 38(8) of the Act.	The HIA was compiled to comply with Section 5, 38(3), (4) and (8) of the NHRA. This HIA was submitted to the responsible HRAs, which in this instance is SAHRA and the Institute.

Applicable legislation used to compile the report	Reference where applied
NHRA Regulations, 2000 (GN R 548) The NHRA Regulations regulate the general provisions and permit application process in respect of heritage resources included in the national estate. Applications must be made in accordance with these regulations. The following Chapters are applicable to this assessment: ▪ II. Permit Applications and General Provisions for Permits; ▪ III: Application for Permit: National Heritage Site, Provincial Heritage Site, Provisionally-Protected Place or Structure older than 60 years; ▪ IV: Application for Permit: Archaeological or Palaeontological or Meteorite; ▪ IX: Application for Permit: Burial Grounds and Graves; ▪ X: Procedure for Consultation regarding Protected Area; ▪ XI: Procedure for Consultation regarding Burial Grounds and Graves; and ▪ XII: Discovery of Previously Unknown Graves.	The HRM process was undertaken with cognisance of the applicable regulations. The proposed mitigation strategies and management measures must comply with these requirements.
KwaZulu-Natal Amafa and Research Institute Act, 2018 (Act No 5 of 2018) (KZNARIA) The KZNARIA provides for the management of heritage resources within the province as encapsulated in Section 41. The Act further provides for general and special protection, including: ▪ General protection of structures (Section 37), graves of victims of conflict (Section 38); informal and private burial grounds (Section 39) and battlefield sites, archaeological sites, rock art sites, palaeontological sites, historic fortifications and meteorites and meteorite impact sites (Section 40); and ▪ Special: protected areas (Section 42), heritage landmarks (Section 44),	The NDA has been submitted to the Institute online via the South African Heritage Resources Information System (SAHRIS[4]). Digby Wells has received comment[5] from the Institute requiring a Phase 1 HIA process. The HIA was compiled to comply with the NHRA (as above) but takes into consideration to requirements encapsulated in Section 41 of the KZNARIA.

[4] Case ID 13536, accessible at: https://sahris.sahra.org.za/cases/nom5486-nomalanga-estates-expansion-project
[5] Interim comment dated 8 March 2019, accessible at: https://sahris.sahra.org.za/node/521528

Applicable legislation used to compile the report	Reference where applied
provincial landmarks (Section 45), graves of members of Royal Family (Section 46), battlefields, public monuments and memorials (Section 47) and heritage objects (Section 49). Permits are required to undertake any activity that may involve an identified generally-protected heritage resource, such as the alteration of historical buildings or archaeological mitigations. In terms of the KZNARIA, the Institute must be notified of proposed developments through the submission of a Needs and Desirability Application (NDA) form. After receiving this form, the Institute will issue comments regarding the necessity of further heritage studies.	

Table 2-2: Applicable policies considered in the HRM process

Applicable policies used to compile the report	Reference where applied
SAHRA Archaeology, Palaeontology and Meteorites (APM) Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports (2007) The guidelines provide the minimum standards that must be adhered to for the compilation of a HIA and/or PIA report. Chapter II Section 7 outlines the minimum requirements for inclusion in the heritage assessment as follows: ▪ Background information on the Project; ▪ Background information on the cultural baseline; ▪ Description of the properties or affected environs; ▪ Description of identified sites or resources; ▪ Recommended field rating of the identified sites to comply with Section 38 of the NHRA; ▪ A statement of Cultural Significance in terms of Section 3(3) of the NHRA; and ▪ Recommendations for mitigation or management of identified heritage resources. Chapter II, Section 8 outlines the minimum requirements for a PIA report. The information requirements are similar as for the HIA report, but must additionally include a 1:50 000 geological map showing the geological context of the Project.	The HIA and PIA reports were compiled to adhere to the minimum standards as defined by Chapter II of the SAHRA APM Guidelines (2007)

3 Constraints and limitations

Digby Wells encountered constraints and limitations during the compilation of this report. Table 3-1 presents an overview of these limitations and the consequences.

Table 3-1: Constraints and Limitations

Description	Consequence
Whilst every attempt was made to obtain the latest available information, the reviewed literature does not represent an exhaustive list of information sources for the various study areas.	The cultural heritage baseline presented in Section 5 below is considered accurate, but may not include new data or information which may not have been made available to the public.
Results from previously-completed heritage assessments as sourced from SAHRIS, that may have formed part of the Project area were not verified in-field.	It is assumed the previously recorded heritage resources are accurate and true.
The final infrastructure design layout was not available at the time of the survey or compilation of this report.	Every effort was made to cover the extent of the study area[6]. The survey was focused on the proposed infrastructure layout current at the time of the survey; however, this has been altered since. Some heritage resources in the Project may therefore not have been identified. The infrastructure layout will be informed in part by the results of the heritage assessment.
Whilst every attempt was made to survey the extent of the site-specific study area, this report does not present an exhaustive list of identified heritage resources. Overgrown vegetation limited visibility at the time of the pre-disturbance survey.	Previously unidentified heritage resources may be encountered. Should this occur, Nomalanga must alert the HRAs of the find and may need to enlist the services of a suitably qualified archaeologist or palaeontologist to advise them on the way forward.
Archaeological and palaeontological resources commonly occur at subsurface levels. These types of resources cannot be adequately recorded or documented by assessors without destructive and intrusive methodologies and without the correct permits issued in terms of Section 35 of the NHRA (Section 40 of the KZNARIA).	The reviewed literature, previously-completed heritage assessments and the results of the field survey are in themselves limited to surface observations. Subsurface tangible heritage may be exposed during Project activities. Should this occur, Nomalanga must alert the HRAs of the find and may need to enlist the services of a suitably qualified archaeologist or palaeontologist to advise them on the way forward.

[6] Refer to Section **Error! Reference source not found.** for a description of the study area.

4 Methodology

4.1 Defining the study area

Heritage resources do not exist in isolation to the greater natural and social environment, including the socio-cultural, socio-economic and socio-political environments. In addition, the NHRA requires the grading of heritage resources in terms of national, provincial and local concern based on their importance and consequent official (i.e. State) management effort required. The type and level of baseline information required to adequately predict heritage impacts varies between these categories. Four nested study areas were defined for the purposes of this study, and include:

- The *development footprint area*: the 300 ha area earmarked for the Project and related infrastructure within the site-specific study area. This excludes the proclaimed nature reserve area;
- The *site-specific study area*: the farm portions extent associated with the proposed Project, including a 500 m buffer area. This includes the proclaimed nature reserve area;
- The *local study area*: the area most likely to be influenced by any changes to heritage resources in the Project area or where Project development could cause heritage impacts. Defined as the area bounded by the local municipality, in this instance ULM, with particular reference to the immediate surrounding properties and/or farms. The local study area was specifically examined to offer a backdrop to the socio-economic conditions within which the proposed development will occur. The local study area furthermore provided the local development and planning context that may contribute to cumulative impacts; and
- The *regional study area*: the area bounded by the district municipality, which here is UDM. Where necessary, the regional study area may be extended outside the boundaries of the district municipality to include much wider regional expressions of specific types of heritage resources and historical events. The regional study area also provided the regional development and planning context that may contribute to cumulative impacts.

4.2 Statement of Cultural Significance

Digby Wells designed the significance rating process to provide a numerical rating of the CS of identified heritage resources. This process considers heritage resources assessment criteria set out in subsection 3(3) of the NHRA, which determines the intrinsic, comparative and contextual significance of identified heritage resources. A resource's importance rating is based on information obtained through review of available credible sources and representativity or uniqueness (i.e. known examples of similar resources to exist).

The rationale behind the heritage value matrix takes into account that a heritage resource's value is a direct indication of its sensitivity to change (i.e. impacts). Value, therefore, was determined prior to completing any assessment of impacts.

The matrix rated the potential, or importance, of an identified resource relative to its contribution to certain values – aesthetic, historical, scientific and social. Resource significance is directly related to the impact on it that could result from Project activities, as it provided minimum accepted levels of change to the resource.

4.3 Definition of heritage impacts

Potential impacts to heritage resources may manifest differently across geographical areas or diverse communities when one considers the simultaneous effect to the tangible resource and social repercussions associated with the intangible aspects. Furthermore, potential impacts may concurrently influence the CS of heritage resources. This assessment therefore considers three broad categories adapted from Winter & Baumann (2005, p. 36). Table 4-1 presents a summary of these types of impacts.

Table 4-1: Definitions of the types of impacts

Category	Description
Direct Impact	Affect the fabric or physical integrity of the heritage resource, for example destruction of an archaeological site or historical building. Direct impacts may be the most immediate and noticeable. Such impacts are usually ranked as the most intense, but can often be erroneously assessed as high-ranking.
Indirect Impact	Occur later in time or at a different place from the causal activity, or as a result of a complex pathway. For example, restricted access to a heritage resource resulting in the gradual erosion of its CS that may be dependent on ritual patterns of access. Although the physical fabric of the resource is not affected through any direct impact, its significance is affected to the extent that it can ultimately result in the loss of the resource itself.
Cumulative Impact	Result from in-combination effects on heritage resources acting within a host of processes that are insignificant when seen in isolation, but which collectively have a significant effect. Cumulative effects can be: ▪ Additive: the simple sum of all the effects, e.g. the reclamation of a historical TSF will minimise the sense of the historic mining landscape. ▪ Synergistic: effects interact to produce a total effect greater than the sum of the individual effects, e.g. the removal of all historical TSFs will sterilise the historic mining landscape. ▪ Time crowding: frequent, repetitive impacts on a particular resource at the same time, e.g. the effect of regular blasting activities on a nearby rock art site or protected historical building could be high. ▪ Neutralizing: where the effects may counteract each other to reduce

Category	Description
	the overall effect, e.g. the effect of changes from a historic to modern mining landscape could reduce the overall impact on the sense-of-place of the study area. ▪ Space crowding: high spatial density of impacts on a heritage resource, e.g. density of new buildings resulting in suburbanisation of a historical rural landscape.

4.4 Secondary data collection

Data collection assists in the development of a cultural heritage baseline profile of the study area under consideration. Qualitative data was collected to inform this HIA and was primarily obtained through secondary information sources, i.e. desktop literature review and historical layering.

A survey of diverse information repositories was made to identify appropriate relevant information sources. These sources were analysed for credibility and relevance. These credible, relevant sources were then critically reviewed. The objectives of the literature review include:

- Gaining an understanding of the cultural landscape within which the proposed Project is located; and
- Identify any potential fatal flaws, sensitive areas, current social complexities and issues and known or possible tangible heritage.

Repositories that were surveyed included the SAHRIS, online/electronic journals and platforms and select internet sources. This HIA includes a summary and discussion of the most relevant findings. Table 4-2 lists the sources consulted in the literature review (refer to Section 11 for more detailed references).

Table 4-2: Qualitative data sources

Reviewed Qualitative Data		
Databases		
Genealogical Society of South Africa (GSSA) database (2011)	University of the Witwatersrand (WITS) Archaeological Database (2010)	
SAHRIS	SAHRIS Palaeo-sensitivity Map (PSM)	
SAHRIS Cases		
Case ID: 4941	Case ID: 7013	Case ID: 11616

Reviewed Qualitative Data		
Cited Text		
Anderson, 2009	Bamford 2012, 2014, 2016	Battlefields Route, 2017
Behrens & Swanepoel, 2008	Bishop, n.d.	Clark, 1982
Deacon & Deacon, 1999	Eastwood, et al., 2002	Esterhuysen & Smith, 2007
Groenwald, 2012	Groenewald & Groenewald 2014	Hamilton, 1985
Huffman 2004, 2007	Johnson, et al., 2006	Landau, 2010
Makhura, 2007	Mitchell, 2002	Mucina & Rutherford, 2010
Ngubane, 2005	Rubidge 2013a, 2013b	Scott-Shaw & Escott, 2011
Smith & Zubieta, 2007	Swanepoel, et al., 2008	Von der Heyde, 2013
Winter & Baumann, 2005		

Table 4-3 below lists the sources of historical imagery. Historical layering is a process whereby diverse cartographic sources from various time periods are layered chronologically using Geographic Information Systems (GIS). The rationale behind historical layering is threefold, as it:

- Enables a virtual representation of changes in the land use of a particular area over time;
- Provides relative dates based on the presence or absence of visible features; and
- Identified potential locations where heritage resources may exist within an area.

Plan 4 includes the points of interest noted on the historical imagery.

Table 4-3: Aerial imagery considered

Aerial photographs					
Job no.	**Flight plan**	**Photo no.**	**Area**	**Date**	**Ref.**
488A	Strip 7	1034	Newcastle	1964	488A/1964
488A	Strip 8	0941	Newcastle	1964	488A/1964

4.5 Primary data collection

Shannon Hardwick undertook a pre-disturbance survey of the development footprint area between 06 and 09 November 2018. This was a pedestrian survey and was non-intrusive (i.e. no sampling was undertaken). The aim of the pre-disturbance survey was to:

- Visually record the current state of the cultural landscape; and
- Record a representative sample of the visible, tangible heritage resources present within the development footprint area, site-specific study area and greater study area.

Identified heritage resources were recorded as waypoints using a handheld GPS device. The heritage resources were also recorded through written and photographic records. Plan 4 presents the results of the pre-disturbance survey, including the waypoints and GPS tracks.

4.6 Site naming convention

Heritage resources identified by Digby Wells during the field survey are prefixed by the SAHRIS case identification generated for this Project. Information on the relevant period or feature code and site number follows (e.g. 13536/HST-001). The site name may be shortened on plans or figures to the period/feature code and site number (e.g. HST-001). Table 4-4 presents a list of the relevant period and feature codes (refer to Section 5 for an explanation of what these terms mean).

Table 4-4: Feature and period codes relevant to this HIA

Feature or Period Code	Reference
BGG	Burial Grounds and Graves
HLP	Historical Layering Point of Interest
HST	Historical Period
LFC	Late Farming Community

Heritage resources identified through secondary data collection were prefixed by the relevant SAHRIS case or map identification number (*where applicable*) and the original site name as used by the author of that assessment (e.g. 11616/Grave Site 1).

5 Cultural heritage baseline description

The cultural heritage baseline description considered the predominant geological context and cultural landscape based on the identified heritage resources within the regional and local study area. Table 5-1 presents a summary of the relevant archaeological periods. Plan 3 represents the spatial distribution of the sites identified in previously-completed heritage assessments. Figure 5-1 below presents the distribution of the identified heritage resources according to the archaeological periods.

Table 5-1: Archaeological periods in South Africa

The Stone Age	Early Stone Age (ESA)	2 million years ago (mya) to 250 thousand years ago (kya)
	Middle Stone Age (MSA)	250 kya to 20 kya
	Later Stone Age (LSA)	20 kya to 500 CE (Common Era[7])
Farming Communities	Early Farming communities (EFC)	500 to 1400 CE
	Late Farming Communities (LFC)	1100 to 1800 CE
Historical Period	-	1500 CE to 1994 (Behrens & Swanepoel, 2008)

Adapted from Esterhuysen & Smith (2007)

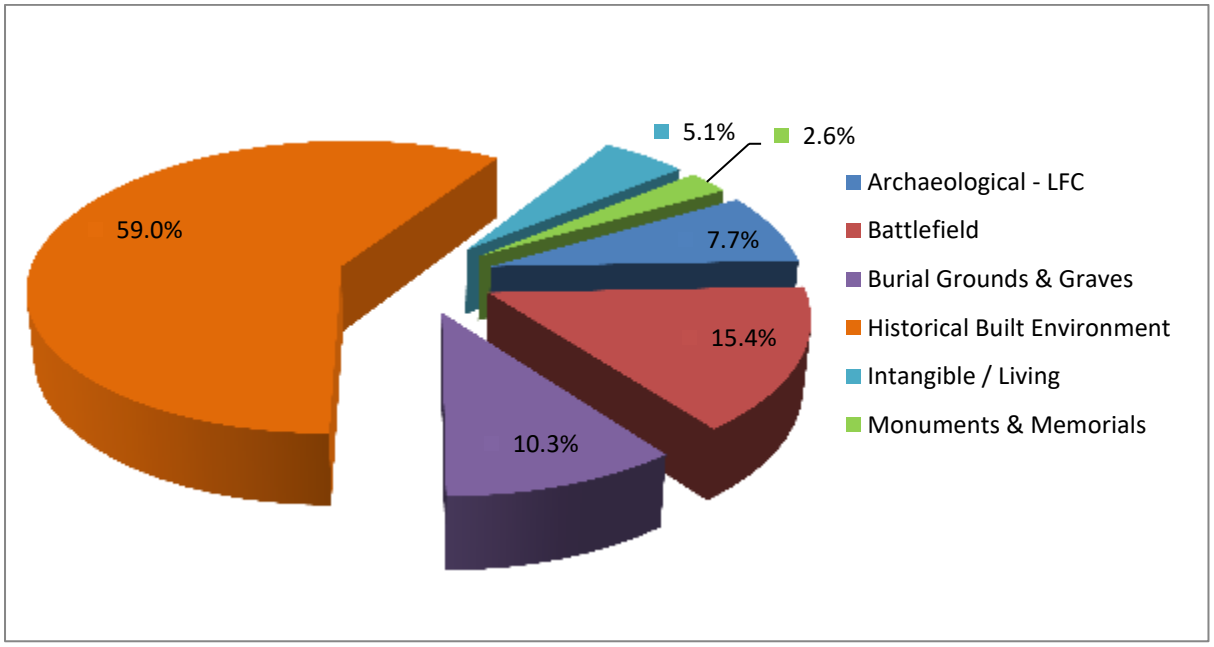


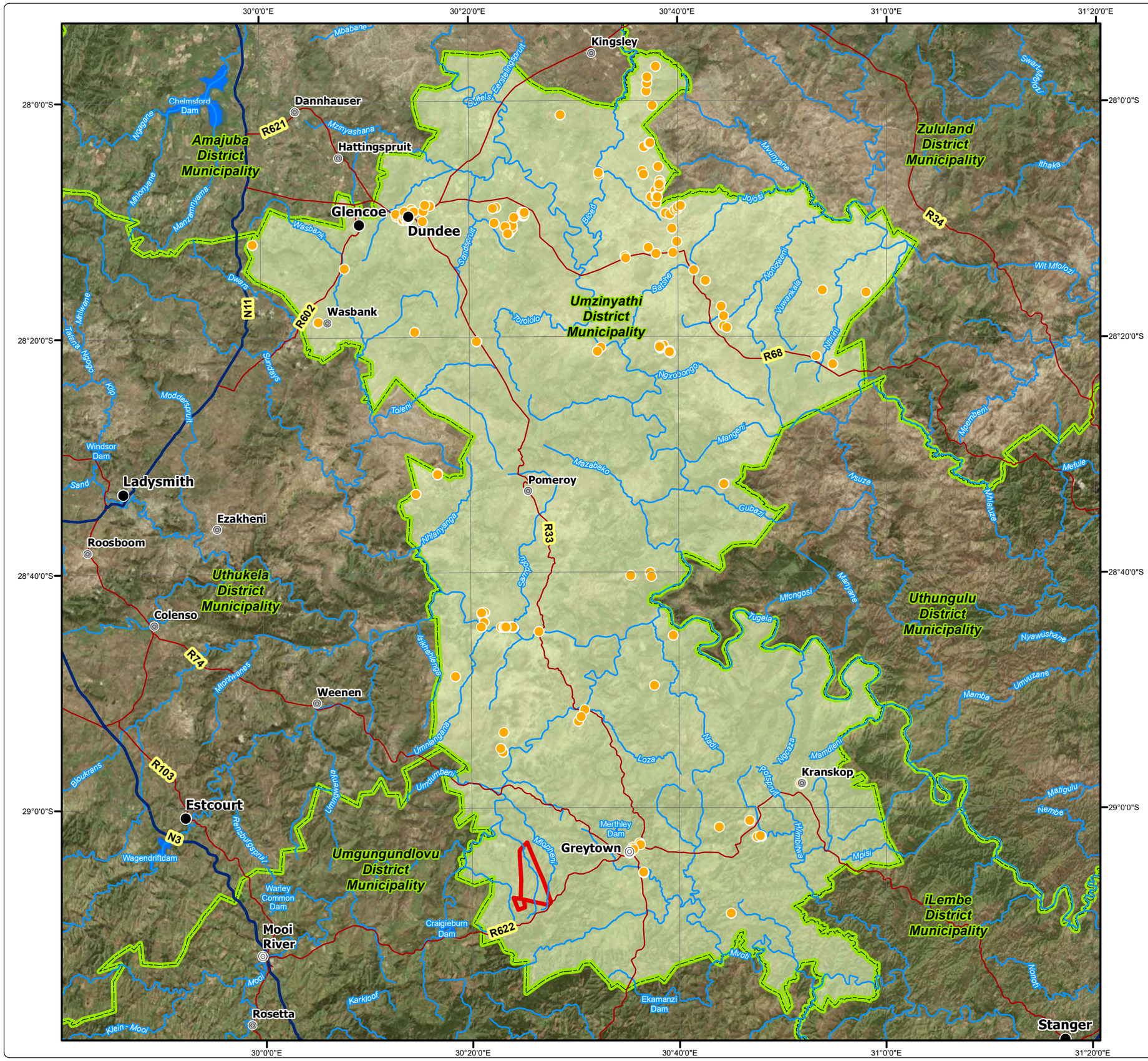
Figure 5-1: Heritage resources identified within the greater study area

[7] Common Era (CE) refers to the same period as *Anno Domini* ("In the year of our Lord", referred to as AD): i.e. the time after the accepted year of the birth of Jesus Christ and which forms the basis of the Julian and Gregorian calendars. Years before this time are referred to as 'Before Christ' (BC) or, here, BCE (Before Common Era).

Plan 2

Nomalanga Estate Agricultural Development EIA

Distribution of Heritage Sites



Legend

- Project Area
- Distribution of Heritage Sites
- Major Town
- Secondary Town
- Other Town
- Main Road
- National Road
- Perennial Stream
- Dam
- Regional Study Area
- District Municipality

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Projection: Transverse Mercator	Ref #: kam.NOM5486.201810.235
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Central Meridian: 31°E	Date: 16/10/2018

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Kilometres

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5.1 Geological context and palaeontological sensitivity[8]

KwaZulu-Natal's geological history covers over 3 100 million years (Groenwald, 2012). Within the regional study area, the geology represents the Karoo Supergroup, which was deposited during the Palaeozoic and Mesozoic Eras of the Phanerozoic Eon (Johnson, et al., 2006). The site-specific study area is underlain by:

- The Karoo Dolerite Suite
- The *Volksrust Formation* in the Ecca Group; and
- The *Madzaringwe Formation* (*Vryheid Formation* in the Ecca Group).

Table 5-2 presents an overview of the relevant geological sequence and associated palaeontological sensitivities of the site-specific study area.

The Karoo Dolerites are intrusive diatremes[9] and are classified as plutonic igneous rocks. These features include no fossiliferous material and their palaeosensitivity is negligible (Rubidge, 2013a; Rubidge, 2013b; SAHRA, 2013). The Karoo Dolerites are therefore not considered further in this report.

The *Volksrust Formation* is a sequence of grey to black shale and siltstone deposited in a deep water environment, most likely representing an offshore shelf. The early and late phases may have been deposited through a shallower environment, such as a lagoon or nearshore or lacustrine environments. The formation can include thin lenses or beds of siltstone or sandstone, which is usually bioturbated (Johnson, et al., 2006; Groenwald, 2012).

The lithologies of the *Madzaringwe Formation* have been redefined to occur only in the Limpopo Province (see for reference Malaza, et al., 2013). The area delineated in the regional geology plan as the *Madzaringwe Formation* now refers to the *Vryheid Formation*. These layers were deposited in a deltaic[10] environmental roughly 180 mya. The *Vryheid Formation* is considered to have very high palaeosensitivity (SAHRA, 2013).The formation corresponds to the basal unit of the Group and includes shales, mudstones and coal (Bamford, 2016).

Coal usually does not include fossils, due to the heat alteration and compression required to transform the plant matter into coal. Coal deposits can potentially include fossils of mammal-like reptiles and mammals but these are rarely, if ever, preserved with plant fossils (Bamford, 2012; 2016). The shales between to coal horizons, however, have the potential to preserve very good examples of plant fossils and, to a lesser extent, the sandstone surface outcrops may also preserve plant fossils (Bamford, 2014; 2016). Common fossil plants within the

[8] This section presents an abbreviated description of the palaeontological setting. The specialist Palaeontological Assessment is appended to this report as Appendix C.

[9] These formations are created when rising magma comes into contact with groundwater, which potentially results in gaseous explosions and a volcanic 'pipe' (diatreme).

[10] This depositional environment occurs when lithologies are deposited onto an alluvial plain through river action.

Vryheid Formation include *Glossopteris* leaves, roots and inflorescences and *Calamites* stems. Other species of fossil plants have been recovered from the Vryheid Formation (Groenwald, 2012). Other fossils within this feature can include: trace fossils, rare insects, possible conchostracans (bivalve crustaceans and shrimp clams that are still extant today), non-marine bivalves and fish scales (Groenewald & Groenewald, 2014).

Table 5-2: Truncated geological sequence and palaeontological sensitivity for the site-specific study area

Eon	Era	Period	Mya	Lithographic Units			Significance	Fossils
				Supergroup	Group	Formation		
Phanerozoic	Mesozoic	Jurassic	145 200			Karoo dolerites	Negligible	None
	Palaeozoic	Permian	300	Karoo Supergroup	Ecca Group	Volksrust	High	The *Volksrust Formation* comprises of trace fossils, rare temnospondyl amphibian remains, invertebrates (bivalves, insects), minor coals with plant remains, petrified wood, organic microfossils (acritarchs), and low-diversity marine to non-marine trace fossil assemblages.
						Vryheid	Very-high	Abundant plant fossils of *Glossopteris* and other plants. Trace fossils. The reptile Mesosaurus has been found in the southern part of the Karoo Basin. Rich fossil plant assemblages of the Permian *Glossopteris* Flora (lycopods, rare ferns and horsetails, abundant glossopterids, cordaitaleans, conifers, ginkgoaleans), rare fossil wood, diverse palynomorphs. Abundant, low diversity trace fossils, rare insects, possible conchostracans, non-marine bivalves, fish scales.

5.2 Archaeo-historical context

The identified palaeontological sensitivities notwithstanding, the cultural heritage baseline description considers the predominant landscape based on identified heritage resources within the regional and local study area.

The southern African Stone Age periods correlate to the changes in lithic technology and the development of specific material cultures by the various hominid species through time. Cleavers and large handaxes dominate the ESA. These are made from coarse-grained material (Esterhuysen & Smith, 2007), and are believed to be produced by early hominids, possibly *Australopithecus* species, but more probable the first *Homo* species, *H. habilis*.

High proportion of minimally modified blades characterise the lithic assemblages of the early MSA (Clark, 1982; Deacon & Deacon, 1999). Additionally, the presence of bone tools, beads and pendants also define this period. Broadly, scholars define the MSA by the presence of blades and points which have been produced on good-quality raw materials. This period is generally associated with archaic to early anatomically modern *H. sapiens*. The lithic assemblage of the LSA are specialised – specific tools are created for specific purposes (Mitchell, 2002). The LSA assemblages are microlithic and include diagnostic tools such as scrapers and segments. Bone points also occur during this period. The LSA is wholly associated with anatomically and behaviourally modern *H. sapiens sapiens*.

In southern Africa, the LSA is closely associated with hunter-gatherers. The San[11] are commonly accepted as the first inhabitants of southern Africa (Makhura, 2007). Open sites are usually poorly preserved and difficult to identify due to the nomadic nature of these peoples. Their occupation, however, is evidenced by ritual practices manifested as Rock Art (Deacon & Deacon, 1999). Three rock art painting traditions occur within South Africa and are widely dispersed. Within the regional complex, these comprise Fine-line paintings. Fine-Line paintings are the first and oldest rock art traditions, associated with autochthonous LSA hunter-gatherer groups. These paintings are usually made with black, red or white pigment through the use of fine brushes, quills or sticks. Although rare, bichrome and polychrome paintings occur. Subjects include realistic and proportionally-correct animals, human figures and symbolic beings (Eastwood, et al., 2002; Smith & Zubieta, 2007).

In southern Africa, the farming community period follows the Stone Age. This period is characterised by the southward movement, and later migrations, of the various Bantu-speaking groups who were ancestral to the modern Sotho-Tswana and Nguni peoples (Makhura, 2007). Farming community period archaeology is subdivided into the EFC and LFC to distinguish between widespread events. Farming communities in KwaZulu-Natal are generally associated with early Nguni speakers based on linguistic, anthropological and

[11] Including Basarwa, Bathwa and hunter-gatherer groups

archaeological evidence. This baseline will present a summarised description of the archaeological context of early Nguni speakers to present-day Zulu speakers[12].

Remnants of settlements are one visible indicator for farming communities. The Nguni commonly settled on slopes above the valleys and fertile agricultural soil and traditionally built beehive houses. Tangible remains of these settlements, specifically the beehive huts, do not preserve well and are difficult to identify in archaeological contexts (Huffman, 2004). Ceramics[13] are another visible indicator of farming community settlements. The nature of Nguni material culture means that ceramics are seldom decorated, which complicates the study of the associated archaeology. This notwithstanding, an abbreviated account of the relevant ceramic sequences is provided here.

As described by Huffman (2004; 2007), the early Nguni ceramic sequence includes four phases:

- *Blackburn* (1050 to 1500 CE);
- *Moor Park* (1350 to 1700 CE);
- *Ntsuanatsatsi* (1450 to 1600 CE); and
- *Nqabeni* (1700 to 1850 CE).

Considering the accepted distribution of these traditions, *Blackburn* and *Nqabeni* occur within the regional study area (refer to Figure 5-2). *Blackburn* ceramics are sparsely decorated. Where it occurs, decoration includes applique bumps, incised parallel lines, oblique panels of punctates, rim-notching and stamping (Huffman, 2004; 2007). While the precise origin of this facies is not known, similarities between the traditions suggest that the Kalambo Branch of the Urewe Tradition may be a likely source (Huffman, 2004). *Nqabeni* ceramics emphasise a high burnish with black or red colouring, appliqué decoration and panels of fingernail impressions (Huffman, 2004; 2007). This ceramic facies is usually associated with stonewalled settlements that emphasise a centre / side access that align kraal entrances facing uphill. It has been noted that regional variances in the stonewalled patterns exist, but these primarily attest to the small scale of Nguni group identities.

The pre-colonial historical[14] context of KwaZulu-Natal is considered to follow on from the LFC; however, this distinction is considered largely artificial, as the pre-colonial context is similar in many ways to the LFC period described above. The populations, material culture

[12] For detailed discussion on the linguistic and anthropological evidence, refer to Huffman (2004).

[13] Huffman's work (see for example, Huffman, 2007) is commonly used as the primary text with which to identify ceramics that in turn provide relative temporal markers for occupations in the region. Ceramics can be used as a broad cultural and/or linguistic marker, but it is acknowledged that ceramics do not necessarily equate to narrowly-defined ethnic groups.

[14] In southern Africa, the last 500 years represent a formative period that is marked by largescale internal economic invention and political experimentation that shaped the cultural boundaries and categories of modern identities outside of European contact. This period, while currently not well documented, has been explored through the 500 Year Initiative (Swanepoel, et al., 2008).

and overall themes remain largely unchanged between the LFC and historical periods, but now include oral and written records.

Pre-colonial northern KwaZulu-Natal comprised a number of relatively small chiefdoms. These socio-political structures changed during the 18th century when political consolidation processes resulted in the emergence of a number of power blocs (Ngubane, 2005). These power blocs include the Mthethwa Paramountcy (c. 1780 to 1817), the Ndwandwe Chiefdom (c. 1780 to 1817) and later the Zulu Kingdom (c. 1818 to 1897).

Following in-fighting amongst the rulers of the Mthethwa, Dingiswayo began his reign in 1807 and enacted a policy of consolidation and expansion to stabilise the northern, coastal and inland borders of the polity (Hamilton, 1985; Ngubane, 2005). Changing climatic conditions necessitated a relocation of the Mthethwa to the coastal lowlands, which coincided with a change in trade to favour cattle over ivory. The polity expanded to the east and south to secure superior grazing and, at the same time, the threat of Buthelezi shifted expansion to the interior. Ultimately, Dingiswayo integrated Buthelezi, as well as the Zulu, through a coalition (Hamilton, 1985).

During this time, similar processes occurred within the Ndwandwe Chiefdom towards the north. The Ndwandwe first sought to control trade networks and then natural resources (Ngubane, 2005). During these times of expansion, consolidation and expansion, several skirmishes and battles took place, some between the Ndwandwe and Mthethwa groups. Shaka had shown extraordinary military skills during battles at this time, earning the favour of Dingiswayo and eventually Dingiswayo's support for Shaka's position as chief of the Zulu Kingdom.

As pressure for control of the region increased, tensions between the Ndwandwe and Mthethwa culminated between 1817 and 1818 (Hamilton, 1985). The Ndwandwe moved against the Mthethwa, in an effort to expand their borders. When called upon for military support, Shaka withheld his resources in what is believed to be a deliberate move to separate the Zulu from Mthethwa authority. This led to the collapse of the Mthethwa. In the wake of the resulting power vacuum, Shaka assumed leadership of the various tributary chiefdoms which had been united under Dingiswayo.

Hoping to undercut the impeding threat, the Ndwandwe launched an attack in 1818. Shaka's successful implementation of his military strategy resulted in smaller losses for the Zulus and a weaker Ndwandwe with depleted resources. This victory set the stage for Shaka to conquer and absorb surrounding chiefdoms, consolidating his power in the area north of the Tugela. The Ndwandwe Chiefdom collapsed the following year with the death of the chief, Zwide, during the two-day Battle of Mhlatuze River. This event resulted in much of the Ndwandwe citizens abandoning their lands and migrating northwards (Von der Heyde, 2013).

The period that followed (between approximately 1817 and 1826 CE) was characterised by violence and unrest occurred. This is referred to as the Mfecane (or the Difaqane, as it is known north of the Orange River) (Landau, 2010). Many aspects of the Mfecane have been

debated and challenged. The traditional understanding of the period is that Mzilikazi and his Ndebele group were pushed out of their territory by the Zulu group led by Shaka. This displacement had a knock-on effect across the interior. A drought during this time exacerbated the instability and increased the pressure on food supplies, which were already running low.

European settlers, traders, missionaries and travellers moving into the area further added to instability and exacerbated the resulting power struggles (Landau, 2010). The *Voortrekkers* had been populating the interior in scattered farms since approximately 1815. From 1824, British colonists arrived in significant numbers and with considerable interest in contacting Zulu Kingdom (Bishop, n.d.). In many cases, the rising tensions and state of unrest was noticed and documented by the European travellers (Anderson, 2009). With the influx and settlement of Europeans in the regional study area came the establishment of the built environment and the development of towns.

Following the collapse of the Zulu Kingdom, the most notable historical events within KwaZulu-Natal are associated with various battles of major military events. The KwaZulu-Natal Battlefield highlights 82 battlefields, museums fortifications and places of remembrance associated with such events across the province (Battlefields Route, 2017). Within the local study area, these places are associated with the South African War[15] of 1899 – 1902 and the Bambatha Rebellion of 1906.

The South African War officially started on 9 October 1899 as a result of tensions and conflicting political agendas between the Boers and the British. Events associated with this time period occur within the region under consideration. The Battlefields Route highlights the birthplace of General Louis Botha south of Greytown, which is marked by a monument. Botha was the Acting Commandant-General of the *Zuid Afrikaansche Republiek* (ZAR) and his reputation stemmed from the Battle of Colenso (15 December 1899) and the Battle of Spioenkop (23 to 24 January 1900), both of which occurred in KwaZulu-Natal. Botha later became the first Prime Minister of the Union of South Africa in 1910 (Battlefields Route, 2017).

The Bambatha Rebellion was a collection of acts of defiance between February and June 1906 against the introduction of a poll tax by the Natal Colonial Government (Battlefields Route, 2017). Two places associated with the rebellion occur to the north of Greytown: Ambush Rock and the Bambatha 1906 Police Memorial. Ambush Rock was the site of a skirmish between members of the Natal Colonial Government police service and Chief Bhambatha of the Zondi people. A police column went to investigate reports of Chief Bambatha were ambushed on their return to Greytown on 4 April 1906. During this attack, four police officers were killed. These officers are buried at the Bambatha 1906 Police Memorial site.

[15] Also referred to as the. Second Anglo-Boer War

A

B

Figure 5-2: Representation of the various types of a) Blackburn and b) Nqabeni pottery, adapted from Huffman (2007, pp. 156, 164)

5.3 Existing environment

The Project area exists within two biomes: savanna and temperate grassland (Mucina & Rutherford, 2010; Scott-Shaw & Escott, 2011). The project area includes the sub-escarpment grassland and savanna biomes, which are represented by three vegetation types: KZN Highland Thornveld, Midlands Mistbelt Grassland and the Thukela Valley Bushveld. Subsequent to Mucina and Rutherford's (2010) publication, an additional vegetation type was classified within KwaZulu-Natal: Temperate Valley Vegetation (Scott-Shaw & Escott, 2011). This is not described by Mucina and Rutherford (2010) but bears similarities to their description of Highveld Alluvial Vegetation. Table 5-3 presents a summary of the vegetation types.

Table 5-3: Summary of the vegetation setting of the Project

Biome	Bio-region	Vegetation Type
Temperate Grassland	Sub-Escarpment Grassland	KwaZulu-Natal Highland Thornveld (Gs 6) Tall tussock grassland with occasional savannoid woodlands on hilly landscapes with broad valleys. This vegetation type is associated with lithologies of the Karoo Supergroup, including the Dwyka, Ecca and Beaufort Groups. This vegetation type is considered "Least Threatened". More than 16% of the land area has been transformed through cultivation and dam construction. Bush encroachment threatens this type.
		Midlands Mistbelt Grassland (Gs 9) Forb-rich, tall sour grasslands on hilly and rolling landscapes. The type is generally characterised by *Themeda triandra* but much has been transformed by the invasive native *Aristida junciformis* subsp. *junciformis*. This type is associated with Ecca Group deposits and Jurassic dolerite dykes and sills. This vegetation type is one of the most threatened vegetation types in the province and is considered endangered. Threats to this type include transformation into plantations, land for cultivation and urban sprawl, which have collectively transformed more than 50% of the land area. Other threats include uncontrolled fires and overgrazing, with alien species a concern in some areas.

Biome	Bio-region	Vegetation Type
Savanna Biome	Sub-Escarpment Savanna	Thukela Valley Bushveld (SVs 1) Short to medium-height deciduous trees and large shrubs on rocky and rugged slopes and terraces. Evergreen trees occur in places and succulents occur on shallow and eroded soils. This vegetation type is associated with the Ecca Group sediments. This type is considered “Least Threatened”. The nearby Weenen Game Reserve protects less than 200 ha but the unit has been degraded over its entire area. Prolonged overgrazing is a threat to this type and has led to the complete destruction of grass cover in some areas. Erosion is variable within the area. Alien plants do occur, but are not considered a threat,
Inland Azonal Vegetation		Temperate Alluvial Vegetation (Aza 8) This vegetation unit has been classified recently. Refer to the Fauna and Flora specialist study in the EIA report for a description of the unit.

Adapted from Mucina & Rutherford (2010) and Scott-Shaw & Escott (2011)

Due to the proclaimed nature reserve within the Project area, there are many areas representing the natural vegetation, including the types described above. The Project area includes several significant fauna species, including Oribi, Blue Crane and Wattled Crane and several vulnerable species. There are multiple Alien Invasive Plant (AIP) species within the Project area and the thornveld habitat has been altered.

The area bookmarked for the Project infrastructure specifically has been disturbed through current and historical agricultural activities. Agricultural endeavours in the surrounds have included: irrigated pastures, beef, citrus, forestry, game, maize, sheep, and timber (Nomalanga, 2012). Figure 5-3 represents the current environment at the time of the pre-disturbance survey.

Figure 5-3: Photographs illustrating the current environment within the Project area

5.4 Results from the pre-disturbance survey

Shannon Hardwick undertook a pre-disturbance survey of the development footprint area between 06 and 09 November 2018. Table 5-4 includes a description of the heritage resources identified during the survey. Plan 4 presents the results of the pre-disturbance survey. Figure 5-4 and Figure 5-5 presents photographs of select heritage resources described below.

Historical layering was undertaken to identify potential structures that may be older than 60 years and would therefore be protected under Section 34 of the NHRA and Section 37 of the KZNARIA. Plan 4 also includes the results of the historical layering.

HLP-002 refers to the current farmstead or werf, the layout of which has not changed considerably since 1964 (refer to Figure 5-5 and Figure 5-6). HLP-003 refers to the site HST-004, described in Table 5-4 below. The points HLP-001, HLP-004 and HLP-005 were not ground-truthed as they fall outside the infrastructure development area.

Table 5-4: Heritage Resources identified through the pre-disturbance survey[16]

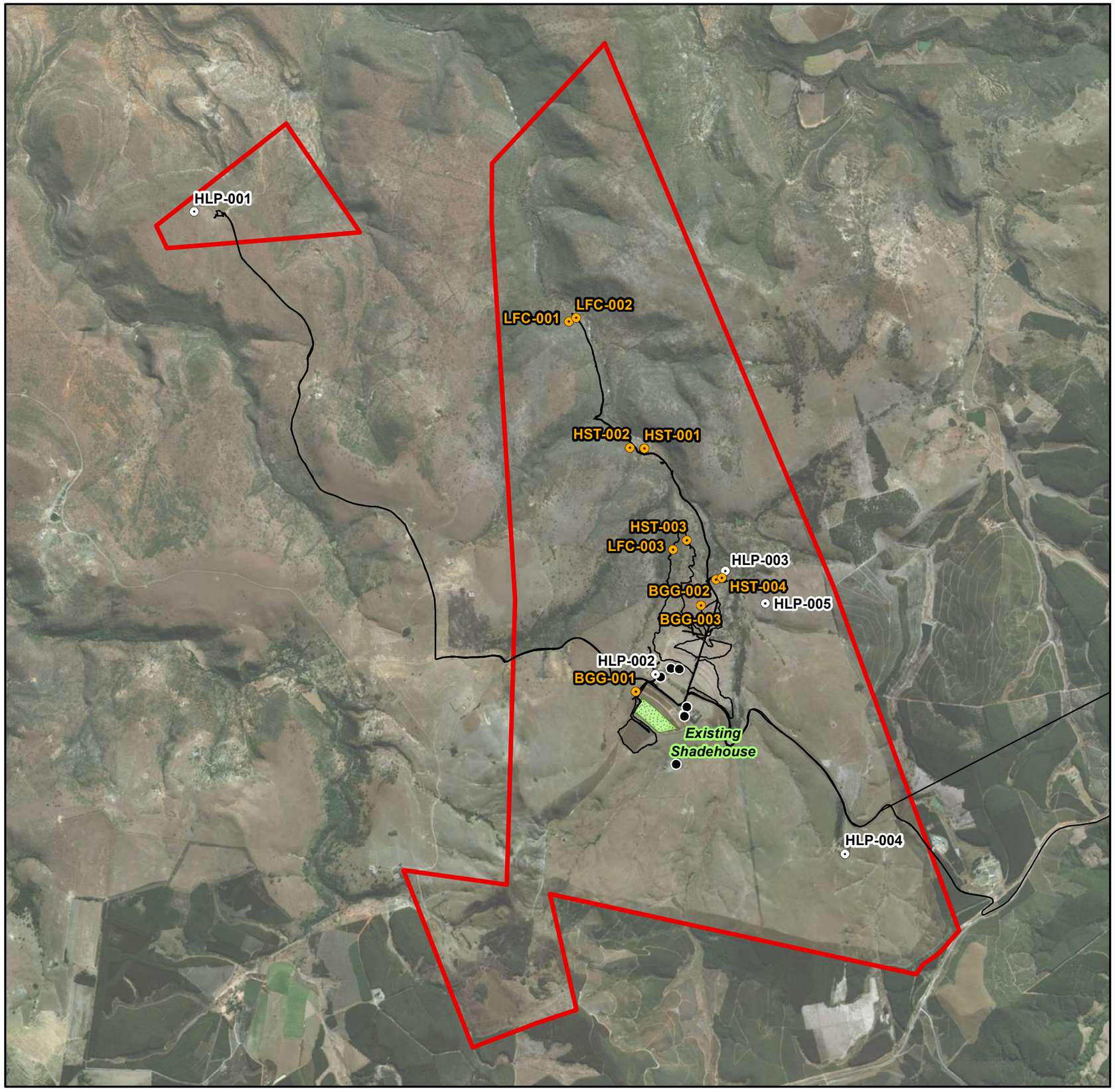
Site Name	Description
BGG-001	Burial ground including four visible graves, all of which have cement headstones with stone dressings. The headstones are not all legible, but all these graves belong to the Nel family. Only one date is legible (1819). The burial ground is demarcated with a wire fence, the corners of which are reinforced with stone piles. The fence includes four large exotic trees, which are assumed to demarcate the original corners of the burial ground.
BGG-002	A burial ground consisting of ten visible graves, although more may be present. Of these graves, six belong to the Nel family. Three of the graves have marble headstones, 3 have granite headstones and stone fittings. The other four have no headstones: one grave has stone/cement fittings with a globe and a separate fence and the other three are marked with stone piles. These graves include one child grave and the dates range from 1902 to 1965. The burial ground is marked by a wire fence, but this is in a bad state of disrepair.
BGG-003	A single grave marked by stone with a large cabbage tree at the head of the grave. There is no headstone; however, the landowner stated that the grave belonged to one of the previous farm owners and dates to 2005 or 2006. The grave is demarcated by a wooden fence which is in a state of disrepair.
HST-001	Remains of four abandoned huts or rondavels. One structure remains standing but only the foundations of the other three are visible. There is also an area which appears to be a kraal. These structures have been abandoned and the natural vegetation appears to be in a state of recovery. This site was not identified on historical layering and so the ages of the structures have not been confirmed. It must be noted that there is the potential for graves in the site and in the immediate area.

[16] In accordance with new SAHRA procedures, the GPS co-ordinates of these heritage resources have not been included in documents available to the public.

Site Name	Description
HST-002	Remains of four abandoned huts or rondavels and two rectangular structures, although there may be more. Only the foundations are visible. This site does not have a kraal-type feature associated with it, but there is a grey, ashy area which may be a midden. These structures have been abandoned and the natural vegetation appears to be in a state of recovery. This site is older or the site was not cleared as thoroughly, as the vegetation is more dense. This site was not identified on historical layering and so the ages of the structures have not been confirmed. It must be noted that there is the potential for graves in the site and in the immediate area.
HST-003	The landowner described[17] this site as a homestead. Some stonewalling was identified here, but there were no defined foundations. There was evidence of a driveway and material of varying ages was scattered around the site. This included glass, metal, old vehicle number-plates, metal jugs, plaster and slate. Of special interest was an old button and a medal or commemorative coin. The inscription read: “Presented by the Major and City Council Johannesburg, 16 Dec 1949” in English and in Afrikaans. This site was not identified on historical layering and so the ages of the structures have not been confirmed. This notwithstanding, the site is assumed to be older than 60 years and has been assessed as such.
HST-004	This may be the original werf as this site includes multiple buildings, at least one of which was standing in 1964 as identified on the historical imagery (HLP-003). These structures are assumed to be older than 60 years old and this will be considered in the recommendations (refer to Section 9). There may be as many as four buildings here – this is difficult to distinguish as the structures are in various states of ruin. None of the structures have any roofs. The site appears to represent several building phases, as there are different building materials across the structures.
HST-005	The furrow between the dams (as described in Section 1.1). The landowner described the furrow as being older than 60 years and being constructed with the current farmhouse / werf (HLP-002). The structure is too small to be identified on the historical imagery. This structure is therefore assumed to be older than 60 years old and this will be considered in the recommendations (refer to Section 9).
HLP-002	The original werf or farmstead, the layout of which has remained mostly unchanged since 1964. Refer to Figure 5-5 and Figure 5-6.

[17] This conversation occurred between the landowner and the Digby Wells Project Manager (not the heritage specialist) during a site visit in the Project Initiation phase. No further detail was available at the time of the heritage pre-disturbance survey.

Site Name	Description
LFC-001	Stone walling, which includes terracing and a semi-circle of stonewall. The extent of the site could not be determined in the field (as the walls were in a state of disrepair and the vegetation was dense) or on the historical layering. This notwithstanding, it is the opinion of the heritage assessor that this represents the LFC period.
LFC-002	A stone circle of approximately 40 m to 50 m in diameter. This is in proximity to LFC-001 and may be related. This feature was not identified on the historical imagery. This notwithstanding, it is the opinion of the heritage assessor that this represents the LFC period.
LFC-003	Stonewalling, approximately 5 m long and between 0.5 m and 1 m in height. The extent of this site could not be determined due to thick vegetation. The site has been disturbed, as a fence runs through part of the site. This feature was not identified on the historical imagery. This notwithstanding, it is the opinion of the heritage assessor that this represents the LFC period.



Plan 4

Nomalanga Estates Agricultural Development EIA

Heritage Points - Historical and Current

Legend

- Project Area
- Existing Heritage Point
- Historical Heritage Point
- Tracks

Infrastructure & Features on Site

- Infrastructure
- Shadehouse (Existing)

DIGBY WELLS ENVIRONMENTAL

• Sustainability • Service • Positive Change • Professionalism • Future Focused • Integrity

Projection: Transverse Mercator	Ref #: per.NOM5486.201904.078
Datum: WGS 1984	Revision Number: 1
Central Meridian: 31°E	Date: 11/04/2019

N

0 0.5 1 2

Kilometers

1:43 000

Figure 5-4: Photographs of select heritage resources identified during the pre-disturbance survey

A.) BGG-001 showing the graves and exotic trees; B.) Site HST-001 showing the remains of one of the rondavels; C.) the kraal area at HST-001; D.) square foundations at HST-002; E.) stone terracing at LFC-001 and F.) stone circle at LFC-002.

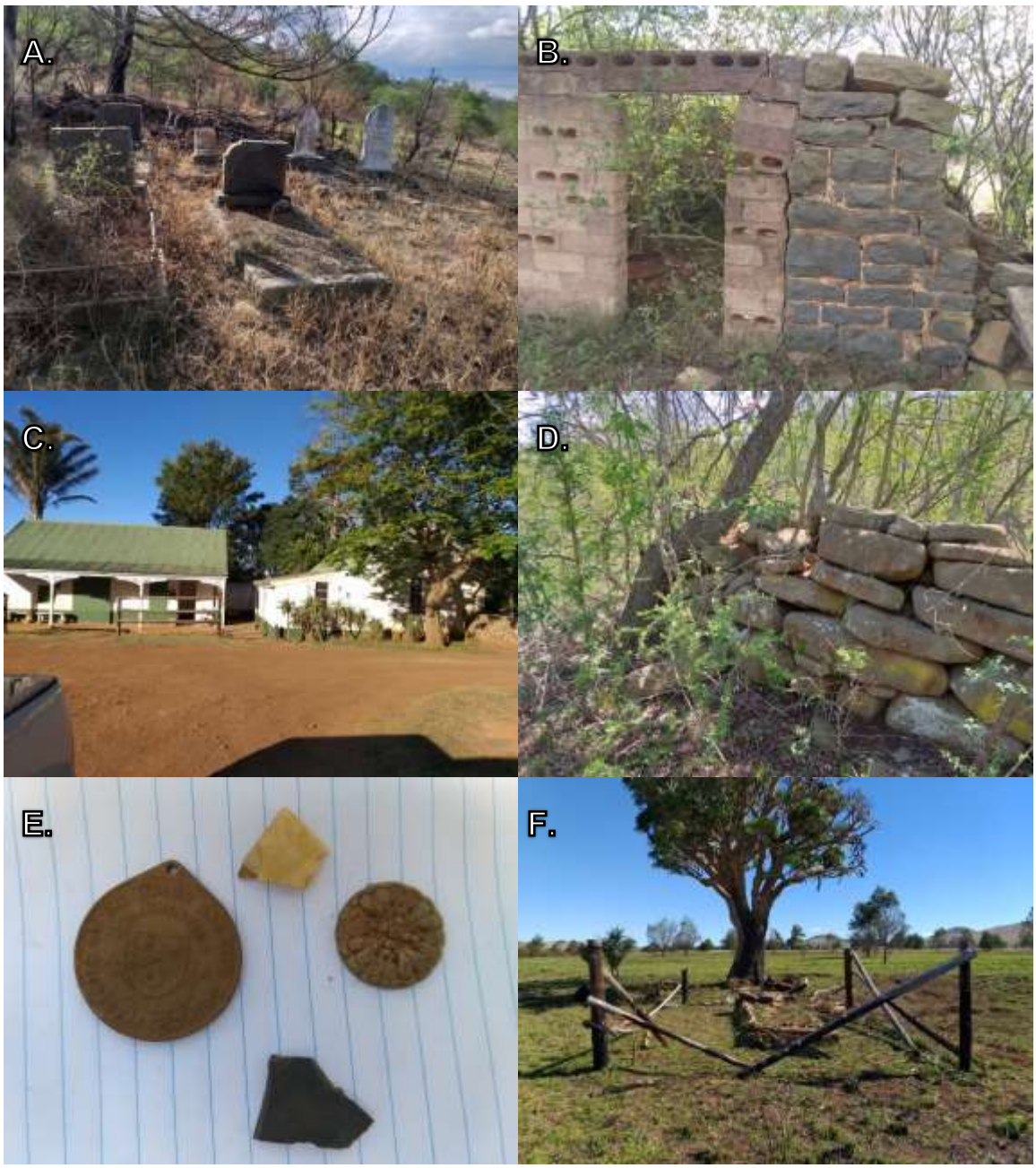


Figure 5-5: Photographs of select heritage resources identified during the pre-disturbance survey

A.) Graves at BGG-002; B.) evidence of multiple building phases at HST-004; C.) historical structures adjacent to the current farmhouse (HLP-002); D.) stonewalling at LFC-003; E.) historical material recovered from site HST-003, including the commemorative coin and button and F.) the single grave and cabbage tree at BGG-003.

Figure 5-6: Image showing the current farmhouse /werf in 1964 and in 2016.

6 Impact assessment

6.1 Cultural Significance of the identified landscape

Heritage resources are intrinsic to the history and beliefs of communities. They characterise community identity and cultures and are finite, non-renewable and irreplaceable. Considering the innate value of heritage resources, HRM acknowledges that these have lasting worth as evidence of the origins of life, humanity and society. Notwithstanding the inherent value ascribed to heritage, it is incumbent on the assessor to determine these resources' significance to allow for the implementation of appropriate management. This is achieved through assessing the value of heritage resources relative to the prescribed criteria encapsulated in policies and legal frameworks.

This section presents a statement of CS as is relevant to newly-identified heritage resources and the greater cultural landscape of the site-specific study area. The statement of significance considers the importance or the contribution of the identified heritage resources and the landscape to four broad value categories: aesthetic, historical, scientific and social, to summarise the CS and other values described in Section 3(3) of the NHRA.

Three categories of heritage resources were recorded during the field survey of the Nomalanga Expansion site-specific study area. These comprised:

- Archaeological – LFC (3 records);
- Burial grounds and graves (3 records); and
- Historical built environment (6 records).

The assessment of the CS and Field Ratings demonstrated that the identified have a CS designation ranging from negligible to very-high. Table 6-1 presents a summary of this assessment. Sites of the same type that share the same CS have been grouped together in terms of the impact assessment (refer to Section 6.2).

Table 6-1: CS and Field Ratings of newly identified heritage resources within the Nomalanga Expansion Project Area

Resource ID	Type	Description	Aesthetic	Historic	Scientific	Social	INTEGRITY	Designation	Recommended Field Rating	Field Rating Description	Recommended Mitigation[18]
VRYH	Geological	*Vryheid Formation*	- This geological formation was not assessed against aesthetic criteria as defined in Section 3(3) of the NHRA.	- This geological formation was not assessed against historic criteria as defined in Section 3(3) of the NHRA.	5 The fossils within this palaeontologically sensitive formation potentially provide significant scientific information and are considered rare heritage resources.	- This geological formation was not assessed against social criteria as defined in Section 3(3) of the NHRA.	4 The integrity of the formation is considered to be excellent with both tangible and intangible fabric preserved.	Very High 20	Grade I	Heritage resources with qualities so exceptional that they are of special national significance.	Project design must change to avoid all change to resource; Conserved in entirety and included in Conservation Management Plan (CMP).
BGG-001 BGG-002 BGG-003	Burial / grave	Burial Grounds & Graves	- Burial grounds and graves were not assessed against aesthetic criteria as defined in Section 3(3) of the NHRA.	- Burial grounds and graves were not assessed against historic criteria as defined in Section 3(3) of the NHRA.	- Burial grounds and graves were not assessed against scientific criteria as defined in Section 3(3) of the NHRA.	5 Burial grounds and graves have specific connections to communities or groups for spiritual reasons. The significance is universally accepted.	4 The integrity of burial grounds is considered to be excellent with both tangible and intangible fabric preserved.	Very High 20	Grade I	Heritage resources with qualities so exceptional that they are of special national significance.	Project design must change to avoid the resource completely and resources must be included in CMP. A Grave Relocation Process (GRP) may be necessary should the project design not be changed.
HST-001	Occurrence	Four rondavels, one structure and three foundations.	3 Structural remains of this kind are rare and uncommon within the greater study area.	3 These structures represent a people within in the past that is not commonly represented within the regional study area	2 The information potential of these resources is uncommon but not particularly well-represented here.	3 These structures may be significant to specific communities, as they represent the past of these peoples.	2 There is questionable scientific potential from these structures. The meaning is lost but the fabric is preserved.	Low 6	General Protection IV B	Resources under general protection in terms of NHRA sections 34 to 37 with Low significance	Resource must be recorded before destruction, including detailed site mapping, surface sampling may be required
HST-002	Occurrence	Four round and two rectangular foundations.									

[18] Please note: this recommended mitigation refers to the minimum mitigation requirements as encapsulated in the NHRA. Project-specific mitigation measures are presented in Section 9

Resource ID	Type	Description	Aesthetic	Historic	Scientific	Social	INTEGRITY	Designation	Recommended Field Rating	Field Rating Description	Recommended Mitigation[18]
HST-003	Site	"Homestead" with scatter of material culture objects.	3 Material culture remains such as the coin are rare within the greater study area.	3 An item with a date is rare and uncommon and provides more secure dates for the site.	3 The information potential of this site is rare, because of the material culture identified on the surface.	3 The material culture on the surface may be of importance to specific families and communities.	2 There is uncommon information potential here; however, the fabric is not preserved and there is some encroachment.	Low 6	General Protection IV B	Resources under general protection in terms of NHRA sections 34 to 37 with Low significance	Resource must be recorded before destruction, including detailed site mapping, surface sampling may be required
HST-004	Occurrence	Original werf, including four buildings in various states of ruin.	2 Historical structures are commonly-represented within the study area. This is a higher-quality example.	3 Historical structures are common within the study area; however, this site exhibits evidence for multiple phases of construction, which is uncommon.	3 The multiple phases of construction provide uncommon information potential within the larger study area.	2 The original werf may hold some social significance for individuals within the community.	1 Information potential is limited, as the fabric of these structures is degraded and poorly preserved.	Negligible 3	General Protection IV C	Resources under general protection in terms of NHRA sections 34 to 37 with Negligible significance	Sufficiently recorded, no mitigation required
HST-005	Feature	The furrow between the dams.	3 Historical features like this furrow are rare and uncommon within the regional study area.	3 Historical features such as the furrow are rare and uncommon within the study area.	2 Although rare, this feature presents limited information potential.	- This functional structure was not assessed against social criteria as defined in Section 3(3) of the NHRA	2 This fabric of this feature is well preserved but has been encroached upon and offers limited information potential.	Negligible 5	General Protection IV C	Resources under general protection in terms of NHRA sections 34 to 37 with Negligible significance	Sufficiently recorded, no mitigation required
HLP-002	Occurrence	The original werf or farmstead.	3 Intact historical structures such as homes and *were* are comparatively uncommon within the regional study area.	3 The outbuildings exhibit some unchanged structural characteristics from the period, such as the roofs. This is uncommon.	3 The information potential presented by these features is rare and uncommon.	2 The original werf may hold some social significance for individuals within the community.	3 The outbuildings are well preserved and, although in use, have undergone little alteration. There is some encroachment but the meaning is evident.	Low 8	General Protection IV B	Resources under general protection in terms of NHRA sections 34 to 37 with Low significance	Resource must be recorded before destruction, including detailed site mapping, surface sampling may be required

Resource ID	Type	Description	Aesthetic	Historic	Scientific	Social	INTEGRITY	Designation	Recommended Field Rating	Field Rating Description	Recommended Mitigation[18]
LFC-001	Occurrence	Stone walling which includes terracing and a semi-circle.	3 These features showcase techniques that are not commonly represented within the study area.	3 These features showcase a time-period that is rarely represented within the study area.	2 Although uncommon within the study area, the information potential here is limited.	2 These features may hold some social significance for individuals within the community.	1 The fabric of this site is poorly preserved and the meaning is not evident.	Negligible 3	General Protection IV C	Resources under general protection in terms of NHRA sections 34 to 37 with Negligible significance	Sufficiently recorded, no mitigation required
LFC-002	Occurrence	A stone circle of approximately 40 m to 50 m in diameter.									Sufficiently recorded, no mitigation required
LFC-003	Occurrence	Stonewalling, approximately 5 m long.			3 The stonewalling is largely intact and so presents uncommon scientific potential.	2 These features may hold some social significance for individuals within the community.	2 The fabric is preserved and there is some encroachment. There is limited information potential.	Low 6	General Protection IV B	Resources under general protection in terms of NHRA sections 34 to 37 with Low significance	Resource must be recorded before destruction, including detailed site mapping, surface sampling may be required

6.2 Heritage Impact Assessment

The assessment of potential impacts to heritage resources considers the aforementioned activities associated with the Project, specifically the construction and operation of the aforementioned infrastructure and agro-processing activities. The final proposed infrastructure layout is not available at this time and so Digby Wells has assumed that all heritage resources will be affected by the Project and have included mitigation measures to avoid or ameliorate these impacts.

Table 6-2 to Table 6-4 provide summaries of the impacts to the heritage resources. Impacts to the palaeontological resources are discussed in the specialist PIA report (refer to Appendix C) and are not repeated here. The cultural heritage resources of the same type of CS have been grouped together for the purposes of the impact assessment.

The SAHRA Minimum Standards recommend that heritage resources with negligible CS require no mitigation and their inclusion into an HIA report is considered to be sufficient in terms of recording these resources. Their inclusion into Table 5-4 and Figure 5-4 and Figure 5-5 is considered sufficient to meet these requirements. To this effect, potential impacts posed to the LFC stonewalling sites LFC-001 and LFC-002 and historic built environment resources HST-004 and HST-005 are not considered in this section.

6.2.1 Burial Grounds and Graves

Potential direct impacts to the identified burial grounds and graves include damage to individual graves within the burial ground and damage to the burial ground as a whole, destruction of individual graves within the burial ground and the destruction of the burial ground as a whole. Destruction is anticipated where the burial ground is located within the infrastructure footprints and damage is to be expected where the burial ground is within proximity to the footprints, up to a distance of 100 m.

Table 6-2 presents an overview of the potential direct impact to BGG-001, BGG-002 and BGG-003.

Table 6-2: Summary of the potential direct impact to identified burial grounds and graves

IMPACT DESCRIPTION: Direct impact to BGG				
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Permanent (7)	Damage to or destruction of the burial grounds or individual graves cannot be reversed and will be permanent.	Consequence: Extremely detrimental (-21)	Significance: Major – negative (-126)

IMPACT DESCRIPTION: Direct impact to BGG				
Dimension	**Rating**	**Motivation**		
Extent	International (7)	Graves are considered to have universally-recognised cultural value and as such, damage or destruction will have international implications.		
Intensity x type of impact	Extremely high - negative (-7)	Damage to or destruction of the BGG is considered a major negative change to a heritage resource of very high CS.		
Probability	Highly probable (6)	Given the proposed activities within the Project area, the site layout and the location of these resources, it is highly likely that the burial grounds will be affected by the Project.		
MITIGATION:				
Nomalanga must alter the infrastructure design and layout to avoid these heritage resources and include a 50 m 'no-go'' buffer zone around the heritage resources. Nomalanga must draft and implement a CMP to consider these heritage resources and conserve the CS of the resources. Should layout redesign not be feasible, Nomalanga must undertake a GRP, which will require permits issued by SAHRA in terms of Section 36 of the NHRA for those graves older than 60. This process must comply with Chapter IX of the NHRA Regulations, and any additional requirements encapsulated in Sections 38 and 39 of the KZNARIA.				
POST-MITIGATION				
Duration	Beyond project life (6)	Should the CMP be developed and implemented, the benefits will extend beyond the lifecycle of the Project.	Consequence: Highly beneficial (13)	Significance: Moderate – positive (91)
Extent	Limited (2)	The CMP will affect select heritage resources within the Project area.		
Intensity x type of impact	High - positive (5)	Implementation of the CMP will be considered a minor change to a heritage resource of very high CS.		
Probability	Certain (7)	Should the CMP be implemented, the heritage resources will be impacted in a positive way.		

6.2.2 LFC Stonewalling site of Low CS

As with the burial grounds and graves, potential direct impacts to the identified stonewalling include damage to or destruction of the heritage resource as a whole. Destruction is anticipated where the stonewalling is located within the infrastructure footprints and damage is to be expected where resource is within proximity to the footprints, up to a distance of 50 m.

Table 6-2 presents an overview of the potential direct impact to LFC-003.

Table 6-3: Summary of the potential direct impact to identified LFC resources

<table>
<tr><th colspan="5">IMPACT DESCRIPTION: Direct impact to LFC Stonewalling of Low CS</th></tr>
<tr><th>Dimension</th><th>Rating</th><th colspan="3">Motivation</th></tr>
<tr><td colspan="5">PRE-MITIGATION</td></tr>
<tr><td>Duration</td><td>Permanent (7)</td><td>Damage to or destruction of this resource will be permanent.</td><td rowspan="3">Consequence: Moderately detrimental (-13)</td><td rowspan="4">Significance: Moderate – negative (-78)</td></tr>
<tr><td>Extent</td><td>Province/ Region (5)</td><td>Damage to or destruction of this resource will affect the greater heritage landscape.</td></tr>
<tr><td>Intensity x type of impact</td><td>Very low - negative (-1)</td><td>Damage or destruction is considered a major negative change to a resource of low CS</td></tr>
<tr><td>Probability</td><td>Highly probable (6)</td><td colspan="2">Given the proposed activities within the Project area, the site layout and the location of these resources, it is highly likely that this resource will be affected by the Project.</td></tr>
<tr><td colspan="5">MITIGATION:</td></tr>
<tr><td colspan="5">Nomalanga must alter the infrastructure design and layout to avoid this heritage resource and include a 25 m 'no-go" buffer zone around the stonewalling. The recommended CMP must include this resource and aim to conserve the CS of LFC-003.
Should layout redesign not be feasible, this resource must be conserved through the records. This will include detailed recording through photographs and detailed mapping. Should any associated material culture be visible on the surface, sampling may be necessary. This will require a permit issued by the HRAs in terms of Section 35 of the NHRA and Section 40 of the KZNARIA.</td></tr>
<tr><td colspan="5">POST-MITIGATION</td></tr>
<tr><td>Duration</td><td>Beyond project life (6)</td><td>Should the CMP be developed and implemented, the anticipated benefits will extend beyond the lifecycle of the Project.</td><td>Consequence: Slightly beneficial (9)</td><td>Significance: Minor - positive (63)</td></tr>
</table>

IMPACT DESCRIPTION: Direct impact to LFC Stonewalling of Low CS				
Dimension	**Rating**	**Motivation**		
Extent	Limited (2)	The proposed mitigation measures are applicable to this heritage resource specifically.		
Intensity x type of impact	Very low - positive (1)	The proposed mitigation measures are considered a minor change to a heritage resource of low CS.		
Probability	Certain (7)	Should the proposed mitigations be implemented, the benefit will definitely occur.		

6.2.3 Historical structures of Low CS

As with the aforementioned heritage resources, potential direct impacts to the identified historical structures include damage to or destruction of the heritage resource as a whole. Destruction is anticipated where the historical structure is located within the infrastructure footprints and damage is to be expected where resource is within proximity to the footprints, up to a distance of 50 m.

Table 6-4 presents an overview of the potential direct impact to HST-001, HST-002, HST-003 and HLP-002.

Table 6-4: Summary of the potential direct impact to identified historical built environment resources

IMPACT DESCRIPTION: Direct impact to Historical Structures of Low CS				
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Permanent (7)	Damage to or destruction of any of these resources will be permanent.	Consequence: Moderately detrimental (-13)	Significance: Moderate – negative (-78)
Extent	Province/ Region (5)	Damage to or destruction of any of these resources will affect the greater heritage landscape.		
Intensity x type of impact	Very low - negative (-1)	Damage or destruction is considered a major negative change to a resource of low CS		

IMPACT DESCRIPTION: Direct impact to Historical Structures of Low CS				
Dimension	**Rating**	**Motivation**		
Probability	Highly probable (6)	Given the proposed activities within the Project area, the site layout and the location of these resources, it is highly likely that these resources will be affected by the Project.		
MITIGATION:				
Nomalanga must alter the infrastructure design and layout to avoid these heritage resources and include a 25 m 'no-go" buffer zone around the stonewalling. The recommended CMP must include these resources and aim to conserve their CS values. Should layout redesign not be feasible, Nomalanga must undertake a permit application process to obtain individual permits for each of these structures. These permits must be issued by the HRAs in terms of Section 34 of the NHRA and Section 37 of the KZNARIA.				
POST-MITIGATION				
Duration	Beyond project life (6)	Should the CMP be developed and implemented, the benefits will extend beyond the lifecycle of the Project.	Consequence: Moderately beneficial (10)	Significance: Minor – positive (70)
Extent	Local (3)	The proposed mitigation measures are applicable to specific heritage resources.		
Intensity x type of impact	Very low - positive (1)	The proposed mitigation measures are considered a minor change to a heritage resource of low CS.		
Probability	Certain (7)	Should the proposed mitigations be implemented, the benefit will definitely occur.		

6.3 Cumulative impacts on the cultural landscape

Cumulative impacts occur from in-combination effects of various impacts on heritage resources acting within a host of processes that result in an incremental effect. The importance of identifying and assessing cumulative impacts is that the whole is often greater than the sum of its parts. This implies that the total effect of multiple stressors or change

processes acting simultaneously on a system may be greater than the sum of their effects when acting in isolation.

This Project in conjunction with other planned developments in line with the strategic development plans for the KwaZulu-Natal Province requires consideration to identify the possible in-combination effects of various impacts to known heritage resources. The possible cumulative impacts of the Project are presented in Table 6-5.

Table 6-5: Summary of potential cumulative impacts

Type	Cumulative Impact	Direction of Impact	Extent of Impact
Additive, Synergistic	The construction of the proposed Project infrastructure will add to the existing body of agricultural and agro-processing infrastructure in the area and will contribute to the degradation of the sense-of-place of the cultural landscape. Considering the greater development landscape, the effects from the various proposed developments will interact to produce a total greater effect on the cultural landscape and degradation thereof.	Negative	Local
Neutralizing	The *in situ* conservation of some or all of the identified heritage resources will conserve tangible markers of the historical landscape. This will be a positive cumulative impact on the cultural landscape and may counter some of the degradation of the sense-of-place as described above.	Positive	Local

6.4 Low risks and unplanned events

This section considers the potential risks *to* protected heritage resources, as well as the potential heritage risks that could arise *for* Nomalanga in terms of implementation of the Project. These two aspects are discussed separately.

Section 5.4 describes the heritage resources identified during the pre-disturbance survey; however, this is not an exhaustive list of all heritage resources within the Project area. If heritage resources are subsequently identified, and where Nomalanga knowingly does not take proactive management measures, potential risks to Nomalanga may include litigation in terms of Section 51 of the NHRA and social or reputational repercussions. Table 6-6 presents a summary of the primary risks that may arise for Nomalanga.

Table 6-6: Identified heritage risks that may arise for Nomalanga

Description	Primary Risk
Heritage resources with a high CS rating are inherently sensitive to any development in so far that the continued survival of the resource could be threatened. In addition to this, certain heritage resources are formally protected thereby restricting various development activities.	Negative Record of Decision (RoD) and/or development restrictions issued by the Institute and/or SAHRA in terms of Section 38(8) of the NHRA and Section 41 of the KZNARIA.
Impacting on heritage resources formally and generally protected by the NHRA without following due process. Due process may include social consultations and/or permit application processes to SAHRA and/or the Institute.	Fines Penalties Seizure of Equipment Compulsory Repair / Cease Work Orders Imprisonment

In the event that additional heritage resources are identified during construction of the proposed infrastructure, potential risks to those heritage resources will need to be assessed. Table 6-7 provides an overview of these potential unplanned events, the subsequent impact that may occur and mitigation measures and management strategies to remove or reduce these risks.

Table 6-7: Identified unplanned events and associated impacts

Unplanned event	Potential impact	Mitigation / Management / Monitoring
Accidental exposure of fossil bearing material implementation of the Project.	Damage or destruction of heritage resources generally protected under Section 35 of the NHRA and Section 40 of the KZNARIA.	Establish Project-specific Chance Find Procedures (CFPs) and Fossil Finds Procedures (FFPs) as a condition of authorisation. Refer to Section 9 for more detailed recommendations.
Accidental exposure of *in situ* LFC settlement sites (or other archaeological material) during the implementation of the Project.		
Accidental exposure of *in situ* historical built environment sites during the implementation of the Project.	Damage or destruction of heritage resources generally protected under Section 34 of the NHRA and Section 37 of the KZNARIA	

Unplanned event	Potential impact	Mitigation / Management / Monitoring
Accidental exposure of *in situ* burial grounds or graves during the implementation of the Project.	Damage or destruction of heritage resources generally protected under Section 36 of the NHRA and Sections 38 and 39 of the KZNARIA.	
Accidental exposure of human remains during the construction phase of the Project.		

7 Identified heritage impacts versus socio-economic benefit

The Project area is located in Ward 11 of the ULM within the UDM. This section provides a brief overview[19] of the socio-economic context within with the Project will be situated. This section presents a summary of the information included in the Integrated Development Plans (IDPs)[20] for both these district municipalities.

Information from Wazimap (2017) has been used to supplement the IDP data. These data were used because it realigns the 2011 Census data captured and presented by Statistics South Africa (2011) with new municipal boundaries used in the 2016 Municipal Elections (Open Up, 2017). This data uses the Census 2011 data as the Community Survey (2016) data is not yet available at ward level.

The 2011 census registered 10 267 300 people living in KwaZulu-Natal, approximately 20% of the country's population (Statistics South Africa, 2011; Wazimap, 2017). KwaZulu-Natal includes ten district municipalities, one metropolitan municipality and 44 local municipalities. UDM is the third-smallest district within the province (in terms of population size) and ULM is almost the median point in terms of population size (it is ranked 26th). The UDM included 514 028 residents and ULM 114 715. UDM includes four of the province's local municipalities and includes ULM the second smallest population.

Table 7-1 presents an overview of the employment status of the populations within the regional study area. The trends across the various study areas are similar, although UDM has a slightly smaller proportion of people of economically-active age (between 15 and 64 years old) and a smaller proportion of the population with employment. Figure 7-1 below presents a breakdown of the employment status of the populations within the regional study area. In this figure, "not applicable" refers to members of the community who are not of economically-active age (i.e. those who are younger than 15 and aged 65 and older).

[19] For a full report on the socio-economic setting of the Project, refer to the Social Impact Assessment report.

[20] IDP for the ULM (2019) and UDM (2018). Refer to Section 11 for more detailed references.

Table 7-1: Summary of employment statistics within the regional study area

Population (Census 2011)	Ward 11		ULM		UDM	
	Number	Percent	Number	Percent	Number	Percent
Total Population	9 393	-	114 715	-	514 028	-
Working Age (15-64)	4 883	52.00	57 996	50.60	238 921	46.50
Employed	1 504	16.00	17 214	15.00	50 734	9.90
Reported Unemployment Rate	-	-	-	30.4%	-	-

Adapted from Statistics SA (2011) and Wazimap (2017)

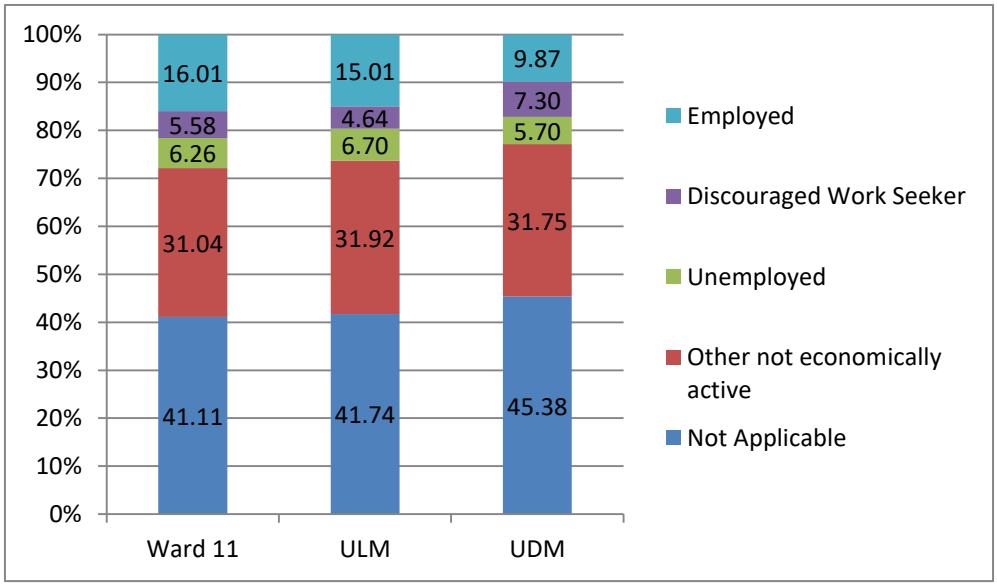


Figure 7-1: Employment status within the regional study area

Adapted from Wazimap (2017)

Although the rate of unemployment is decreasing, and has been on a downward trend between 2001 and 2011 in ULM, the overall unemployment rate within UDM (including ULM) increased between 2012 and 2016 (UDM, 2018; ULM, 2019). Unemployment is especially high within Wards 3, 7 and 8 especially (ULM, 2019).

Agriculture was not seen as a significant sector of employment, neither in terms of number of people employed nor in terms of the economic contribution of the sector (UDM, 2018). The contribution of the agricultural sector to the Gross Value Added (GVA) of the UDM has decreased from 15% to 10.8% between 2012 and 2016 (although the absolute contribution has grown). The number of employment opportunities in the agricultural sector have also decreased in this period, from 13 867 to 5 379 opportunities.

Nomalanga presently employs 32 workers in the current operations, but anticipate employing a workforce of a minimum of 500 people by the end of the third year of the Project. This will account for a significant increase in the number of permanent employment opportunities (an

increase of almost 10% of the 2016 figures). Nomalanga do not expect that the entire workforce will be accommodated in the staff housing included in this Project. There is therefore opportunity for indirect benefits, such as an increase in the transportation and accommodation industries near the Project area.

Based on the review of the applicable planning documents and the motivation above, the potential socio-economic benefits that may result from the Project and the intended expansion of the Nomalanga Estates agricultural operation outweigh the identified impacts and risks to known heritage resources within the site-specific study area. This statement is supported by the following:

- The infrastructure design layout is flexible and may be altered to allow the identified heritage resources to remain and be maintained *in situ*;
- Alternatively, the identified impacts and risks can be managed through the proposed recommendations; and
- The expanded agro-processing operation will contribute significantly to the employment of people in an area where unemployment is a challenge.

8 Consultation

The consultation process affords Interested and Affected Parties (I&APs) opportunities to engage in the EIA process. The objectives of the Stakeholder Engagement Process (SEP) include the following:

- To ensure that I&APs are informed about the project;
- To provide I&APs with an opportunity to engage and provide comment on the project;
- To draw on local knowledge by identifying environmental and social concerns associated with the project;
- To involve I&APs in identifying methods in which concerns can be addressed;
- To verify that stakeholder comments have been accurately recorded; and
- To comply with the legal requirements.

The Public Participation Process (PPP) has been completed in part, as a process separate to the heritage specialist assessment. No formal consultation was undertaken as part of this assessment. Should any I&AP comments be submitted in relevance to heritage resources during the SEP, these will be considered in the final EIA report.

Site surveys can often present an opportunity for informal consultation with specific stakeholders (usually farm owners, managers and employees). This consultation can result in the identification of burial grounds and graves – importantly, these could include formal burial grounds or graves, sometimes with no visible surface markers – or in the identification of sacred sites or other places of importance, which may not otherwise be identified.

During the field survey, limited informal consultation was undertaken with one of the current landowners, Mr. Irwin Pascal, as an introductory meeting prior to the survey. Mr Pascal provided information regarding BGG-003, which included the time of interment (2005 or 2006) and that the grave belonged to the former landowner. Mr Pascal also provided information regarding the furrows and estimated that they were older than 60 years and had been constructed with the original werf.

9 Recommendations

To mitigate against the identified impacts against cultural and fossil heritage resources as described in Section 6.2, Digby Wells has made the following recommendations:

- Nomalanga must amend the infrastructure design where possible to avoid identified heritage resources within the infrastructure design area within the Project area. Digby Wells acknowledges that it may not be feasible to avoid all the identified heritage resources;
- Where burial grounds and graves will be impacted upon by the proposed infrastructure, Nomalanga must undertake mitigation measures (inclusive of a BGGC, permit application process and GRP) in accordance with Section 36 of the NHRA and Chapter IX and XI of the NHRA Regulations as well as additional requirements encapsulated in Section 38 and 39 of the KZNARIA;
- Where archaeological sites will be impacted upon by the proposed infrastructure, Nomalanga must undertake mitigation measures (so-called Archaeological Phase 2 Mitigations, which will include detailed mapping and which may include surface collections) in accordance with Section 35 of the NHRA and Chapter IV of the NHRA Regulations as well as additional requirements encapsulated in Section 38 and 39 of the KZNARIA;
- Where historical structures will be impacted upon by the proposed infrastructure, Nomalanga must undertake mitigation measures (inclusive of a permit application process) in accordance with Section 34 of the NHRA and Chapter III of the NHRA Regulations as well as additional requirements encapsulated in Section 37 of the KZNARIA;
- Where identified heritage resources are avoided, Nomalanga must develop and implement a CMP to conserve the heritage resource and its CS value as described in Section 6.1. The CMP will include mitigation measures, management strategies and proposed monitoring schedules and will outline the roles and responsibilities of those involved in the conservation of the heritage resources. This document must be submitted to the HRAs for Statutory Comment before it can be implemented;
- A project-specific CFP must be developed, approved by the HRAs and implemented prior to the commencement of the construction of Project-related infrastructure; and

- The project-specific FFP must be approved and implemented prior to the commencement of the construction phase of the Project (refer to Appendix A of the PIA report).

10 Conclusion

The aim of the HRM process was to comply with regulatory requirements contained within Section 38 of the NHRA and Section 41 of the KZNARIA through the following:

- Defining the cultural landscape within which the Project is situated;
- Identifying, as far as is feasible, heritage resources that may be impacted upon by the project as well as define the CS;
- Assessing the possible impacts to the identified heritage resources;
- Considering the socio-economic benefits of the Project; and
- Providing feasible mitigation and management measures to avoid, remove or reduce perceived impacts and risks.

These objectives were met as presented in Sections 5 through 9 above. Based on the understanding of the Project while considering the results of this assessment, Digby Wells does not object to the Project where the provided cultural and fossil heritage specific recommendations are adopted.

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Appendix A: Specialist CV

Miss Shannon Hardwick

Junior Heritage Resources Management Consultant

Social and Heritage Services Division

Digby Wells Environmental

1 Education

Date	Degree(s) or Diploma(s) obtained	Institution
2013	MSc (Archaeology)	University of the Witwatersrand
2010	BSc (Honours) (Archaeology)	University of the Witwatersrand
2009	BSc	University of the Witwatersrand
2006	Matric	Rand Park High School

2 Language Skills

Language	Written	Spoken
English	Excellent	Excellent
Afrikaans	Fair	Basic

3 Employment

Period	Company	Title/position
2017 to present	Digby Wells Environmental	Junior Heritage Resources Management Consultant
2016-2017	Tarsus Academy	Facilitator
2011-2016	University of the Witwatersrand	Teaching Assistant
2011	University of the Witwatersrand	Collections Assistant

4 Experience

I joined the Digby Wells in April 2017 as an archaeologist and a Heritage Resources Management intern in the Social and Heritage Services Division and have most recently been promoted to a Junior Consultant. I received my Master of Science (MSc) degree in Archaeology from the University of the Witwatersrand in 2013, specialising in archaeobotany and historical archaeology. I have fieldwork experience in historical archaeology as well as in Stone Age archaeology in South Africa; since joining Digby Wells, this has been expanded to include pre-disturbance surveys across South Africa and fieldwork in Malawi.

Since joining Digby Wells, I have gained generalist experience through the compilation of various heritage assessment reports in South Africa, Malawi and Mali and Section 34 Permit Applications. I have also obtained experience in compiling socio-economic documents, including a Community Health, Safety and Security Management Plan (CHSSMP) and social baselines and data analysis in South Africa, Malawi, Mali and Sierra Leone.

5 Project Experience

My project experience is listed in the table below.

Project Title	Name of Client	Project Location	Date:		Project / Experience Description
Environmental Authorisation for the Dagsoom Coal Mining Project near Ermelo, Mpumalanga Province	Dagsoom Coal Mining (Pty) Ltd	Ermelo, Mpumalanga Province	April 2019	Ongoing	Heritage Impact Assessment
Regional Tailings Storage Facility Heritage Mitigations	Ergo Mining (Pty) Ltd	Randfontein, Gauteng	April 2019	Ongoing	Section 34 Permit Application Process
Weltervreden Mine Environmental Authorisation, Water Use Licence and Mining Right Application Project	Mbuyelo Group (Pty) Ltd	Belfast, Mpumalanga	April 2019	Ongoing	Heritage Impact Assessment
Environmental Authorisation for the proposed Lephalale Pipeline Project, Limpopo Province	MDT Environmental (Pty) Ltd	Lephalale, Limpopo Province	April 2019	Ongoing	Notification of Intent to Develop
Heritage Resources Management Process Update for the Exxaro Matla Mine	Exxaro Coal Mpumalanga (Pty) Ltd	Kriel, Mpumalanga Province	February 2019	Ongoing	Heritage Site Management Plan Update
Environmental Authorisation for the proposed Musina-Makhado Special Economic Zone Development Project, Limpopo Province	Limpopo Economic Development Agency	Vhembe District Municipality, Limpopo Province	February 2019	Ongoing	Heritage Impact Assessment
Songwe Hills Rare Earth Elements Project	Mkango Resources Limited	Phalombe District, Malawi	February 2019	Ongoing	Heritage Impact Assessment

Project Title	Name of Client	Project Location	Date:		Project / Experience Description
Elandsfontein Colliery Burial Grounds and Graves Chance Finds	Anker Coal and Mineral Holdings SA (Pty) Ltd Elandsfontein Colliery (Pty) Ltd	Clewer, Emalahleni, Mpumalanga Province	November 2018	December 2018	Site Inspection
Environmental Authorisation Process to Decommission a Conveyor Belt Servitude, Road and Quarry at Twistdraai East Colliery	Sasol Mining (Pty) Ltd	Secunda, Mpumalanga Province	November 2018	Ongoing	Notification of Intent to Develop
Environmental and Social Impact Assessment for the Bougouni Lithium Project, Mali	Future Minerals S.A.R.L.	Bougouni, Mali	October 2018	Ongoing	Heritage Impact Assessment
Environmental Authorisation for the Nomalanga Estates Expansion Project, KwaZulu-Natal	Nomalanga Property Holdings (Pty) Ltd	Greytown. KwaZulu-Natal	October 2018	Ongoing	Heritage Impact Assessment
Environmental Authorisation for the Temo Mine proposed Rail, Road and Pipeline Development, Limpopo Province	Temo Coal Mining (Pty) Ltd	Lephalale, Limpopo Province	August 2018	Ongoing	Heritage Impact Assessment
Gorumbwa RAP Audit	Randgold Resources Limited	Kibali Sector, Democratic Republic of the Congo	July 2018	December 2018	Resettlement Action Plan Audit
Sasol Sigma Defunct Colliery Surface Mitigation Project: Proposed Rover Diversion and Flood Protection Berms	Sasol Mining (Pty) Ltd	Sasolburg	June 2018	November 2018	Notification of Intent to Develop

Project Title	Name of Client	Project Location	Date:		Project / Experience Description
Basic Assessment and Regulation 31 Amendment / Consolidation for Sigma Colliery: Mooikraal and Sigma Colliery: 3 Shaft	Sasol Mining (Pty) Ltd	Sasolburg, Free State Province	April 2018	Ongoing	Notification of Intent to Develop
Sasol Mining Sigma Colliery Ash Backfilling Project, Sasolburg, Free State Province	Sasol Mining (Pty) Ltd	Sasolburg, Free State Province	April 2018	July 2018	Heritage Basic Assessment Report Update
Constructed Landfill Site for the Sierra Rutile Limited Mining Operation, Southern Province, Sierra Leone	Sierra Rutile Limited	Southern Province, Sierra Leone	April 2018	May 2019	Social Impact Assessment
Environmental Impact Assessment for the Klipspruit Colliery Water Treatment Plant and associated pipeline, Mpumalanga	South32 SA Coal Holdings (Pty) Ltd	Ogies, Mpumalanga Province	March 2018	Ongoing	Notification of Intent to Develop; Social baseline
Proposed construction of a Water Treatment Plant and associated infrastructure for the Treatment of Mine-Affected Water at the Kilbarchan Colliery	Eskom Holdings SOC Limited	Newcastle, KwaZulu-Natal Province	February 2018	Ongoing	Heritage Impact Assessment
Belfast Implementation Project	Exxaro Coal Mpumalanga (Pty) Ltd	Belfast, Mpumalanga Province	February 2018	Ongoing	Section 34 Permit Application
Newcastle Landfill Project	GCS Water and Environmental Consultants	Newcastle, KwaZulu-Natal	January 2018	March 2019	Heritage Impact Assessment

Project Title	Name of Client	Project Location	Date:		Project / Experience Description
NHRA Section 34 Permit Application process for the Davin and Queens Court Buildings on Erf 173 and 174, West Germiston, Gauteng Province	IDC Architects	Johannesburg, Gauteng Province	January 2018	May 2018	Section 34 Permit Application Process
Basic Assessment and Environmental Management Plan for the Proposed pipeline from the Mbali Colliery to the Tweefontein Water Reclamation Plant, Mpumalanga Province	HCI Coal (Pty) Ltd Mbali Colliery	Ogies, Mpumalanga Province	November 2017	February 2018	Heritage Basic Assessment Report
The South African Radio Astronomy Observatory Square Kilometre Array Heritage Impact Assessment and Conservation Management Plan Project	The South African Radio Astronomy Observatory (SARAO)	Carnarvon, Northern Cape Province	November 2017	July 2018	Heritage Impact Assessment; Conservation Management Plan
Environmental Impact Assessment for the proposed Future Developments within the Sun City Resort Complex	Sun International (Pty) Ltd	Rustenburg, North West Province	November 2017	Ongoing	Heritage Impact Assessment Conservation Management Plan Social Baseline
Environmental Fatal Flaw Analysis for the Mabula Filling Station	Mr van den Bergh	Waterberg, Limpopo Province	November 2017	November 2017	Fatal Flaw Analysis

Project Title	Name of Client	Project Location	Date:		Project / Experience Description
Environmental Impact Assessment for the Blyvoor Gold Mining Project near Carletonville, Gauteng Province	Blyvoor Gold Capital (Pty) Ltd	Carletonville, Gauteng	October 2017	Ongoing	Notification of Intent to Develop; Social Baseline
Heritage Resources Management Process for the Exxaro Matla Mine	Exxaro Coal Mpumalanga (Pty) Ltd	Kriel, Mpumalanga Province	August 2017	October 2018	Heritage Impact Assessment
Liwonde Additional Studies	Mota-Engil Africa	Liwonde, Malawi	June 2017	June 2018	Community Health, Safety and Security Management Plan
Environmental Impact Assessment for the Millsite TSF Complex	Sibanye-Stillwater	Randfontein, Gauteng	June 2017	December 2017	Heritage Impact Assessment
Heritage Resources Management Process for the Portion 296 of the farm Zuurfontein 33 IR Proposed Residential Establishment Project	Shuma Africa Projects (Pty) Ltd	Ekurhuleni (Johannesburg), Gauteng	May 2017	June 2017	Notification of Intent to Develop
NHRA Section 35 Archaeological Investigations, Lanxess Chrome Mine, North-West Province	Lanxess Chrome Mine (Pty) Ltd	Rustenburg, North West Province	March 2017	August 2017	Archaeological Phase 2 Mitigation
Environmental and Social Input for the Pre-Feasibility Study	Birimium Gold	Bougouni, Mali	January 2017	October 2018	Pre-Feasibility Study; Heritage Impact Assessment

6 Professional Registration

Position	Professional Body	Registration Number
Member	Association of Southern African Professional Archaeologists (ASAPA)	451

7 Publications

Esterhuysen, A.B. & Hardwick, S.K. 2017. Plant remains recovered from the 1854 siege of the Kekana Ndebele, Historic Cave, Makapan Valley, South Africa. *Journal of Ethnobiology* 37(1): 97-119.

DIGBY WELLS
ENVIRONMENTAL

Mr. Justin du Piesanie

Manager: Heritage Resources Management

Social and Heritage Services Department

Digby Wells Environmental

1 Education

Date	Degree(s) or Diploma(s) obtained	Institution
2015	Continued Professional Development, Intermediate Project Management Course	PM.Ideas: A division of the Mindset Group
2013	Continued Professional Development Programme, Architectural and Urban Conservation: Researching and Assessing Local Environments	University of Cape Town
2008	MSc	University of the Witwatersrand
2005	BA (Honours) (Archaeology)	University of the Witwatersrand
2004	BA	University of the Witwatersrand
2001	Matric	Norkem Park High School

2 Language Skills

Language	Written	Spoken
English	Excellent	Excellent
Afrikaans	Proficient	Good

3 Employment

Period	Company	Title/position
2016 to present	Digby Wells Environmental	Unit Manager: Heritage Resources Management
2011-2016	Digby Wells Environmental	Heritage Management Consultant: Archaeologist
2009-2011	University of the Witwatersrand	Archaeology Collections Manager
2009-2011	Independent	Archaeologist
2006-2007	Maropeng & Sterkfontein Caves UNESCO World Heritage Site	Tour guide

4 Experience

I joined the company in August 2011 as an archaeologist and was subsequently made unit manager in the Social and Heritage Services Department in 2016. I obtained my Master of Science (MSc) degree in Archaeology from the University of the Witwatersrand in 2008, specialising in the Southern African Iron Age. I further attended courses in architectural and urban conservation through the University of Cape Town's Faculty of Engineering and the Built Environment Continuing Professional Development Programme in 2013. I am a professional member of the Association of Southern African Professional Archaeologists (ASAPA), and accredited by the association's Cultural Resources Management (CRM) section. I am also a member of the International Council on Monuments and Sites (ICOMOS), an advisory body to the UNESCO World Heritage Convention. I have over 10 years combined experience in HRM in South Africa, including heritage assessments, archaeological mitigation, grave relocation, and NHRA Section 34 application processes. I gained further generalist experience since my appointment at Digby Wells in Botswana, Burkina Faso, the Democratic Republic of Congo, Liberia and Mali on projects that have required compliance with IFC requirements such as Performance Standard 8: Cultural Heritage. Furthermore, I have acted as a technical expert reviewer of HRM projects undertaken in Cameroon and Senegal. My current focus at Digby Wells is to develop the HRM process as an integrated discipline following international HRM principles and standards. This approach aims to provide clients with comprehensive, project-specific solutions that promote ethical heritage management and assist in achieving strategic objectives.

5 Project Experience

Please see the following table for relevant project experience:

Project Title	Project Location	Date:		Description of the Project	Name of Client
Klipriviersberg Archaeological Survey	Meyersdal, Gauteng, South Africa	2005	2006	Archaeological surveys	ARM
Sun City Archaeological Site Mapping	Sun City, Pilanesberg, North West Province, South Africa	2006	2006	Phase 2 Mapping	Sun International
Witbank Dam Archaeological Impact Assessment	Witbank, Mpumalanga, South Africa	2007	2007	Archaeological survey	ARM
Archaeological Assessment of Modderfontein AH Holdings	Johannesburg, Gauteng, South Africa	2008	2008	Heritage Basic Assessment	ARM
Heritage Assessment of Rhino Mines	Thabazimbi, Limpopo Province, South Africa	2008	2008	Heritage Impact Assessment	Rhino Mines
Cronimet Project	Thabazimbi, Limpopo Province, South Africa	2008	2008	Archaeological surveys	Cronimet
Eskom Thohoyandou SEA Project	Limpopo Province, South Africa	2008	2008	Heritage Statement	Eskom
Wenzelrust Excavations	Shoshanguve, Gauteng, South Africa	2009	2009	Phase 2 Excavations	Heritage Contracts Unit
University of the Witwatersrand Parys LIA Shelter Project	Parys, Free State, South Africa	2009	2009	Phase 2 Mapping	University of the Witwatersrand
Transnet NMPP Line	Kwa-Zulu Natal, South Africa	2010	2010	Heritage survey	Umlando Consultants
Archaeological Impact Assessment – Witpoortjie Project	Johannesburg, Gauteng, South Africa	2010	2010	Archaeological Impact Assessment	ARM
Der Brochen Archaeological Excavations	Steelpoort, Mpumalanga, South Africa	2010	2010	Phase 2 Excavations	Heritage Contracts Unit
De Brochen and Booysendal Archaeology Project	Steelpoort, Mpumalanga, South Africa	2010	2010	Phase 2 Mapping	Heritage Contracts Unit
Eskom Thohoyandou Electricity Master Network	Limpopo Province, South Africa	2010	2010	Heritage Statement	Strategic Environmental Focus
Batlhako Mine Expansion	North-West Province, South Africa	2010	2010	Phase 2 Mapping	Heritage Contracts Unit
Kibali Gold Project Grave Relocation Plan	Orientale Province, Democratic Republic of Congo	2011	2013	Grave Relocation	Randgold Resources Limited

Project Title	Project Location	Date:		Description of the Project	Name of Client
Kibali Gold Hydro-Power Project	Orientale Province, Democratic Republic of Congo	2012	2014	Heritage Impact Assessment	Randgold Resources Limited
Everest North Mining Project	Steelpoort, Mpumalanga, South Africa	2012	2012	Heritage Impact Assessment	Aquarius Resources
Environmental Authorisation for the Gold One Geluksdal TSF and Pipeline	Gauteng, South Africa	2012	2012	Heritage Impact Assessment	Gold One International
Platreef Burial Grounds and Graves Survey	Mokopane, Limpopo Province, South Africa	2012	2012	Burial Grounds and Graves Survey	Platreef Resources
Resgen Boikarabelo Coal Mine	Limpopo Province, South Africa	2012	2012	Phase 2 Excavations	Resources Generation
Bokoni Platinum Road Watching Brief	Burgersfort, Limpopo Province, South Africa	2012	2012	Watching Brief	Bokoni Platinum Mine
SEGA Gold Mining Project	Burkina Faso	2012	2013	Socio Economic and Asset Survey	Cluff Gold PLC
Everest North Mining Project	Steelpoort, Mpumalanga, South Africa	2012	2015	Heritage Impact Assessment	Aquarius Resources
SEGA Gold Mining Project	Burkina Faso	2013	2013	Technical Reviewer	Cluff Gold PLC
Consbrey and Harwar Collieries Project	Breyton, Mpumalanga, South Africa	2013	2013	Heritage Impact Assessment	Msobo
New Liberty Gold Project	Liberia	2013	2014	Grave Relocation	Aureus Mining
Falea Uranium Mine Environmental Assessment	Falea, Mali	2013	2013	Heritage Scoping	Rockgate Capital
Putu Iron Ore Mine Project	Petroken, Liberia	2013	2014	Heritage Impact Assessment	Atkins Limited
Sasol Twistdraai Project	Secunda, Mpumalanga, South Africa	2013	2014	Notification of Intent to Develop	ERM Southern Africa
Daleside Acetylene Gas Production Facility	Gauteng, South Africa	2013	2013	Heritage Impact Assessment	ERM Southern Africa
Exxaro Belfast GRP	Belfast, Mpumalanga, South Africa	2013	-	Grave Relocation	Exxaro Coal Mpumalanga (Pty) Ltd
Nzoro 2 Hydro Power Project	Orientale Province, Democratic Republic of Congo	2014	2014	Social consultation	Randgold Resources Limited
Eastern Basin AMD Project	Springs, Gauteng, South Africa	2014	2014	Heritage Impact Assessment	AECOM
Soweto Cluster Reclamation Project	Soweto, Gauteng, South Africa	2014	2014	Heritage Impact Assessment	Ergo (Pty) Ltd

Project Title	Project Location	Date:		Description of the Project	Name of Client
Klipspruit South Project	Ogies, Mpumalanga, South Africa	2014	2014	Heritage Impact Assessment	BHP Billiton
Klipspruit Extension: Weltevreden Project	Ogies, Mpumalanga, South Africa	2014	2014	Heritage Impact Assessment	BHP Billiton
Ergo Rondebult Pipeline Basic Assessment	Johannesburg, South Africa	2014	2014	Heritage Basic Assessment	Ergo (Pty) Ltd
Kibali ESIA Update Project	Orientale Province, Democratic Republic of Congo	2014	2014	Heritage Impact Assessment	Randgold Resources Limited
GoldOne EMP Consolidation	Westonaria, Gauteng, South Africa	2014	2014	Gap analysis	Gold One International
Yzermite PIA	Wakkerstroom, Mpumalanga, South Africa	2014	2014	Palaeontological Assessment	EcoPartners
Sasol Mooikraal Basic Assessment	Sasolburg, Free State, South Africa	2014	2014	Heritage Basic Assessment	Sasol Mining
Oakleaf ESIA Project	Bronkhorstspruit, Gauteng, South Africa	2014	2015	Heritage Impact Assessment	Oakleaf Investment Holdings
Rea Vaya Phase II C Project	Johannesburg, Gauteng, South Africa	2014	2014	Heritage Impact Assessment	ILISO Consulting
Imvula Project	Kriel, Mpumalanga, South Africa	2014	2015	Heritage Impact Assessment	Ixia Coal
Sibanye WRTRP	Gauteng, South Africa	2014	2016	Heritage Impact Assessment	Sibanye
VMIC Vanadium EIA Project	Mokopane, Limpopo, South Africa	2014	2015	Heritage Impact Assessment	VM Investment Company
NLGM Constructed Wetlands Project	Liberia	2015	2015	Heritage Impact Assessment	Aureus Mining
ERPM Section 34 Destruction Permits Applications	Johannesburg, Gauteng, South Africa	2015	2015	Section 34 Destruction Permit Applications	Ergo (Pty) Ltd
JMEP II EIA	Botswana	2015	2015	Heritage Impact Assessment	Jindal
Gino's Building Section 34 Destruction Permit Application	Johannesburg, Gauteng, South Africa	2015	2016	Heritage Impact Assessment and Section 34 Destruction Permit Application	Bigen Africa Services (Pty) Ltd
EDC Block Refurbishment Project	Johannesburg, Gauteng, South Africa	2015	2016	Heritage Impact Assessment and Section 34 Permit Application	Bigen Africa Services (Pty) Ltd
Namane IPP and Transmission Line EIA	Steenbokpan, Limpopo Province, South Africa	2015	2016	Heritage Impact Assessment	Namane Resources (Pty) Ltd
Temo Coal Road Diversion and Rail Loop EIA	Steenbokpan, Limpopo Province, South Africa	2015	2016	Heritage Impact Assessment	Namane Resources (Pty) Ltd
Groningen and Inhambane PRA	Limpopo Province, South Africa	2016	2016	Heritage Basic Assessment	Rustenburg Platinum Mines Limited

Project Title	Project Location	Date:		Description of the Project	Name of Client
NTEM Iron Ore Mine and Pipeline Project	Cameroon	2014	2016	Technical Review	IMIC plc
Palmietkuilen MRA	Springs, Gauteng, South Africa	2016	2016	Heritage Impact Assessment	Canyon Resources (Pty) Ltd
Copper Sunset Sand Mining S.102	Free State, South Africa	2016	2016	Heritage Basic Assessment	Copper Sunset Sand (Pty) Ltd
Grootvlei MRA	Springs, Gauteng, South Africa	2016	2016	Notification of Intent to Develop	Ergo (Pty) Ltd
Lambda EMP	Mpumalanga, South Africa	2016	2016	Palaeontological Impact Assessment	Eskom Holdings SOC Limited
Kilbarchan Basic Assessment and EMP	Newcastle, KwaZulu-Natal, South Africa	2016	2016	Heritage Basic Assessment	Eskom Holdings SOC Limited
Grootegeluk Amendment	Lephalale, Limpopo Province, South Africa	2016	2016	Notification of Intent to Develop	Exxaro
Garsfontein Township Development	Pretoria, Gauteng, South Africa	2016	2016	Notification of Intent to Develop	Leungo Construction Enterprises
Massawa EIA	Senegal	2016	2017	Technical Reviewer Heritage Impact Assessment	Randgold Resources Limited
Louis Botha Phase 2	Johannesburg, Gauteng, South Africa	2016	2016	Phase 2 Excavations	Royal Haskoning DHV
Beatrix EIA and EMP	Welkom, Free State, South Africa	2016	2017	Heritage Impact Assessment	Sibanye Gold Ltd
Sun City Heritage Mapping	Pilanesberg, North-West Province, South Africa	2016	2016	Phase 2 Mapping	Sun International
Sun City Chair Lift	Pilanesberg, North-West Province, South Africa	2016	2017	Notification of Intent to Develop and Heritage Basic Assessment	Sun International
Hendrina Underground Coal Mine EIA	Hendrina, Mpumalanga, South Africa	2016	2017	Heritage Impact Assessment	Umcebo Mining (Pty) Ltd
Elandsfontein EMP Update	Clewer, Mpumalanga, South Africa	2016	2017	Heritage Impact Assessment	Anker Coal
Eskom Northern KZN Strengthening	KwaZulu-Natal, South Africa	2016	-	Heritage Impact Assessment	ILISO Consulting
Thabametsi GRP	Lephalale, Limpopo Province, South Africa	2017	-	Grave Relocation	Exxaro Resources Ltd
Grootegeluk Watching Brief	Lephalale, Limpopo Province, South Africa	2017	2017	Watching Brief	Exxaro Resources Ltd
Matla HSMP	Kriel, Mpumalanga Province, South Africa	2017	2017	Heritage Site Management Plan	Exxaro Coal Mpumalanga (Pty) Ltd
Ledjadja Coal Borrow Pits	Lephalale, Limpopo Province, South Africa	2017	2017	Heritage Basic Assessment	Ledjadja Coal (Pty) Ltd
Exxaro Belfast Implementation Project PIA	Belfast, Mpumalanga, South Africa	2017	2017	Palaeontological Impact Assessment	Exxaro Coal Mpumalanga (Pty) Ltd

Project Title	Project Location	Date:		Description of the Project	Name of Client
Lanxess Chrome Mine Archaeological Mitigation	Rustenburg, North West Province, South Africa	2017	2017	Phase 2 Excavations	Lanxess Chrome Mine (Pty) Ltd
Goulamina EIA Project	Goulamina, Sikasso Region, Mali	2017	2017	Heritage Impact Assessment	Birimian Limited
Zuurfontein Residential Establishment Project	Ekurhuleni, Gauteng, South Africa	2017	2017	Notification of Intent to Develop	Shuma Africa Projects
Kibali Grave Relocation Training and Implementation	Orientale Province, Democratic Republic of Congo	2017	-	Grave Relocation	Randgold Resources Limited
Exxaro Matla HRM	Kriel, Mpumalanga	2017	-	Heritage Impact Assessment	Exxaro Coal Mpumalanga (Pty) Ltd

6 Professional Registrations

Position	Professional Body	Registration Number
Member	Association for Southern African Professional Archaeologists (ASAPA); ASAPA Cultural Resources Management (CRM) section	270
Member	International Council on Monuments and Sites (ICOMOS)	14274
Member	Society for Africanist Archaeologists (SAfA)	N/A
Member	International Association of Impact Assessors (IAIA) South Africa	5494

7 Publications

Huffman, T.N. & du Piesanie, J.J. 2011. Khami and the Venda in the Mapungubwe Landscape. Journal of African Archaeology 9(2): 189-206

du Piesanie, J.J., 2017. Book Review: African Cultural Heritage Conservation and Management. South African Archaeological Bulletin 72(205)

Appendix B: HRM Methodology

DIGBY WELLS
ENVIRONMENTAL

Heritage Cultural Significance, Field Rating and Impact Assessment Methodology

Assessment Methodology Statement

Project Number:

ZZZ9999

Prepared for:

Internal Document

June 2016

Digby Wells and Associates (South Africa) (Pty) Ltd
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This document has been prepared by Digby Wells Environmental.

Document:	**Assessment Methodology Statement**
Description:	**Heritage Cultural Significance, Field Rating and Impact Assessment Methodology**
Project Code:	**ZZZ9999**

Revision History

Name	Responsibility	Version	Date
Johan Nel ASAPA Member 095	HRM Unit Manager	Ver 1	May 2014
		Ver 2	October 2014
		Ver 3	May 2015
Justin du Piesanie ASAPA Member 270	HRM Manager	Ver 4	January 2016
		Ver 5	June 2016

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1 Introduction

Assessment of impacts include several steps aimed to evaluate the way in which environmental aspects will / may interact with the cultural landscape (*the environment*) resulting in environmental impacts to heritage resources. Environmental aspects and impacts are defined as:

- Environmental aspects: an element of an organisation's activities or products or services that can interact with the environment' (ISO 14001: 2004 - 3.6); and
- Environmental impacts: any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects (ISO 14001: 2004 - 3.7).

However, in terms of cultural heritage resources, environmental impacts should be assessed relative to the heritage value or cultural significance of a resource. The methodology employed in the various stages of the impact assessment process is described in more detail below.

2 Evaluation of Cultural Significance

The significance rating process is designed to provide a numerical rating of the cultural significance[1] of identified heritage resources. The evaluation was done as objectively as possible through a matrix developed by Digby Wells for this purpose. In addition, the methodology aims to allow ratings to be reproduced independently should it be required, provided that the same information sources are used.

Dimension		Attributes considered	NHRA Ref.
Aesthetic & technical	1	Importance in aesthetic characteristics	S.3(3)(e)
	2	Degree of technical / creative skill at a particular period	S.3(3)(f)
Historical importance & associations	3	Importance to community or pattern in country's history	S.3(3)(a)
	4	Site of significance relating to history of slavery	S.3(3)(i)
	5	Association with life or work of a person, group or organisation of importance in the history of the country	S.3(3)(h)
Information potential	6	Possession of uncommon, rare or endangered natural or cultural heritage aspects	S.3(3)(b)
	7	Information potential	S.3(3)(c)
	8	Importance in demonstrating principle characteristics	S.3(3)(d)
Social	9	Association to community or cultural group for social, cultural or spiritual reasons	S.3(3)(g)

Box 1: NHRA section 3 criteria

This matrix takes into account heritage resources assessment criteria set out in subsection 3(3) of the NHRA (see Box 1), which determines the intrinsic, comparative and contextual significance of identified heritage resources. A resource's importance rating is based on information obtained through review

[1] Cultural significance is defined in the NHRA as the intrinsic "aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance" of a heritage resource. These attributes are combined and reduced to four themes used in the Digby Wells significance matrix: aesthetic, historical, scientific and social.

of available credible sources and representivity or uniqueness (i.e. known examples of similar resources to exist). The final significance attributed to a resource furthermore takes into account the physical integrity of the fabric of the resource. The formula used to determine significance can is summarised in Box 2.

Value = Importance x Integrity

where

Importance = average sum

of

Aesthetic + Historic + Scientific + Social

Box 2: CS formula

The rationale behind the heritage value matrix takes into account the fact that a heritage resource's value is a direct indication of its sensitivity to change (impacts). Value therefore needs to be determined prior to the completion of any assessment of impacts.

This matrix rates the potential, or importance, of an identified resource relative to its contribution to certain values – aesthetic, historical, scientific and social.

The significance of a resource is directly related to the impact on it that could result from project-related activities, as it provides minimum accepted levels of change to the resource. SAHRA has published minimum standards that include minimum required mitigation of heritage resources. These minimum requirements are integrated into the matrix to guide both assessments of impacts and recommendations for mitigation and management of resources.

The weight assigned to the various parameters for significance in the formula, significance ratings and recommended mitigation are presented in Table 3-1.

3 Field Rating

Although grading of heritage resources remains the responsibility of heritage resources authorities, SAHRA requires in terms of its Minimum Standards that heritage reports include Field Ratings for identified resources to comply with section 38 of the NHRA. The NHRA in terms of section 7 provides for a system of grading of heritage resources that form part of the national estate, distinguishing between three categories.

The field rating process is designed to provide a numerical rating of the recommended grading of identified heritage resources. The evaluation was done as objectively as possible by integrating the field rating into the significance matrix. Field ratings guide decision-making in terms of appropriate minimum required mitigation measures and consequent management responsibilities in accordance with section 8 of the NHRA. The formula used to determine field ratings is summarised in Box 3. The weight assigned to the various field rating parameters in the formula and the sum of the average ratings are is presented in Table 3-1.

Field Rating = average sum

of

Aesthetic + Historic + Scientific + Social

Box 3: Field rating formula

Table 3-1: Ratings and descriptions used in determining CS and field ratings

Rating	IMPORTANCE *A heritage resource's contribution to aesthetic, historic, scientific and social value.*	INTEGRITY *The undivided or unbroken state, material wholeness, completeness or entirety of a resource or site*	FIELD RATING *Recommended grading of identified heritage resources in terms of NHRA Section 7*
-	Not assessed - dimension and/or attribute not considered in determining value.		Not assessed - dimension and/or attribute not considered in field rating.
0	The resource exhibits attributes that may be considered in a particular dimension, but it is so poorly represented that it cannot or does not contribute to the resource's overall value.	No information potential, complete loss of meaning, Fabric completely degraded, original setting lost	
1	Common, well represented throughout diverse cultural landscapes	Fabric poorly preserved, limited information, little meaning ascribed, extensive encroachment on setting	Resources under general protection in terms of NHRA sections 34 to 37 with Negligible significance Grade IV C
2	Generally well represented but exhibits superior qualities in comparison to other similar examples	Fabric is preserved, some information potential (quality questionable) and meaning evident, some encroachment on setting	Resources under general protection in terms of NHRA sections 34 to 37 with Low significance Grade IV B
3	The resource exhibits attributes that are rare and uncommon within a region. It is important to specific communities.	Fabric well preserved, good quality information and meaning evident, limited encroachment	Resources under general protection in terms of NHRA sections 34 to 37 with Medium to Medium-High significance Grade IV A
4	Rare and uncommon, value of national importance	Excellent preservation of fabric, high information potential of high quality, meaning is well established, no encroachment on setting	Resources under general protection in terms of NHRA sections 34 to 37 with High significance Grade III B
5	The resource exhibits attributes that are considered singular, unique and/or irreplaceable to the degree that its significance can be universally accepted.		Resources under general protection in terms of NHRA sections 34 to 37 with Very High significance Grade III A
6			Heritage resources under formal protection that can be considered to have special qualities which make them significant within the context of a province or a region Grade II
7			Heritage resources under formal protection that can be considered to have special qualities which make them significant within a national and / or international context. Grade I

4 Impact Assessment

The following are terms and definitions applicable to the EIA concept (ISO 14001):

- **Project Activity:** Activities associated with the project that result in an environmental interaction during the different phases (construction, operation and decommissioning), e.g., new processing plant, new stockpiles, development of open pit, dewatering, water treatment plant;
- **Interaction:** An "environmental interaction" is an element or characteristic of an activity, product, or service that interacts or can interact with the environment. Environmental interactions can cause environmental impacts (but may not necessarily do so). They can have either beneficial impacts or adverse impacts and can have a direct and decisive impact on the environment or contribute only partially or indirectly to a larger environmental change.
- **Environmental Aspect:** The term "environmental aspect" refers to the various natural and human environments that an activity may interact with. These environments extend from within the activity itself to the global system, and include air, water, land, flora, fauna (including people) and natural resources of all kinds.
- **Environmental Impact:** An "environmental impact" is a change to the environment that is caused either partly or entirely by one or more environmental interactions. An environmental interaction can have either a direct and decisive impact on the environment or contribute only partially or indirectly to a larger environmental change. In addition, it can have either a beneficial environmental impact or an adverse environmental impact.

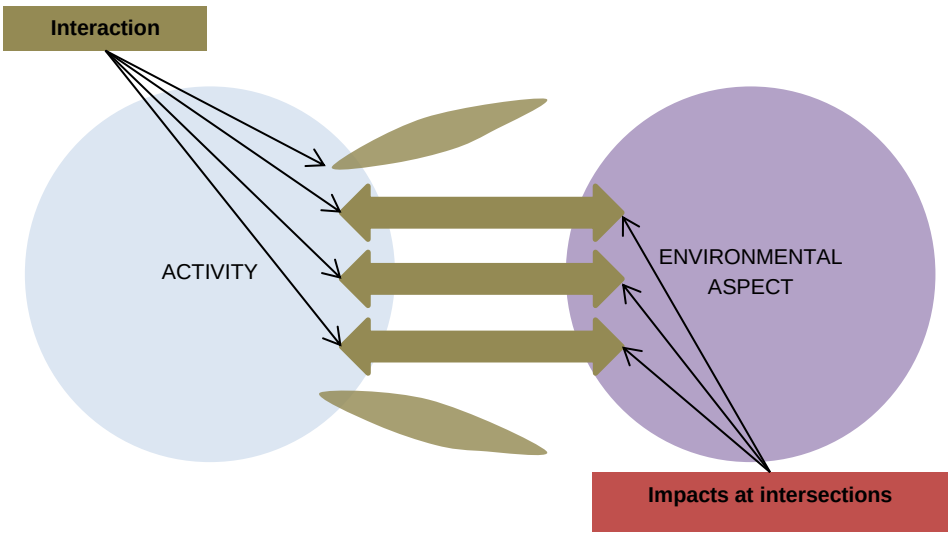

Figure 4-1: Graphical representation of impact assessment concept

The potential impacts were considered through an examination of the project phase and activity, the environmental aspect, the interdependencies between aspects, an assessment and classification of categories, and consideration of the potential impact on heritage resources. An example of this process is presented in Figure 4-2.

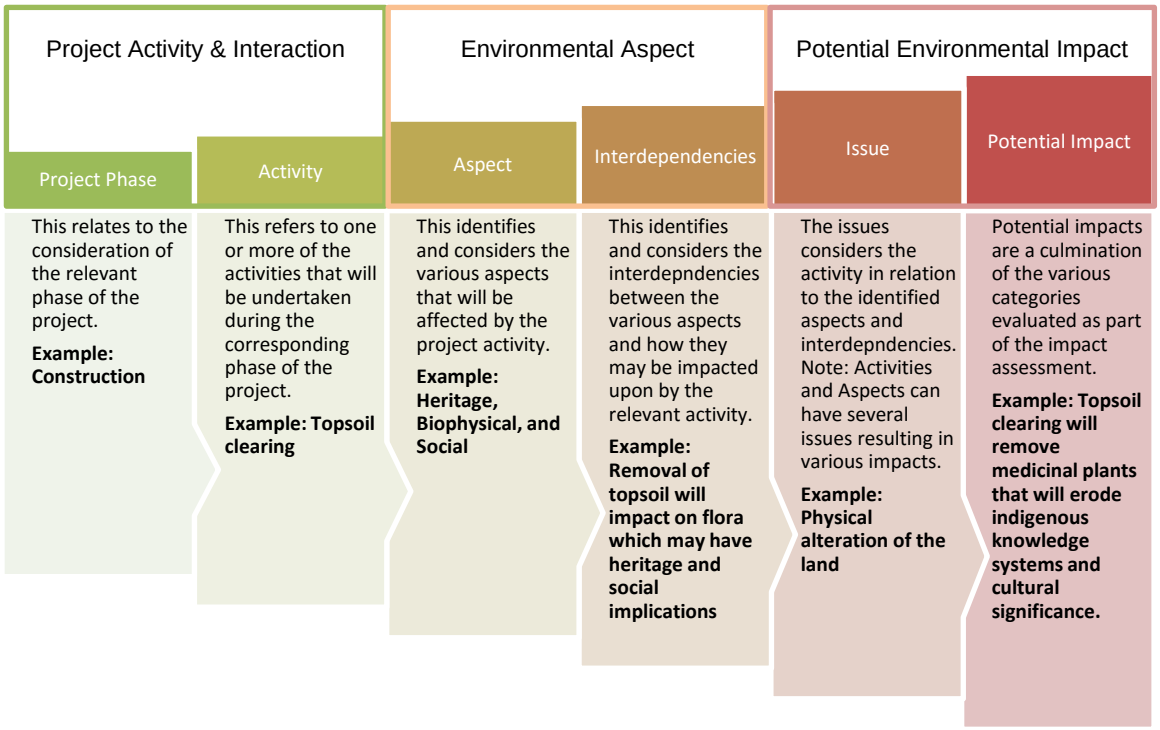

Figure 4-2: Example of how potential impacts were considered.

4.1 Defining Heritage Impacts

Different heritage impacts may manifest in different geographical areas and diverse communities. For instance, heritage impacts can simultaneously affect the physical resource and have social repercussions: this is compounded when the intensity of physical impacts and social repercussions differ significantly. In addition, heritage impacts can influence the cultural significance of heritage resources without any actual physical impact on the resources taking place. Heritage impacts can therefore generally be placed into three broad categories (adapted from Winter & Bauman 2005: 36):

- **Direct or primary heritage impacts** affect the fabric or physical integrity of the heritage resource, for example destruction of an archaeological site or historical building. Direct or primary impacts may be the most immediate and noticeable. Such impacts are usually ranked as the most intense, but can often be erroneously assessed as high-ranking.

- **Indirect, induced or secondary heritage impacts** can occur later in time or at a different place from the causal activity, or as a result of a complex pathway. For example, restricted access to a heritage resource resulting in the gradual erosion of its cultural significance that may be dependent on ritual patterns of access. Although the physical fabric of the resource is not affected through any primary impact, its significance is affected that can ultimately result in the loss of the resource itself.
- **Cumulative heritage impacts** result from in-combination effects on heritage resources acting within a host of processes that are insignificant when seen in isolation, but which collectively have a significant effect. Cumulative effects can be:
  - **Additive**: the simple sum of all the effects, e.g. the total number of development activities that will occur within the study area.
  - **Synergistic**: effects interact to produce a total effect greater than the sum of the individual effects, e.g. the effect of each different activity on the archaeological landscape in the study area.
  - **Time crowding**: frequent, repetitive impacts on a particular resource at the same time, e.g. the effect of regular blasting activities on a nearby rock art site or protected historical building high.
  - **Neutralizing**: where the effects may counteract each other to reduce the overall effect, e.g. the effect of changes in land use could reduce the overall impact on sites within the archaeological landscape of the study area.
  - **Space crowding**: high spatial density of impacts on a heritage resource, e.g. density of new buildings resulting in suburbanisation of a historical rural landscape.

The relevance of the above distinction to defining the study areas in the HSR arises from the fact that heritage resources do not exist in isolation to the wider natural, social, cultural and heritage landscape: cultural significance is therefore also linked to rarity / uniqueness, physical integrity and importance to diverse communities.

In addition, the NHRA requires that heritage resources are graded in terms of national, provincial and local concern based on their importance and consequent official (i.e. State) management effort required. The type and level of baseline information required to adequately predict heritage impacts varies between these categories. Three ‘concentric’ study areas were defined for the purposes of this study and are discussed in detail in the HSR.

4.2 Impact Assessment

The impact rating process is designed to provide a numerical rating of the identified heritage impacts. The significance rating follows an established impact/risk assessment formula is shown in Box 4.

The weight assigned to the various parameters for positive and negative impacts in the formula is presented in Table 4-2 below.

Project-related impacts on heritage resources have taken into account the inherent value of heritage resources, described above, and only applied to resources with values above negligible. As a result, the impact assessment did not consider individual resources, but was applied to diverse resources grouped in terms of similar values.

The magnitude will then be applied to pre- and post-mitigation scenarios with the intention of removing all impacts on heritage resources. Where project related mitigation does not avoid or sufficiently reduce negative changes/impacts on heritage resources with high values, mitigation of these resources may be required. This may include alteration, restoration or demolition of structures under a permit issued by the HRAs.

Significance = consequence of an event x probability of the event occurring

where:

Consequence = type of impact x (Intensity + Spatial Scale + Duration)

and

Probability = Likelihood of an impact occurring

In the formula for calculating consequence:

Type of impact = +1 (positive) or -1 (negative)

Box 4: Impact assessment formula

Impacts were rated prior to mitigation and again after consideration of the proposed mitigation measures. Impacts were then categories into one of eight categories listed in Table 4-2. The relationship between the consequence, probability and significance ratings is also graphically depicted in Table 4-2.

Table 4-1: Description of duration, extent, intensity and probability ratings used in impact assessment

Value	DURATION RATING - A measure of the lifespan of the impact		EXTENT RATING A measure of how wide the impact would occur		INTENSITY RATING- A measure of the degree of harm, injury or loss.		PROBABILITY RATING - A measure of the chance that consequences of that selected level of severity could occur during the exposure window.	
	Probability	**Description**	**Exposure**	**Description**	**Intensity**	**Description**	**Probability**	**Description**
7	**Permanent**	Impact will permanently alter or change the heritage resource and/or value (Complete loss of information)	**International**	Impacts on heritage resources will have international repercussions, issues or effects, i.e. in context of international cultural significance, legislation, associations, etc.	**Extremely high**	Major change to Heritage Resource with High-Very High Value	**Certain/Definite**	Happens frequently. The impact will occur regardless of the implementation of any preventative or corrective actions.
6	**Beyond Project Life**	Impact will reduce over time after project life (Mainly renewable resources and indirect impacts)	**National**	Impacts on heritage resources will have national repercussions, issues or effects, i.e. in context of national cultural significance, legislation, associations, etc.	**Very high**	Moderate change to Heritage Resource with High-Very High Value	**High probability**	Happens often. It is most likely that the impact will occur.
5	**Project Life**	The impact will cease after project life.	**Region**	Impacts on heritage resources will have provincial repercussions, issues or effects, i.e. in context of provincial cultural significance, legislation, associations, etc.	**High**	Minor change to Heritage Resource with High-Very High Value	**Likely**	Could easily happen. The impact may occur.
4	**Long Term**	Impact will remain for >50% - Project Life	**Municipal area**	Impacts on heritage resources will have regional repercussions, issues or effects, i.e. in context of the regional study area.	**Moderately high**	Major change to Heritage Resource with Medium-Medium High Value	**Probable**	Could happen. Has occurred here or elsewhere
3	**Medium Term**	Impact will remain for >10% - 50% of Project Life	**Local**	Impacts on heritage resources will have local repercussions, issues or effects, i.e. in context of the local study area.	**Moderate**	Moderate change to Heritage Resource with Medium - Medium High Value	**Unlikely / Low probability**	Has not happened yet, but could happen once in a lifetime of the project. There is a possibility that the impact will occur.

Value	DURATION RATING - A measure of the lifespan of the impact		EXTENT RATING A measure of how wide the impact would occur		INTENSITY RATING- A measure of the degree of harm, injury or loss.		PROBABILITY RATING - A measure of the chance that consequences of that selected level of severity could occur during the exposure window.	
	Probability	**Description**	**Exposure**	**Description**	**Intensity**	**Description**	**Probability**	**Description**
2	**Short Term**	Impact will remain for <10% of Project Life	**Limited**	Impacts on heritage resources will have site specific repercussions, issues or effects, i.e. in context of the site specific study area.	**Low**	Minor change to Heritage Resource with Medium - Medium High Value	**Rare / Improbable**	Conceivable, but only in extreme circumstances. Have not happened during the lifetime of the project, but has happened elsewhere. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures
1	**Transient**	Impact may be sporadic/limited duration and can occur at any time. E.g. Only during specific times of operation, and not affecting heritage value.	**Very Limited**	Impacts on heritage resources will be limited to the identified resource and its immediate surroundings, i.e. in context of the specific heritage site.	**Very low**	No change to Heritage Resource with values medium or higher, or Any change to Heritage Resource with Low Value	**Highly Unlikely /None**	Expected never to happen. Impact will not occur.

Table 4-2: Impact significance ratings, categories and relationship between consequence, probability and significance

Score	Description	Rating
109 to 147	A very beneficial impact which may be sufficient by itself to justify implementation of the project. The impact may result in permanent positive change.	Major (positive)
73 to 108	A beneficial impact which may help to justify the implementation of the project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the heritage resources.	Moderate (positive)
36 to 72	An important positive impact. The impact is insufficient by itself to justify the implementation of the project. These impacts will usually result in positive medium to long-term effect on the heritage resources.	Minor (positive)
3 to 35	A small positive impact. The impact will result in medium to short term effects on the heritage resources.	Negligible (positive)
-3 to -35	An acceptable negative impact for which mitigation is desirable but not essential. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative medium to short term effects on the heritage resources.	Negligible (negative)
-36 to -72	An important negative impact which requires mitigation. The impact is insufficient by itself to prevent the implementation of the project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the heritage resources.	Minor (negative)
-73 to -108	A serious negative impact which may prevent the implementation of the project. These impacts would be considered by society as constituting a major and usually a long-term change to the heritage resources and result in severe effects.	Moderate (negative)
-109 to -147	A very serious negative impact which may be sufficient by itself to prevent implementation of the project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects.	Major (negative)

Relationship between consequence, probability and significance ratings

Probability \ Significance	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
7	-147	-140	-133	-126	-119	-112	-105	-98	-91	-84	-77	-70	-63	-56	-49	-42	-35	-28	-21	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147
6	-126	-120	-114	-108	-102	-96	-90	-84	-78	-72	-66	-60	-54	-48	-42	-36	-30	-24	-18	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126
5	-105	-100	-95	-90	-85	-80	-75	-70	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
4	-84	-80	-76	-72	-68	-64	-60	-56	-52	-48	-44	-40	-36	-32	-28	-24	-20	-16	-12	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84
3	-63	-60	-57	-54	-51	-48	-45	-42	-39	-36	-33	-30	-27	-24	-21	-18	-15	-12	-9	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63
2	-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10	-8	-6	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
1	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21

Consequence

5 Mitigation Measures and Recommendations

The desired outcome of an impact assessment is the removal of negative impacts on heritage resources through the implementation of feasible mitigation measures. The mitigation and management measures recommended in this section comply with the General Principles set out under section 5 of the NHRA. The recommendations further considered the cultural significance of heritage resources and were guided by the minimum mitigation contained in the SAHRA Minimum Standards (See Box 5).

Designation	Recommended mitigation
Negligible	Sufficiently recorded, no mitigation required
Low	Resource must be recorded before destruction, including detailed site mapping, surface sampling may be required
Medium	Mitigation of resource to include detailed recording and mapping, and limited sampling, e.g. STPs.
Medium High	Project design should aim to reduce or remove changes; Mitigation of resource to include extensive sampling and recording, e.g. test excavation, analyses, etc.
High	Project design must aim to avoid change to resource; Partly conserved, Conservation Management Plan (CMP)
Very High	Project design must change to avoid all change to resource; Conserved in entirety, CMP

Box 5: Recommended minimum level of required mitigation

Recommended mitigation is therefore divided into two categories: *project-related* and *mitigation of heritage resources* defined below.

- Project-related mitigation requires changes or amendments to project design, planning and siting of infrastructure to avoid or reduce physical impacts on heritage resources. Project-related mitigation measures are always the preferred option, especially where heritage resources with higher cultural significance will be impacted on. Project-related mitigation may include:
  - *In situ* preservation (i.e. no-development) of heritage resources for which Conservation Management Plans (CMPs) are required; and
  - Conservation of heritage resources through, for example, incorporating the resources into project design and planning, for which CMPs are also required.
- Mitigation of heritage resources may be necessary where project-related mitigation will not sufficiently reduce or remove impacts, thus resulting in partial or complete changes (including destruction) to a resource. Such resources need to be mitigated to ensure that they are fully recorded, documented and researched before any negative change occurs. This may require actions such as:
  - Intensive detailed recording of sites through various non-intrusive techniques to create a documentary record of the site – “preservation by record”;
  - Intrusive recording and sampling such as shovel test pits (STPs) and excavations, relocation (usually burial grounds and graves, but certain types of sites may be relocated), restoration and alteration. Any form of intrusive mitigation is a regulated permitted activity for which permits need to be issued by

the relevant heritage authorities. Such mitigation may result in a reassessment of the value of a resource that could require conservation measures to be implemented. Alternatively, an application for a destruction permit may be made if the resource has been sufficiently sampled; and

- Where resources have negligible significance the specialist may recommend that no further mitigation is required and the site may be destroyed, for which a destruction permit must be applied for.

Appropriate mitigation measures were identified for each impact, and the procedure discussed above was to assess the possible consequence, probability and significance of each impact post-mitigation.

The post-mitigation rating provided an indication of the significance of residual impacts, while the difference between an impact's pre- and post-mitigation ratings represents the degree to which the recommended mitigation measures are expected to be effective in reducing or ameliorating that impact.

Appendix C: Palaeontological Impact Assessment

Palaeontological Impact Assessment for the proposed development of intensive agriculture on Nomalanga Estate, near Greytown KwaZulu-Natal Province

Desktop Study

For

Digby Wells

22 November 2018

Prof Marion Bamford
Palaeobotanist
P Bag 652, WITS 2050
Johannesburg, South Africa
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Expertise of Specialist

The Palaeontologist Consultant is: Prof Marion Bamford
Qualifications: PhD (Wits Univ, 1990); FRSSAf, ASSAf
Experience: 30 years research; 22 years PIA studies

Declaration of Independence

This report has been compiled by Professor Marion Bamford, of the University of the Witwatersrand, sub-contracted by Digby Wells, South Africa. The views expressed in this report are entirely those of the author and no other interest was displayed during the decision making process for the Project.

Specialist: Prof Marion Bamford

Signature:

Executive Summary

A Phase 2 or site visit palaeontological Impact Assessment was requested for the proposed development of intensive agriculture on Nomalanga Estate, near Greytown. The land involved comprises 5 farm portions that include Portion 2 of Farm Springfield No.1832, Portion 4 of Farm Vermaaks Kraal No.1061, Portion 1 of Farm Vermaaks Kraal No.1061, REM of Portion 3 of Farm Vermaaks Kraal No.1061 and REM extent of Farm Vermaaks Kraal No. 1061. They lie on sediments of the Vryheid Formation and Adelaide Subgroup and other non-fossiliferous sediments. To comply with the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a desktop Palaeontological Impact Assessment (PIA) was completed for the proposed development of a sand mining area.

The site visit was undertaken from 7-8 November and surveyed the central section where the main construction and development will take place. The survey yielded no fossils at all. The Vryheid Formation and Estcourt Formation could potentially contain plants of the Glossopteris flora while the Adelaide subgroup could contain vertebrate or fish fossils BUT no fossils were found on the ground surface or in river cuttings. Since there is a small chance that fossils could occur below the surface a Fossil Chance Find Protocol should be added to the EMPr for when excavations commence.

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1. Background

A palaeontological impact assessment (Phase 2/site visit) was requested by SAHRA for the proposed development of intensive agriculture on Nomalanga Estate, near Greytown. To comply with the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a site visit was carried out and is reported here.

Nomalanga Estate is made up of 5 farm portions that include Portion 2 of Farm Springfield No.1832, Portion 4 of Farm Vermaaks Kraal No.1061, Portion 1 of Farm Vermaaks Kraal No.1061, REM of Portion 3 of Farm Vermaaks Kraal No.1061 and REM extent of Farm Vermaaks Kraal No. 1061. The total extent of the estate is approximately 4300Ha and is located 15km east of Greytown. The area earmarked for intense agricultural production is 180 hectares. The current shade house covers 5 hectares under fertigation/drip irrigation. The afforested area of the estate is approximately 250 hectares. There is a pack house unit which is 200m^2 with cooling facilities. The current water source is a single borehole as the main dam is still recovering from the drought. The estate also includes a 2748 hectare nature reserve which was declared a Stewardship site by eZemvelo KZN Wildlife.

The overall project objective is:

- To process fruit and vegetables to a range of final product in a high care processing facility.
- To grow quality fruit and vegetables using a combination of production systems ranging from intense greenhouses through to open field orchards and annual cultivation.
- Currently, the area under shade netting, as well as open crop area, is to be expanded from 5 hectares to approximately 85 hectares.
- To upgrade the water infrastructure so that the estate is resilient to drought by developing dam infrastructure for storage of water, increasing the numbers of boreholes and linking to a pipeline.
- To conduct the agro processing and agricultural development and operations in a manner that is ecologically sensitive, minimises environmental impact and has a positive impact on the neighbouring communities.

The project is divided into two phases and the overall aim for each phase is listed below.
Phase 1 (Commence in January 2019):

- Expand the green house production to 25 hectares including a 2-hectare nursery which includes an irrigation and precision farming system.
- Construct the agro processing facility.
- Drill 3-4 bore holes and upgrade existing water infrastructure.
- Complete all statutory approvals required for implementation of phase 2.

Phase 2 (Commence in late September 2019):

- Expand the greenhouse to 45 hectares.
- Plant an Avocado orchard of 40 hectares, peacan orchard of 20 hectares, assorted fruit of 15 hectares and open fields of 10 hectares.

- Construct a new dam and link to a pipeline.
- Complete expanded irrigation

Table 1: Specialist report requirements in terms of Appendix 6 of the EIA Regulations (2014)

A specialist report prepared in terms of the Environmental Impact Regulations of 2014 must contain:	**Relevant section in report**
Details of the specialist who prepared the report	Appendix B
The expertise of that person to compile a specialist report including a curriculum vitae	Appendix B
A declaration that the person is independent in a form as may be specified by the competent authority	Page 1
An indication of the scope of, and the purpose for which, the report was prepared	Section 1
The date and season of the site investigation and the relevance of the season to the outcome of the assessment	N/A
A description of the methodology adopted in preparing the report or carrying out the specialised process	Section 2
The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	Sections 3 and 4
An identification of any areas to be avoided, including buffers	N/A
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;	N/A
A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 5
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 4
Any mitigation measures for inclusion in the EMPr	N/A
Any conditions for inclusion in the environmental authorisation	N/A
Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 8
A reasoned opinion as to whether the proposed activity or portions thereof should be authorised	N/A
If the opinion is that the proposed activity 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	N/A
A description of any consultation process that was undertaken during the course of carrying out the study	N/A

A summary and copies if any comments that were received during any consultation process	N/A
Any other information requested by the competent authority.	N/A

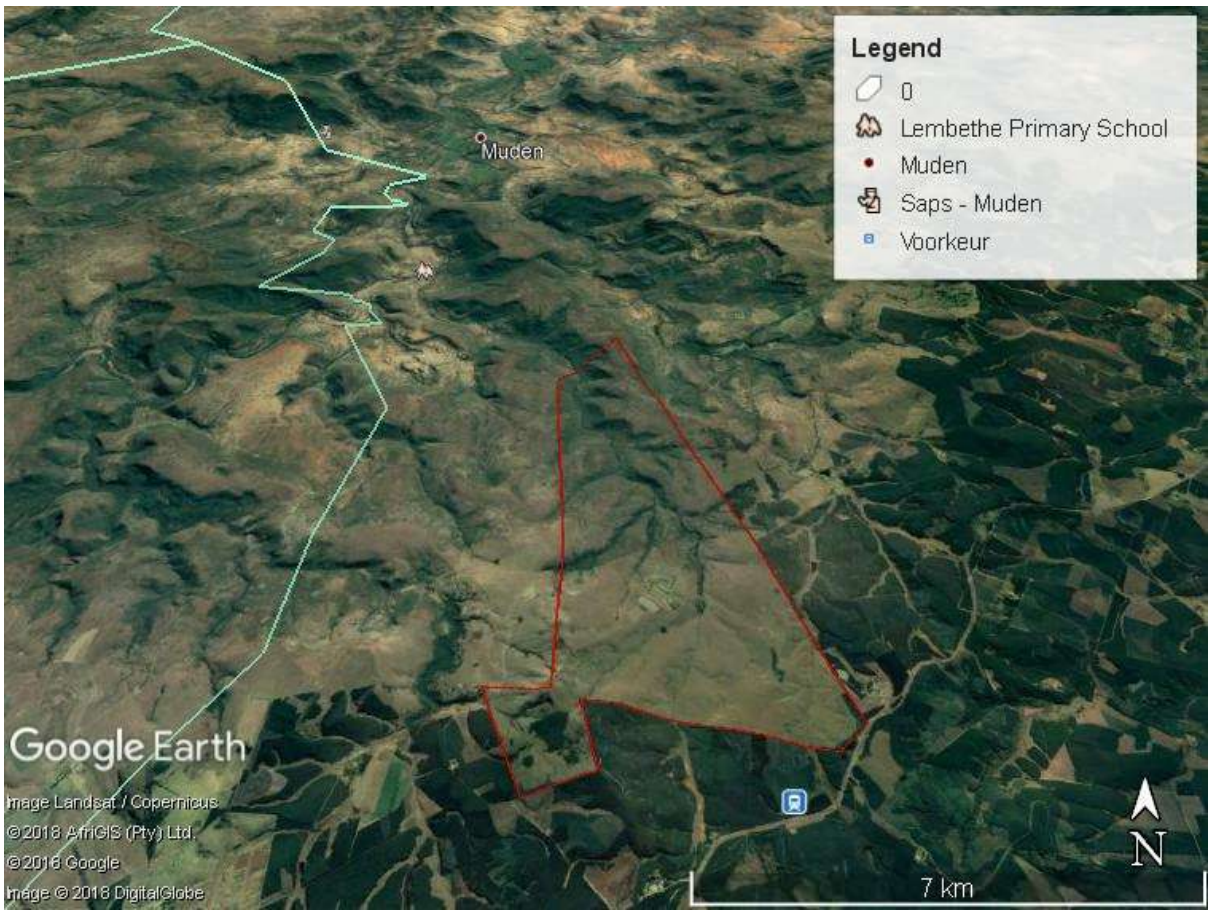

Figure 1: Google Earth map of the proposed development agricultural development on Nomalanga Estate, 15 km west of Greytown. The whole area is shown in the red outline. Map supplied by Digby Wells.

2. Methods and Terms of Reference

The Terms of Reference (ToR) for this study were to undertake a PIA and provide feasible management measures to comply with the requirements of SAHRA.
The methods employed to address the ToR included:

1. Consultation of geological maps, literature, palaeontological databases, published and unpublished records to determine the likelihood of fossils occurring in the affected areas. Sources included records housed at the Evolutionary Studies Institute at the University of the Witwatersrand and SAHRA databases;

2. Where necessary, site visits by a qualified palaeontologist to locate any fossils and assess their importance (*applicable to this assessment*);
3. Where appropriate, collection of unique or rare fossils with the necessary permits for storage and curation at an appropriate facility (*not applicable to this assessment*); and
4. Determination of fossils' representivity or scientific importance to decide if the fossils can be destroyed or a representative sample collected (*not applicable to this assessment*).

3. Geology and Palaeontology

i. Project location and geological context

The location of the project lies on the north eastern margin of the Main Karoo Basin and includes the Ecca Group (Pietermaritzburg, Vryheid, Volksrust Formations) and Beaufort Group (Adelaide Subgroup/Estcourt Formation) and the Tarkastad Subgroup. Ecca Group shales, sandstones, mudrock and coals were deposited around the large inland sea that receded over time and are overlain by the Beaufort deposits that were the result of a shrinking sea and shift from lacustrine to braided stream settings.

The other older rocks in the region, to the east would not be affected by this development and will not be discussed further.

ii. Palaeontological context

The Pietermaritzburg dark silty mudrock and shales are the result of a major post-glacial transgression from the melting of the Dwyka ice sheets. Invertebrate trace fossils are present in some areas and no fossils have been recorded (Johnson et al., 2006). Overlying the Pietermaritzburg Formation are the upward-coarsening cycles of the Vryheid Formation that are deltaic in origin. Fossil plants are fairly common and can be found in the shales and mudstone, usually associated with shale lenses and coal seams. Where plants are found, more often than not, no vertebrates are found. The overlying Volksrust Formation comprises grey to black silty shale with thin sandstone or siltstone lenses. It probably represents a transgressive open shelf sequence (Johnson et al., 2006) and fossils have not been recorded from this formation.

The Beaufort Group, represented here by the Adelaide Subgroup or Estcourt Formation in this part of the basin, with lower deltaic sediments. It does preserve fossil plants of the Glossopteris flora, namely *Glossopteris* leaves, rare fructifications, cordaitaleans, gymnosperms, lycopods, sphenophytes and ferns that in some outcrops can be abundant. Vertebrates and fish are fairly common in the Adelaide Subgroup but seldom occur in the same localities as the fossil plants. Both plants and vertebrates should be surveyed for in the site visit.

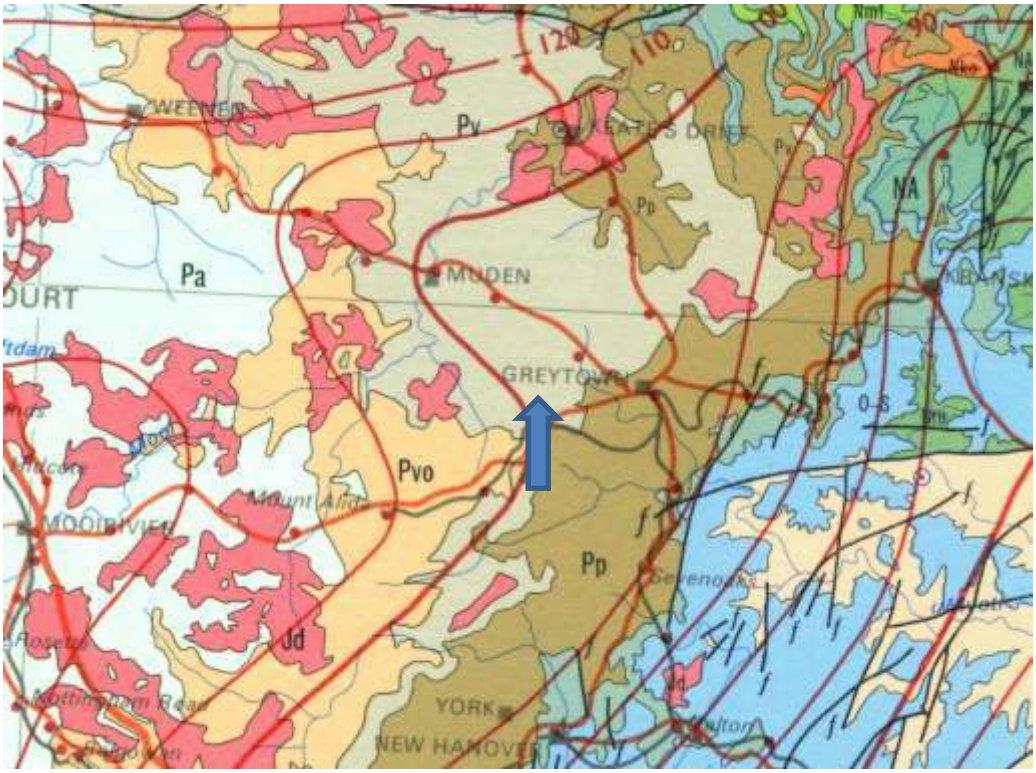

Figure 2: Geological map of the area around Greytown and the Nomalanga Estate. The location of the proposed project is indicated with the arrow. Abbreviations of the rock types are explained in Table 2. Map enlarged from the Geological Survey 1: 1 000 000 map 1984.

Table 2: Explanation of symbols for the geological map and approximate ages (Erikssen et al., 2006. Johnson et al., 2006; McCarthy et al., 2006; Robb et al., 2006; van der Westhuizen et al., 2006). SG = Supergroup; Fm = Formation.

Symbol	Group/Formation	Lithology	Approximate Age
Jd	Jurassic	Dolerite dykes, intrusive	Jurassic, approx. 180 Ma
Trt	Tarkastad Subgroup, Beaufort Group	Shale, sandstone, mudstone, coal	Early Triassic 252 – 230 Ma
Pa	Adelaide and Estcourt Subgroups	Mudstone, sandstone	Late Permian 270-252 Ma
Pvo	Volksrust Fm	shale	Middle Permian, Upper Ecca
Pv	Vryheid Fm	Shales, sandstone, coal	Early Permian, Middle Ecca
Pp	Pietermaritzburg Fm,	shale	Early Permian, Early Ecca
O-S	Natal Group	Quartzitic sandstone, arkose, shale	Ordovician-Silurian

The palaeontological sensitivity of the area under consideration is presented in Figure 3.

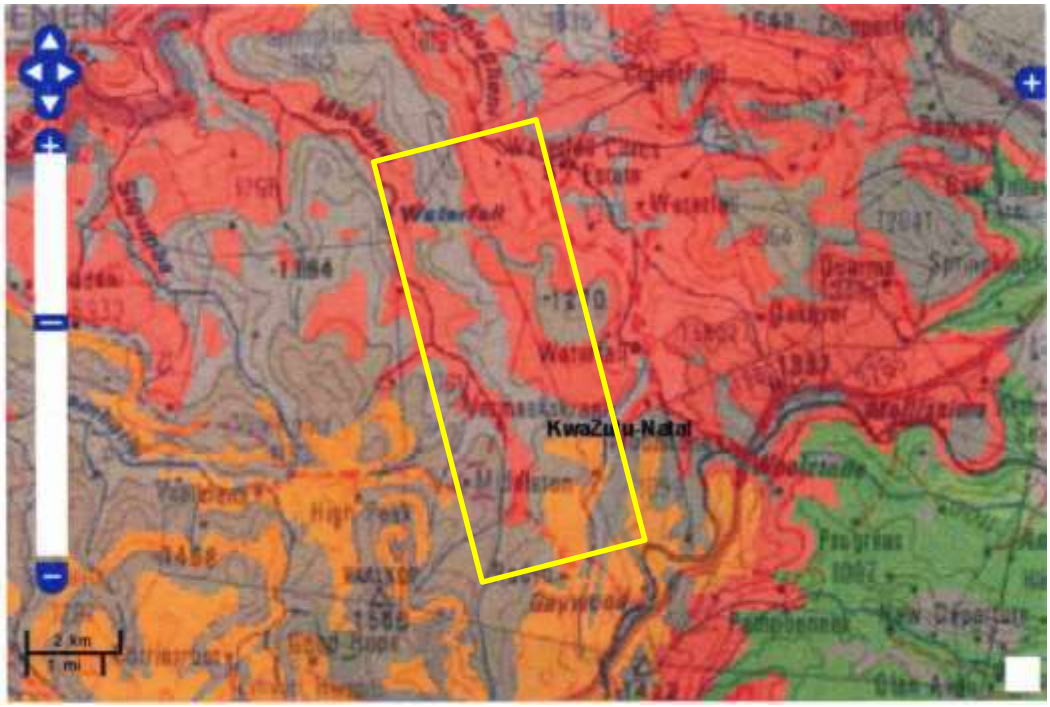

Figure 3: SAHRIS palaeosensitivity maps for the site for the proposed Nomalanga Estate expansion for agriculture is shown within the yellow rectangle. Colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.

iii. Site Visit

The site was visited on 7-8 November, focussing on the central part of the area where the development will be concentrated.

Site designation	GPS cords	Comment
Start:	S29°05.408' E30°25.722'	General view of the terrain and vegetation. Figure 4
Point one	S29°05.378' E30°25.699'	Shales, potentially fossiliferous but although some slabs were split open there were no fossil plants or vertebrates. Figure 5
Outcrop 1	S29°05.240' E30°25.522' 1082m	No fossils
Crevasse	S29°05.191' E30°25.544'	Sandstone outcrop Figure 6

	1069m	
Point 2	S29°05.187' E30°25.467' 1073m	No fossils
Entrance	S29°06.357' E30°25.936' 1215m	No fossils
Point 3	S29°05.406' E30°25.774' 1110m	No fossils
Basalt pillows point	S29°05.378' E30°25.697' 1106m	Shales? Basalt pillows Not fossiliferous, intrusive. Figure 7
Point 4	S29°05.230' E30°25.499' 1093m	No fossils
Outcrop 2	S29°05.236' E30°25.510' 1093m	No fossils
Point 5	S29°05.110' E30°25.384' 1092m	No fossils
Point 6, rocky riverbed	29°05.114' E30°25.203' 1090m	No fossils Figure 8
Point 7	S29°05.063' E30°25.303' 1057m	No fossils
Point 8, outcrop?	S29°05.570' E30°25.840' 1111m	No fossils
Point 9	S29°05.921' E30°25.711' 1198m	No fossils
Point 10	S29°05.881' E30°26.052' 1161m	No fossils

Figure 4: general view of the terrane

Figure 5: fine grained shales but no fossils were found.

Figure 6: Sandstone outcrop.

Figure 7: Pillow lavas that are weathering out. Volcanic rocks so no chance of preserving fossils.

Figure 8: Shales exposed in a river cutting but no fossils preserved.

4. Impact assessment

An assessment of the potential impacts to possible palaeontological resources considers the criteria encapsulated in Table 3:

TABLE 3A: CRITERIA FOR ASSESSING IMPACTS

PART A: DEFINITION AND CRITERIA		
Criteria for ranking of the SEVERITY/NATURE of environmental impacts	**H**	Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action.
	M	Moderate/ measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints.
	L	Minor deterioration (nuisance or minor deterioration). Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	L+	Minor improvement. Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	M+	Moderate improvement. Will be within or better than the recommended level. No observed reaction.
	H+	Substantial improvement. Will be within or better than the recommended level. Favourable publicity.
Criteria for ranking the DURATION of impacts	**L**	Quickly reversible. Less than the project life. Short term
	M	Reversible over time. Life of the project. Medium term
	H	Permanent. Beyond closure. Long term.
Criteria for ranking the SPATIAL SCALE of	**L**	Localised - Within the site boundary.
	M	Fairly widespread – Beyond the site boundary. Local

impacts	**H**	Widespread – Far beyond site boundary. Regional/ national
PROBABILITY (of exposure to impacts)	**H**	Definite/ Continuous
	M	Possible/ frequent
	L	Unlikely/ seldom

TABLE 3B: IMPACT ASSESSMENT

PART B: ASSESSMENT		
SEVERITY/NATURE	**H**	-
	M	The Vryheid Fm, Estcourt and Adelaide subgroup could contain fossil materials of plants, fish and vertebrates. The impact would be moderate
	L	..
	L+	-
	M+	-
	H+	-
DURATION	**L**	-
	M	-
	H	Where manifest, the impact will be permanent.
SPATIAL SCALE	**L**	Since only the possible fossils within the area would be vertebrates or fossil plants from the *Glossopteris* flora in the shales, the spatial scale will be localised within the site boundary.
	M	-
	H	-
PROBABILITY	**H**	**-**
	M	**There is a moderate chance of fossils occurring BUT none was found during the survey. There is a small chance that once excavations begin fossils will be exposed from below the surface so a Chance Find Protocol should be added to the EMPr.**
	L	-

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the rocks are the correct age and type to preserve fossil, however none was found by the palaeontologist who surveyed the area. Since there is a small chance that fossils from the Vryheid Formation may be disturbed a Fossil Chance Find Protocol has been added to this report. Taking account of the defined criteria and results of the survey, the potential impact to fossil heritage resources is extremely low.

5. Assumptions and uncertainties

Based on the geology of the area and the palaeontological record as we know it, it can be assumed that the formation and layout of the dolomites, sandstones, shales and sands are typical for the country and do contain fossil plant, insect, invertebrate and vertebrate material. From the survey we are certain that there are no surface exposures of fossils. They may occur below ground

6. Recommendation

Based on experience and the lack of any finding any fossils from the area, it is unlikely that any fossils would be preserved in the site. There is very small chance that fossil may occur below the surface so a Chance Find Protocol should be added to the EMPr: if fossils are found once excavations have commenced then they should be rescued and a palaeontologist called to assess and collect a representative sample.

7. References

Anderson, J.M., Anderson, H.M., 1985. Palaeoflora of Southern Africa: Prodromus of South African megafloras, Devonian to Lower Cretaceous. A.A. Balkema, Rotterdam. 423 pp.

Johnson, M.R., van Vuuren, C.J., Visser, J.N.J., Cole, D.I., Wickens, H.deV., Christie, A.D.M., Roberts, D.L., Brandl, G., 2006. Sedimentary rocks of the Karoo Supergroup. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). The Geology of South Africa. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 461 – 499.

Plumstead, E.P., 1969. Three thousand million years of plant life in Africa. Geological Society of southern Africa, Annexure to Volume LXXII. 72pp + 25 plates.

Robb, L.J., Brandl, G., Anhaeusser, C.R., Poujol, M., 2006. Archaean Granitoid Intrusions. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). The Geology of South Africa. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 57-94.

Van der Westhuizen, W.A., de Bruiyn, H., Meintjes, P.G., 2006. The Ventersdorp Supergroup. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). The Geology of South Africa. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. pp 187-208.

8. Chance Find Protocol

Monitoring Programme for Palaeontology – to commence once the excavations for infrastructure begin.

1. The following procedure is only required if fossils are seen on the surface and when excavations commence.
2. When excavations begin the rocks and must be given a cursory inspection by the environmental officer or designated person. Any fossiliferous material (plants, insects, bone, coal) should be put aside in a suitably protected place. This way the mining activities will not be interrupted.
3. Photographs of similar fossil plants must be provided to the developer to assist in recognizing the fossil plants in the shales and mudstones (for example see Figure 9, 10). This information will be built into the EMP's training and awareness plan and procedures.
4. Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment.
5. If there is any possible fossil material found by the developer or environmental officer then the qualified palaeontologist sub-contracted for this project, should visit the site to inspect the selected material and check the dumps where feasible.
6. Fossil plants or vertebrates that are considered to be of good quality or scientific interest by the palaeontologist must be removed, catalogued and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the site an AMAFA permit must be obtained. Annual reports must be submitted to SAHRA as required by the relevant permits.
7. If no good fossil material is recovered then the site inspections by the palaeontologist will not be necessary. Annual reports by the palaeontologist must be sent to AMAFA.
8. If no fossils are found and the excavations have finished then no further monitoring is required.

Appendix A – examples of fossils from the Vryheid Formation

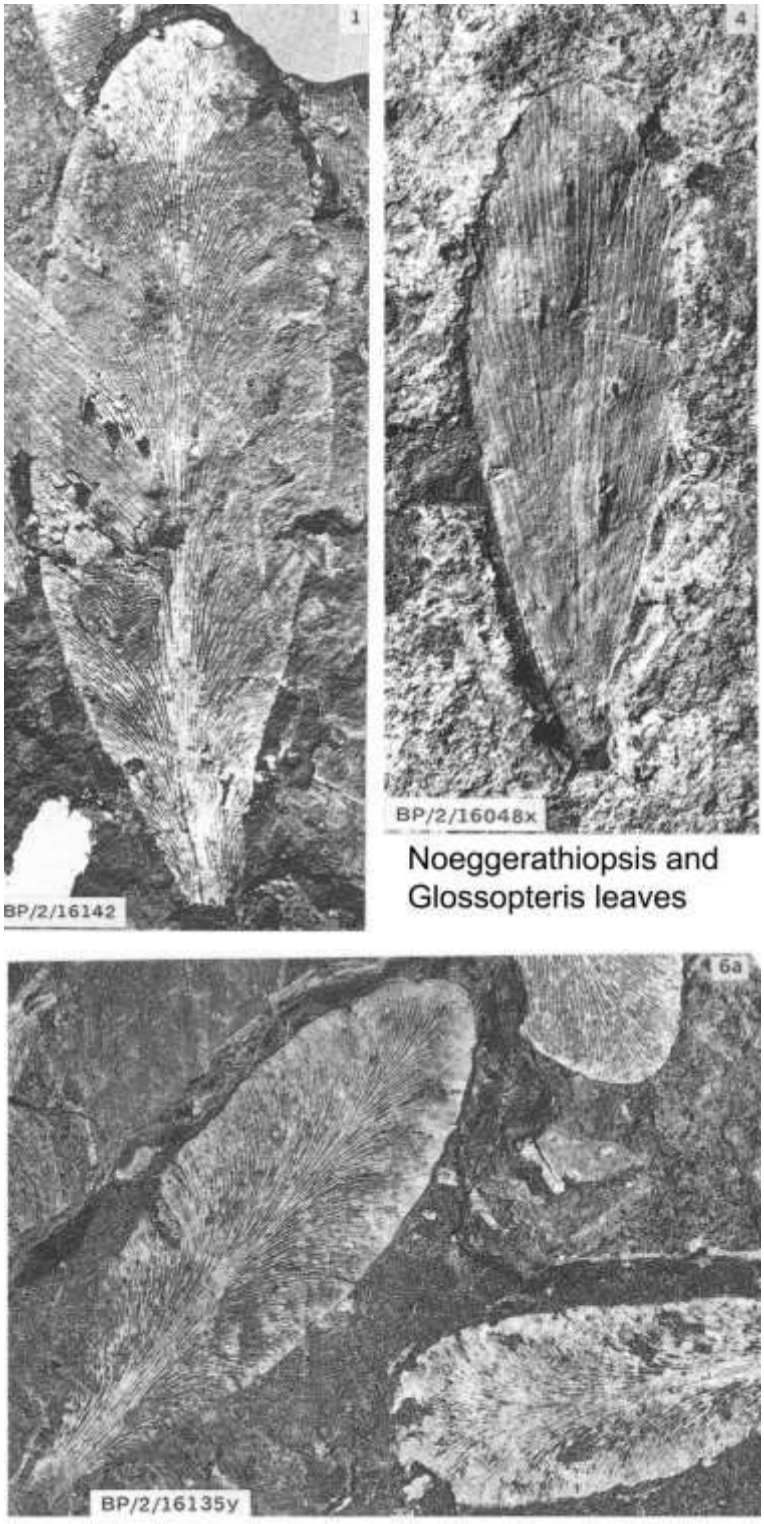

Figure 9: *Glossopteris* and cordaitalean leaves from Ecca sediments

Figure 10: appearance of vertebrate bones (white) embedded in the mudstone (grey, light brown). Paintbrush for scale.

Appendix B – Details of specialist

Curriculum vitae (short) - Marion Bamford PhD
October 2018

I) Personal details

Surname	:	**Bamford**
First names	:	**Marion Kathleen**
Present employment	:	Professor; Director of the Evolutionary Studies Institute. Member Management Committee of the NRF/DST Centre of Excellence Palaeosciences, University of the Witwatersrand, Johannesburg, South Africa-
Telephone	:	+27 11 717 6690
Fax	:	+27 11 717 6694
Cell	:	082 555 6937
E-mail	:	marion.bamford@wits.ac.za ; marionbamford12@gmail.com

ii) Academic qualifications

Tertiary Education: All at the University of the Witwatersrand:
1980-1982: BSc, majors in Botany and Microbiology. Graduated April 1983.
1983: BSc Honours, Botany and Palaeobotany. Graduated April 1984.
1984-1986: MSc in Palaeobotany. Graduated with Distinction, November 1986.
1986-1989: PhD in Palaeobotany. Graduated in June 1990.

iii) Professional qualifications

Wood Anatomy Training (overseas as nothing was available in South Africa):
1994 - Service d'Anatomie des Bois, Musée Royal de l'Afrique Centrale, Tervuren, Belgium, by Roger Dechamps
1997 - Université Pierre et Marie Curie, Paris, France, by Dr Jean-Claude Koeniguer
1997 - Université Claude Bernard, Lyon, France by Prof Georges Barale, Dr Jean-Pierre Gros, and Dr Marc Philippe

iv) Membership of professional bodies/associations

Palaeontological Society of Southern Africa
Royal Society of Southern Africa - Fellow: 2006 onwards
Academy of Sciences of South Africa - Member: Oct 2014 onwards
International Association of Wood Anatomists - First enrolled: January 1991
International Organization of Palaeobotany – 1993+

Botanical Society of South Africa
South African Committee on Stratigraphy – Biostratigraphy - 1997 - 2016
SASQUA (South African Society for Quaternary Research) – 1997+
PAGES - 2008 –onwards: South African representative
ROCEEH / WAVE – 2008+
INQUA – PALCOMM – 2011+onwards

vii) Supervision of Higher Degrees

All at Wits University

Degree	Graduated/completed	Current
Honours	6	1
Masters	8	1
PhD	10	3
Postdoctoral fellows	9	3

viii) Undergraduate teaching
Geology II – Palaeobotany GEOL2008 – average 65 students per year
Biology III – Palaeobotany APES3029 – average 25 students per year
Honours – Evolution of Terrestrial Ecosystems; African Plio-Pleistocene Palaeoecology; Micropalaeontology – average 2-8 students per year.

ix) Editing and reviewing
Editor: Palaeontologia africana: 2003 to 2013; 2014 – Assistant editor
Guest Editor: Quaternary International: 2005 volume
Member of Board of Review: Review of Palaeobotany and Palynology: 2010 –
Cretaceous Research: 2014 -

Review of manuscripts for ISI-listed journals: 25 local and international journals

x) Palaeontological Impact Assessments

Selected – list not complete:

- Thukela Biosphere Conservancy 1996; 2002 for DWAF
- Vioolsdrift 2007 for Xibula Exploration
- Rietfontein 2009 for Zitholele Consulting
- Bloeddrift-Baken 2010 for TransHex
- New Kleinfontein Gold Mine 2012 for Prime Resources (Pty) Ltd.
- Thabazimbi Iron Cave 2012 for Professional Grave Solutions (Pty) Ltd
- Delmas 2013 for Jones and Wagener
- Klipfontein 2013 for Jones and Wagener
- Platinum mine 2013 for Lonmin
- Syferfontein 2014 for Digby Wells
- Canyon Springs 2014 for Prime Resources
- Kimberley Eskom 2014 for Landscape Dynamics

- Yzermyne 2014 for Digby Wells
- Matimba 2015 for Royal HaskoningDV
- Commissiekraal 2015 for SLR
- Harmony PV 2015 for Savannah Environmental
- Glencore-Tweefontein 2015 for Digby Wells
- Umkomazi 2015 for JLB Consulting
- Ixia coal 2016 for Digby Wells
- Lambda Eskom for Digby Wells
- Alexander Scoping for SLR
- Perseus-Kronos-Aries Eskom 2016 for NGT
- Mala Mala 2017 for Henwood
- Modimolle 2017 for Green Vision
- Klipoortjie and Finaalspan 2017 for Delta BEC
- Ledjadja borrow pits 2018 for Digby Wells
- Lungile poultry farm 2018 for CTS
- Olienhout Dam 2018 for JP Celliers
- Isondlo and Kwasobabili 2018 for GCS
- Kanakies Gypsum 2018 for Cabanga
- Nababeep Copper mine 2018
- Glencore-Mbali pipeline 2018 for Digby Wells
-

xi) Research Output

Publications by M K Bamford up to June 2018 peer-reviewed journals or scholarly books: over 120 articles published; 5 submitted/in press; 8 book chapters.
Scopus h index = 26; Google scholar h index = 28;
Conferences: numerous presentations at local and international conferences.

xii) NRF Rating

NRF Rating: B-2 (2016-2020)
NRF Rating: B-3 (2010-2015)
NRF Rating: B-3 (2005-2009)
NRF Rating: C-2 (1999-2004)