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VORTUM ENERGY (PTY) LTD: PROPOSED COMBINED CYCLE GAS TURBINE (CCGT) POWER PLANT ON A PORTION THE REMAINDER OF THE FARM LANGEBERG 188 AND ASSOCIATED INFRASTRUCTURE ACROSS A NUMBER OF FARM PORTIONS IN THE SALDANHA BAY LOCAL MUNICIPALITY, WEST COAST DISTRICT MUNICIPALITY, WESTERN CAPE PROVINCE

Archaeological Impact Assessment



Prepared for: **Vortum Energy (Pty) Ltd.**

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Document History

Document Version 1 (Draft) – 01 December 2015
Document Version 2 (Draft) – 24 February 2016
Document Version 3 (Final) – 26 February 2016



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Exigo Sustainability promotes the conservation of sensitive archaeological and heritage resources and therefore uncompromisingly adheres to relevant Heritage Legislation (National Heritage Resources Act no. 25 of 1999, Human Tissue Act 65 of 1983 as amended, Removal of Graves and Dead Bodies Ordinance no. 7 of 1925, Excavations Ordinance no. 12 of 1980). In order to ensure best practices and ethics in the examination, conservation and mitigation of archaeological and heritage resources, Exigo Sustainability follows the Minimum Standards: Archaeological and Palaeontological Components of Impact Assessment as set out by the South African Heritage Resources Agency (SAHRA) and the CRM section of the Association for South African Professional Archaeologists (ASAPA).

DECLARATION

I, Nelius Le Roux Kruger, declare that –

- I act as the independent specialist;
- I am conducting any work and activity relating to the proposed Vortum Thermal Power Plant Project in an objective manner, even if this results in views and findings that are not favourable to the client;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have the required expertise in conducting the specialist report and I will comply with legislation, including the relevant Heritage Legislation (National Heritage Resources Act no. 25 of 1999, Human Tissue Act 65 of 1983 as amended, Removal of Graves and Dead Bodies Ordinance no. 7 of 1925, Excavations Ordinance no. 12 of 1980), the Minimum Standards: Archaeological and Palaeontological Components of Impact Assessment (SAHRA, AMAFA and the CRM section of ASAPA), regulations and any guidelines that have relevance to the proposed activity;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this declaration are true and correct.



Signature of specialist

Company: Exigo Sustainability

Date: 26 February 2016

EXECUTIVE SUMMARY

This report details the results of an Archaeological Impact Assessment (AIA) study subject to an Environmental Impact Assessment (EIA) process for the proposed Vortum Thermal Power Plant Project east of the town of Saldanha within the Saldanha Bay Local Municipality, West Coast District Municipality, Western Cape Province. The proposed project includes the construction of an energy generation facility (thermal power plant) with associated infrastructure covering **80ha**, a 132 kV power line of approximately **27km**, running parallel with the existing Eskom high-voltage power line which will connect to the ESKOM Aurora power station, and an access road of approximately **3.6km** is planned. Also included in the final EIA is a natural gas / fuel supply pipeline linking the proposed thermal power plant with either a LNG facility (proposed by the Department of Energy) or an oil terminal at the Saldanha harbour. Two route options for the proposed pipeline, measuring approximately **5.1km** and **12km** respectively, are proposed. The study was conducted on the following properties:

- A portion of the Remainder of the Farm Langeberg 188 (Thermal Plant & access road)
- Portions 1 and 9 (Remaining Extent) of the Farm Langeberg 187 (Power Line Corridor)
- Portions 1 and Remainder of the Farm Uyekraal 189 (Power Line Corridor)
- Farm Everts Hope 190 (Power Line Corridor)
- Farm Wascklip 183 (Power Line Corridor)
- Farm Zoutekuylen 179 (Power Line Corridor)
- Farm 1162 (Power Line Corridor)
- Portions 3 and 8 of the Farm Langverwacht 178 (Power Line Corridor)
- Farm adjoining Springfontein 174 (Power Line Corridor)
- Portions 3 and 4 of the Farm Driehoeksfontein 176 (Power Line Corridor)
- Farm Hopefield 195 (Natural Gas / Fuel Supply Pipeline)
- Farm Yzervarkensrug 129 (Natural Gas / Fuel Supply Pipeline)

This report includes background information on the area's archaeology, its representation in southern Africa, and the history of the larger area under investigation, survey methodology and results as well as heritage legislation and conservation policies. A copy of the report will be supplied to the South African Heritage Resources Agency and Heritage Western Cape and recommendations contained in this document will be reviewed.

A wide array of palaeontological, archaeological and historical studies conducted along the West Coast of South Africa has provided evidence for an extremely rich and diverse archaeological landscape. A previously conducted Palaeontological Impact Assessment Study on the farm Langeberg¹ indicates that the larger Langebaan / Saldanha landscape is known to be rich in palaeontological resources and one might expect to find fossil remains in underlying limestone deposits and associated fossil bearing sediments. Previous AIA studies² identified Stone Age material of low significance occurring in low densities on certain portions of Langeberg and a number of Colonial Period site have also been located in the adjacent landscape. In the study area subject to this assessment, archaeological material occur in open contexts and in most cases the original

¹ John Pether, 2012. Palaeontological Assessment for the proposed rare earths separation plant, Frontier Rare Earths Limited.

² Jonathan Kaplan, 2007. Archaeological Impact Assessment of the Farms 1195, 187/4, 1891/1 and 188 in the Vredenburg/Saldanha Area. .

positions of heritage material might have been lost due to agriculture activities which has altered large portions of the surface soil. Natural agents might also have contributed to the displacement of heritage objects. However, a Colonial Period site was documented in the project area:

- The coastal dune veld of the project locales along the second option for the gas / fuel pipeline constitutes the area of main heritage conservation priority where a Colonial Period occupation site (**Exigo-VTP-HP01**) was recorded. It is primarily recommended that Option 2 be excluded for consideration for the gas / fuel pipeline. However, should the option remain for consideration, it is recommended that a conservation buffer zone of 100m be implemented around the heritage site. In addition, the design of the pipeline should be adjusted to avoid the site and of the proposed conservation buffer. A heritage site management plan should be compiled in order to stipulate consecration measures for the site. Should impact on the site prove inevitable a Phase 2 archaeological specialist assessment of the site will be required. Such an assessment should minimally include mapping of all features, sampling of cultural and other remains that will adequately allow the temporal, cultural and spatial classification of the site and further desktop studies in order to contextualize the site within the larger historical landscape. This measure should be undertaken subject to the relevant permitting requirements from the competent heritage authority (HWC). A destruction permit should be obtained prior to the final destruction of the site.
- It is recommended that the site of the proposed development activities be monitored during construction and operational phases in order to avoid the destruction of previously undetected heritage remains. Since the area is situated in a paleontologically sensitive landscape, a Palaeontological Impact Assessment should be conducted by a qualified specialist. Should fossil remains such as fossil fish, reptiles or vitrified wood be exposed during construction, these objects should be carefully safeguarded and the relevant heritage resources authority (HWC) should be notified immediately so that the appropriate action can be taken by a professional palaeontologist.

Vortum Thermal Power Plant Project: Documented Site Location:

Site Code	Short Description	Coordinate S E	Mitigation Action
EXIGO-VTP-HP01	Colonial Period occupation site	S33.003421° E18.022815°	Preferred Action: exclusion of gas / fuel pipeline Option 2. Alternative Action: Conservation buffer, redesign of the pipeline, heritage site management plan. Site Mentoring Alternative Action if site will be impacted on: Phase 2 archaeological specialist assessment & destruction permitting.

A significant heritage receptor occurs in proposed Vortum Thermal Plant Project area and unmitigated impact to the heritage resource is probable. However, it is the opinion of the author of this Archaeological Impact Assessment Report that the proposed Vortum Thermal Plant Project may proceed from a culture resources management perspective, provided that mitigation measures included in this assessment, and endorsed by the relevant Heritage Resources Agency are implemented.

It is essential that cognisance be taken of the larger archaeological landscape of the West Coast region in order to avoid the destruction of previously undetected heritage sites. Should any previously undetected heritage resources be exposed or uncovered during construction phases of the proposed project, these should immediately be reported to HWC. Since the intrinsic heritage and social value of graves and cemeteries are

highly significant, these resources require special management measures. Should human remains be discovered at any stage, these should be reported to the Heritage Specialist and relevant authorities (HWC) and development activities should be suspended until the site has been inspected by the Specialist. The Specialist will advise on further management actions and possible relocation of human remains in accordance with the Human Tissue Act (Act 65 of 1983 as amended), the Removal of Graves and Dead Bodies Ordinance (Ordinance no. 7 of 1925), the National Heritage Resources Act (Act no. 25 of 1999) and any local and regional provisions, laws and by-laws pertaining to human remains. A full social consultation process should occur in conjunction with the mitigation of cemeteries and burials.

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

NOTATIONS AND TERMS/TERMINOLOGY

Absolute dating:

Absolute dating provides specific dates or range of dates expressed in years.

Archaeology:

The study of the human past through its material remains.

Archaeological record:

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

Artefact:

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

Assemblage:

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

¹⁴C or radiocarbon dating:

The ¹⁴C method determines the absolute age of organic material by studying the radioactivity of carbon. It is reliable for objects not older than 70 000 years by means of isotopic enrichment. The method becomes increasingly inaccurate for samples younger than ±250 years.

Ceramic Facies:

In terms of the cultural representation of ceramics, a facies is denoted by a specific branch of a larger ceramic tradition. A number of ceramic facies thus constitute a ceramic tradition.

Ceramic Tradition:

In terms of the cultural representation of ceramics, a series of ceramic units constitutes as ceramic tradition.

Context:

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

Culture:

A contested term, "culture" could minimally be defined as the learned and shared things that people have, do and think.

Cultural Heritage Resource:

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

Cultural landscape:

A cultural landscape refers to a distinctive geographic area with cultural significance.

Cultural Resource Management (CRM):

A system of measures for safeguarding the archaeological heritage of a given area, generally applied within the framework of legislation designed to safeguard the past.

Ecofact:

Non artefactual material remains that has cultural relevance which provides information about past human activities. Examples would include remains or evidence of domesticated animals or plant species.

Excavation:

The principal method of data acquisition in archaeology, involving the systematic uncovering of archaeological remains through the removal of the deposits of soil and the other material covering and accompanying it.

Feature:

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

GIS:

Geographic Information Systems are computer software that allows layering of various types of data to produce complex maps; useful for predicting site location and for representing the analysis of collected data within sites and across regions.

Historical archaeology:

Primarily that aspect of archaeology which is complementary to history based on the study of written sources. In the South African context it concerns the recovery and interpretation of relics left in the ground in the course of Europe's discovery of South Africa, as well as the movements of the indigenous groups during, and after the "Great Scattering" of Bantu-speaking groups – known as the *mfecane* or *difaqane*.

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

Iron Age:

Also known as "Farmer Period", the "Iron Age" is an archaeological term used to define a period associated with domesticated livestock and grains, metal working and ceramic manufacture.

Lithic:

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

Management / Management Actions:

Actions – including planning and design changes - that enhance benefits associated with a proposed development, or that avoid, mitigate, restore, rehabilitate or compensate for the negative impacts.

Matrix:

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

Megalith:

A large stone, often found in association with others and forming an alignment or monument, such as large stone statues.

Midden:

Refuse that accumulates in a concentrated heap.

Microlith:

A small stone tool, typically knapped of flint or chert, usually about three centimetres long or less.

Monolith:

A geological feature such as a large rock, consisting of a single massive stone or rock, or a single piece of rock placed as, or within, a monument or site.

Oral Histories:

The historical narratives, stories and traditions passed from generation to generation by word of mouth.

Phase 1 CRM Assessment:

An Impact Assessment which identifies archaeological and heritage sites, assesses their significance and comments on the impact of a given development on the sites. Recommendations for site mitigation or conservation are also made during this phase.

Phase 2 CRM Study:

In-depth studies which could include major archaeological excavations, detailed site surveys and mapping / plans of sites, including

historical / architectural structures and features. Alternatively, the sampling of sites by collecting material, small test pit excavations or auger sampling is required. Mitigation / Rescue involves planning the protection of significant sites or sampling through excavation or collection (in terms of a permit) at sites that may be lost as a result of a given development.

Phase 3 CRM Measure:

A Heritage Site Management Plan (for heritage conservation), is required in rare cases where the site is so important that development will not be allowed and sometimes developers are encouraged to enhance the value of the sites retained on their properties with appropriate interpretive material or displays.

Prehistoric archaeology:

That aspect of archaeology which concerns itself with the development of humans and their culture before the invention of writing. In South Africa, prehistoric archaeology comprises the study of the Early Stone Age, the Middle Stone Age and the greater part of the Later Stone Age and the Iron Age.

Probabilistic Sampling:

A sampling strategy that is not biased by any person’s judgment or opinion. Also known as statistical sampling, it includes systematic, random and stratified sampling strategies.

Provenience

Provenience is the three-dimensional (horizontal and vertical) position in which artefacts are found. Fundamental to ascertaining the provenience of an artefact is *association*, the co-occurrence of an artefact with other archaeological remains; and *superposition*, the principle whereby artefacts in lower levels of a matrix were deposited before the artefacts found in the layers above them, and are therefore older.

Random Sampling:

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

Relative dating:

The process whereby the relative antiquity of sites and objects are determined by putting them in sequential order but not assigning specific dates.

Remote Sensing:

The small or large-scale acquisition of information of an object or phenomenon, by the use of either recording or real-time sensing device(s) that is not in physical or intimate contact with the object (such as by way of aircraft, spacecraft or satellite). Here, ground-based geophysical methods such as Ground Penetrating Radar and Magnetometry are often used for archaeological imaging.

Rock Art Research:

Rock art can be "decoded" in order to inform about cultural attributes of prehistoric societies, such as dress-code, hunting and food gathering, social behaviour, religious practice, gender issues and political issues.

Scoping Assessment:

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

Sensitive:

Often refers to graves and burial sites although not necessarily a heritage place, as well as ideologically significant sites such as ritual / religious places. *Sensitive* may also refer to an entire landscape / area known for its significant heritage remains.

Site (Archaeological):

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

Slag:

The material residue of smelting processes from metalworking.

Stone Age:

An archaeological term used to define a period of stone tool use and manufacture.

Stratigraphy:

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

Stratified Sampling:

A probabilistic sampling strategy whereby a study area is divided into appropriate zones – often based on the probable location of archaeological areas, after which each zone is sampled at random.

Systematic Sampling:

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

Tradition:

Artefact types, assemblages of tools, architectural styles, economic practices or art styles that last longer than a phase and even a horizon are describe by the term *tradition*. A common example of this is the early Iron Age tradition of Southern Africa that originated ± 200 AD and came to an end at about 900 AD.

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

Tuyère:

A ceramic blow-tube used in the process of iron smelting / reduction.

LIST OF ABBREVIATIONS

Abbreviation	Description
ASAPA	Association for South African Professional Archaeologists
AIA	Archaeological Impact Assessment
BP	Before Present
BCE	Before Common Era
CRM	Culture Resources Management
EIA	Environmental Impact Assessment
ESA	Earlier Stone Age
GIS	Geographic Information Systems
HIA	Heritage Impact Assessment
HWC	Heritage Western Cape
ICOMOS	International Council on Monuments and Sites
LSA	Later Stone Age
MRA	Mining Right Area
MSA	Middle Stone Age
NHRA	National Heritage Resources Act No.25 of 1999, Section 35
PFS	Pre-Feasibility Study
PHRA	Provincial Heritage Resources Authorities
SAFA	Society for Africanist Archaeologists
SAHRA	South African Heritage Resources Association
YCE	Years before Common Era (Present)

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1 BACKGROUND

1.1 Scope and Motivation

Exigo Sustainability was commissioned by Vortum Energy (Pty) Ltd. for an Archaeological Impact Assessment (AIA) study subject to an Environmental Impact Assessment (EIA) process for the proposed Vortum Thermal Power Plant Project in the Saldanha Bay Local Municipality, West Coast District Municipality, Western Cape Province. The rationale of this AIA is to determine the presence of heritage resources such as archaeological and historical sites and features, graves and places of religious and cultural significance in previously unstudied areas; to consider the impact of the proposed project on such heritage resources, and to submit appropriate recommendations with regard to the cultural resources management measures that may be required at affected sites / features.

1.2 Project Direction

Exigo Sustainability's expertise ensures that all projects be conducted to the highest international ethical and professional standards. As archaeological specialist for Exigo Sustainability, Mr Neels Kruger acted as field director for the project; responsible for the assimilation of all information, the compilation of the final consolidated AIA report and recommendations in terms of heritage resources on the demarcated project areas. Mr Kruger is an accredited archaeologist and Culture Resources Management (CRM) practitioner with the Association of South African Professional Archaeologists (ASAPA), a member of the Society for Africanist Archaeologists (SAFA) and the Pan African Archaeological Association (PAA) as well as a Master's Degree candidate in archaeology at the University of Pretoria.

1.3 Project Brief

Vortum Energy (Pty) Ltd is proposing the establishment of an energy generation facility (thermal power plant) with associated infrastructure and structures on a portion (±80 ha) of the Remainder of the Farm Langeberg 188, 861.6ha in extent and located within the Saldanha Bay. The energy generation facility will be a thermal power plant with a maximum generation capacity up to 1200 MWel (electrical rated power). Access to the project site would be either:

- from the **regional road R27**, which runs adjacent to the eastern boundary of the project site; or
- from a **secondary road (R79)** linking the regional road R27 with the regional road R399, which runs adjacent to the southern boundary of the project site.

The proposed thermal power plant will be a Combined Cycle Gas Turbine (CCGT) power plant, to be fuelled with natural gas imported by means of one or more gas import facilities (e.g. LNG Import Terminal(s) and/or new gas pipeline(s)). Indeed the Department of Energy is investigating the feasibility of new gas pipelines and LNG Import Terminals, in order to import natural gas from new offshore gas fields and/or from other countries (e.g. Mozambique). The securing of new energy sources, like natural gas, has become high priority for the Government, considering that the current energy production is not able to meet the increased energy demand of the Country. This leads to frequent electricity shortage and fluctuations in supply ("load shedding"), detrimental to the economic development of South Africa. Should natural gas not be available at the time of the commissioning of the Vortum Thermal Power Plant, the proposed facility may be fuelled with liquid fuel (diesel or other types of liquid fuels) until natural gas is available. Gas turbines can be fuelled either with natural gas or liquid fuel. The overall installed capacity will nevertheless be up to 1200 MWel.

Should natural gas not be available at the time of the commissioning of the Vortum Thermal Power Plant, the proposed facility may be fuelled with liquid fuel (diesel or other types of liquid fuels) until natural gas is available. Gas turbines can be fuelled either with natural gas or liquid fuel. Due to the current electricity shortage and the urgent need for new power generation units in the Country, the Vortum Thermal Power Plant may operate as an Open Cycle Gas Turbine (OCGT) power plant as a first phase and in the second phase, with the "closure" of the open cycle (by means of steam turbine units added to the gas turbine units), as a Combined Cycle Gas Turbine (CCGT) power plant. The construction timeframe of an OCGT plant is notably shorter than that of a CCGT plant. Therefore the first phase of the project may be an Open Cycle Gas Turbine (OCGT) power plant fuelled by diesel, to be operated as Peak Power Plant, i.e. few hours per day, during the peak hours of the electricity demand, when required by the grid to fulfil the customer's requirement.

Liquid fuel (diesel) may be imported a) from the oil pier of the Port of Richards Bay; and / or b) from the Lilly pipeline (Sasol Gas' pipeline), crossing the project site, by means of a diesel pipeline and / or tank trucks and loaded to on-site storage tanks. Initially (first phase) the Vortum Thermal Power Plant will operate as OCGT because the commissioning of an OCGT plant can take only 9 months, while a CCGT plant can be built in 24 months. The aim of Vortum Energy is to start the OCGT plant operation as soon as the gas turbines are commissioned. Once also the steam turbines are commissioned (second phase), the power plant will be operated as CCGT, fuelled with gas (if available) or diesel. In a CCGT power plant a Rankine cycle (steam cycle) is added to a Brayton cycle (gas cycle). The combination of the two thermodynamic cycles results in improved overall efficiency as less heat is wasted because heat is recovered - the "waste" heat from the gas cycle is utilised to produce steam to generate additional electricity via steam turbine units, enhancing the efficiency of overall electricity generation. The thermal efficiency of a CCGT power plant is up to 62%.

A Combined Cycle Gas Turbine (CCGT) power plant consists of gas turbine units coupled with steam turbine units: the "waste" heat from each gas turbine is sent to heat recovery steam generators (HRSG) to generate high pressure steam; the steam from the HRSG drives steam turbines coupled with generators, in order to generate electricity increasing the efficiency of the power plant. Each gas turbine and steam turbine are coupled to the single generator in a tandem arrangement, on a single shaft (single-shaft configuration).

The CCGT power plant will consist of the following components:

- two or more **gas turbine units** with a capacity **up to 400 MWeI** (electrical rated power) **each**;
- fuel storage facility (in case of liquid fuel);
- **heat recovery steam generators (HRSG)** to generate steam;
- two or more **steam turbine units** with a capacity **up to 220 MWeI** (electrical rated power) **each**;
- **electrical generators**, which convert the mechanical energy of the gas and steam turbine units to electricity;
- gas compressors and combustors, for the gas cycle;
- water pumps and pressurisers, for the steam cycle;
- cooling system, with condensers & cooling towers, in order to condensate the steam to water;
- a dam, to collect the water necessary for the generation of steam;
- a control room with offices;
- warehouses;
- a natural gas or liquid fuel supply pipeline;
- a water supply pipeline;
- on-site high voltage substation;
- high-voltage power lines, for the connection to the Eskom grid.

The number and size (capacity) of the gas and steam turbine units has not been finalised yet and will depend on the load (demand) curve required by the grid. This will be assessed during the scoping phase in consultation with Eskom.

The Vortum Thermal Power Plant will deliver the energy to the **Eskom AURORA main transmission substation via one or more 400 kV power lines approximately 27 km long**. The number of new 400 kV power lines will be assessed during the scoping phase in consultation with Eskom. The proposed power line corridor runs parallel to existing Eskom high-voltage power lines and may cross through the following properties:

- A portion of the Remainder of the Farm Langeberg 188 (Thermal Plant)
- Portions 1 and 9 (Remaining Extent) of the Farm Langeberg 187 (Power Line Corridor)
- Portions 1 and Remainder of the Farm Uyekraal 189 (Power Line Corridor)
- Farm Everts Hope 190 (Power Line Corridor)
- Farm Wascklip 183 (Power Line Corridor)
- Farm Zoutekuylen 179 (Power Line Corridor)
- FARM 1162 (Power Line Corridor)
- Portions 3 and 8 of the Farm Langverwacht 178 (Power Line Corridor)
- Farm adjoining Springfontein 174 (Power Line Corridor)
- Portions 3 and 4 of the Farm Driehoeksfontein 176 (Power Line Corridor)
- Farm Hopefield 195 (Natural Gas / Fuel Supply Pipeline)
- Farm Yzervarkensrug 129 (Natural Gas / Fuel Supply Pipeline)

An access road of approximately **3.6km** will connect the power plant to either the R27 or the R79.

The project also includes a natural gas / fuel supply pipeline, linking the proposed thermal power plant with either a LNG facility (proposed by the Department of Energy) or an oil terminal at the Saldanha harbour. Two route options, measuring approximately **5.1km** and **12km** respectively, are proposed.

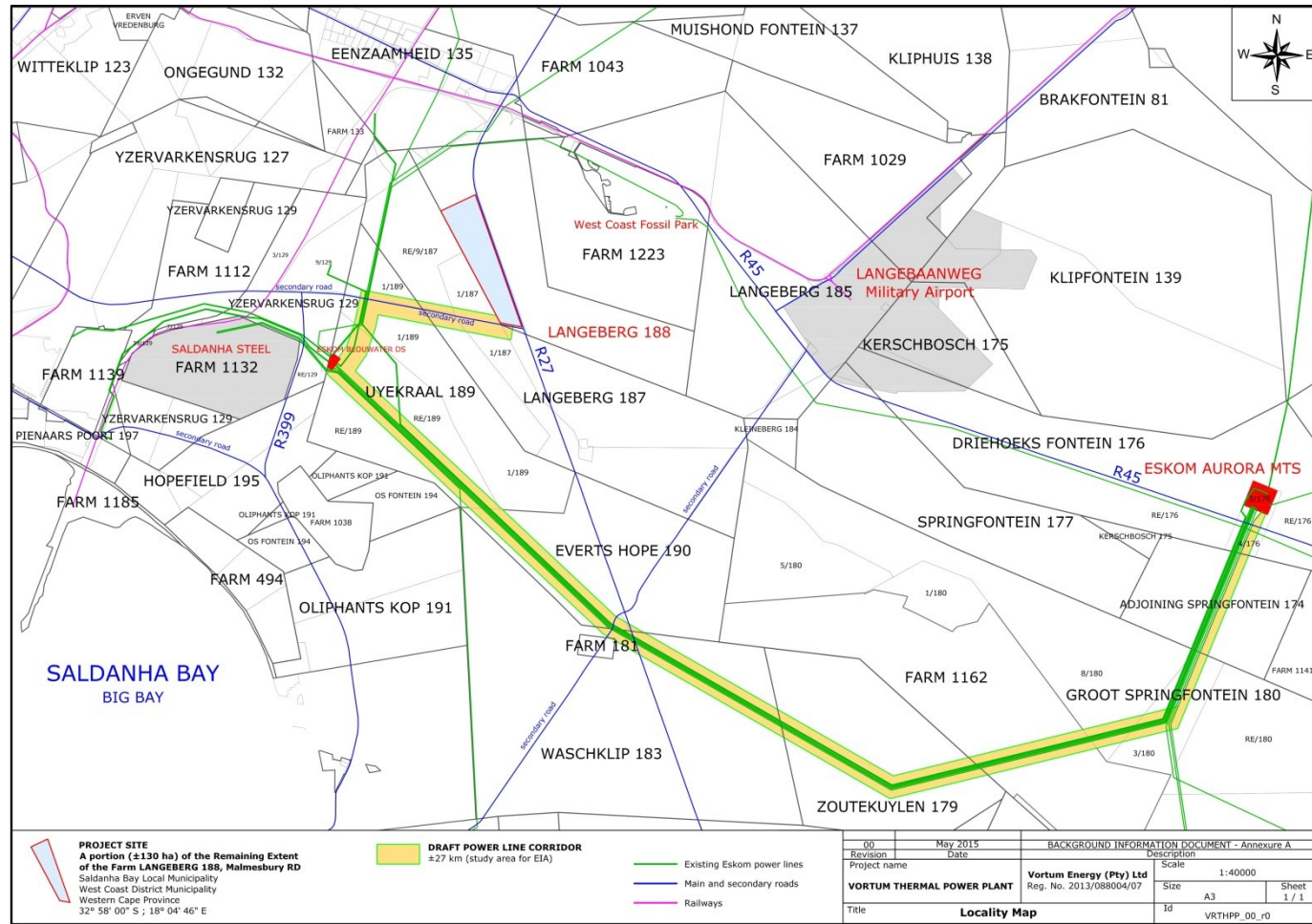


Figure 1-1: Map representation of the general locality of the Vortum Thermal Power Plant, access road and power line corridor.

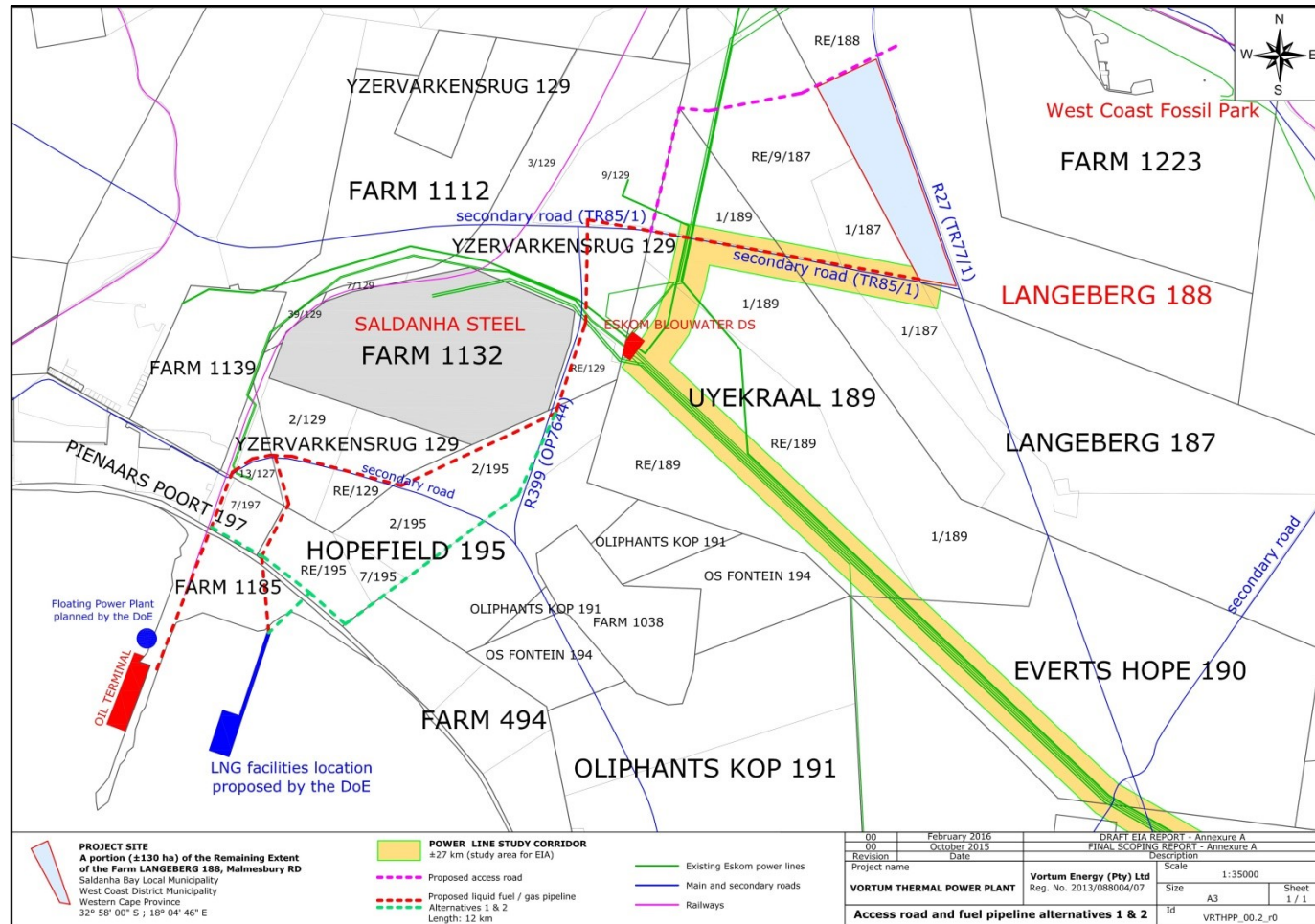


Figure 1-2: Map representation of the general locality of the two natural gas / fuel pipeline route options.

1.4 Terms of Reference

Heritage specialist input into the Environmental Impact Assessment (EIA) process is essential to ensure that through the management of change, developments still conserve our heritage resources. Heritage specialist input in EIA processes can play a positive role in the development process by enriching an understanding of the past and its contribution to the present. It is also a legal requirement for certain development categories which may have an impact on heritage resources (Refer to Section 2.5.2).

Thus, EIAs should always include an assessment of Heritage Resources. The heritage component of the EIA is provided for in the **National Environmental Management Act, (Act 107 of 1998)** and endorsed by section 38 of the **National Heritage Resources Act (NHRA - Act 25 of 1999)** and the **KwaZulu-Natal Heritage Act (KZNHRA - Act of 2008)**. In addition, the NHRA and the KZNHRA protects all structures and features older than 60 years, archaeological sites and material and graves as well as burial sites. The objective of this legislation is to ensure that developers implement measures to limit the potentially negative effects that the development could have on heritage resources. Based hereon, this project functioned according to the following **terms of reference** for heritage specialist input:

- *Provide detailed updated description of all additional archaeological artefacts, structures (including graves) and settlements which may be affected, if any.*
- *Assess the nature and degree of significance of such resources within the area.*
- *Establish heritage informants/constraints to guide the development process through establishing thresholds of impact significance.*
- *Assess any possible impact on the archaeological and historical remains within the area emanating from the proposed development activities.*
- *Propose possible heritage management measures provided that such action is necessitated by the development.*
- *Obtain a comment from the EC-PHRA.*

1.5 CRM: Legislation, Conservation and Heritage Management

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

1.5.1 Legislation regarding archaeology and heritage sites

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

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

According to the National Heritage Resources Act of 1999 a historical site is any identifiable building or part thereof, marker, milestone, gravestone, landmark or tell older than 60 years. This clause is commonly known

as the “60-years clause”. Buildings are amongst the most enduring features of human occupation, and this definition therefore includes all buildings older than 60 years, modern architecture as well as ruins, fortifications and Iron Age settlements. “Tell” refers to the evidence of human existence which is no longer above ground level, such as building foundations and buried remains of settlements (including artefacts).

The Act identifies heritage objects as:

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

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

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

and

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

- (a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;*
- (b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;*
- (c) trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or*
- (d) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites. (35. [4] 1999:58).”*

and

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

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

- (b) *destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority;*
- (c) *bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) and excavation equipment, or any equipment which assists in the detection or recovery of metals (36. [3] 1999:60)."*

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

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

1.5.2 Background to HIA and AIA Studies

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

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

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

- (a) *the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;*
- (b) *the construction of a bridge or similar structure exceeding 50m in length;*
- (c) *any development or other activity which will change the character of a site:*
 - (i) *exceeding 5 000 m² in extent; or*
 - (ii) *involving three or more existing erven or subdivisions thereof; or*
 - (iii) *involving three or more erven or divisions thereof which have been consolidated within the past five years; or*
 - (iv) *the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;*

- (d) the re-zoning of a site exceeding 10 000 m² in extent; or*
- (e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority,*

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

And:

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

- (a) The identification and mapping of all heritage resources in the area affected;*
- (b) an assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 6(2) or prescribed under section 7;*
- (c) an assessment of the impact of the development on such heritage resources;*
- (d) an evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;*
- (e) the results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;*
- (f) if heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and*
- (g) plans for mitigation of any adverse effects during and after the completion of the proposed development (38. [3] 1999:64).”*

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

1.6 Assessing the Significance of Heritage Resources

Archaeological sites, as previously defined in the National Heritage Resources Act (Act 25 of 1999) are places in the landscape where people have lived in the past – generally more than 60 years ago – and have left traces of their presence behind. In South Africa, archaeological sites include hominid fossil sites, places where people of the Earlier, Middle and Later Stone Age lived in open sites, river gravels, rock shelters and caves, Iron Age sites, graves, and a variety of historical sites and structures in rural areas, towns and cities.

Palaeontological sites are those with fossil remains of plants and animals where people were not involved in the accumulation of the deposits. The basic principle of cultural heritage conservation is that archaeological and other heritage sites are valuable, scarce and *non-renewable*. Many such sites are unfortunately lost on a daily basis through development for housing, roads and infrastructure and once archaeological sites are damaged, they cannot be re-created as site integrity and authenticity is permanently lost. Archaeological sites have the potential to contribute to our understanding of the history of the region and of our country and continent. By preserving links with our past, we may not be able to revive lost cultural traditions, but it enables us to appreciate the role they have played in the history of our country.

- Categories of significance

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

- *Aesthetic value:*

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

- *Historic value:*

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

- *Scientific value:*

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

- *Social value:*

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

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

Formally protected sites:

- Grade 1 or national heritage sites, which are managed by SAHRA

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

Generally protected sites:

- Human burials older than 60 years.
- Archaeological and palaeontological sites.
- Shipwrecks and associated remains older than 70 years.
- Structures older than 60 years.

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

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

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

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

A fundamental aspect in assessing the significance and protection status of a heritage resource is often whether or not the sustainable social and economic benefits of a proposed development outweigh the conservation issues at stake. When, for whatever reason the protection of a heritage site is not deemed necessary or practical, its research potential must be assessed and mitigated in order to gain data / information, which would otherwise be lost.

2 REGIONAL CONTEXT

2.1 Area Location

As noted previously, the Vortum Thermal Power plant project infrastructure elements are situated east of Saldanha along the following properties:

- A portion of the Remainder of the Farm Langeberg 188 (Thermal Plant & access road)
- Portions 1 and 9 (Remaining Extent) of the Farm Langeberg 187 (Power Line Corridor)
- Portions 1 and Remainder of the Farm Uyekraal 189 (Power Line Corridor)
- Farm Everts Hope 190 (Power Line Corridor)
- Farm Wascklip 183 (Power Line Corridor)
- Farm Zoutekuylen 179 (Power Line Corridor)
- FARM 1162 (Power Line Corridor)
- Portions 3 and 8 of the Farm Langverwacht 178 (Power Line Corridor)
- Farm adjoining Springfontein 174 (Power Line Corridor)
- Portions 3 and 4 of the Farm Driehoeksfontein 176 (Power Line Corridor)
- Farm Hopefield 195 (Natural Gas / Fuel Supply Pipeline)
- Farm Yzervarkensrug 129 (Natural Gas / Fuel Supply Pipeline)

The project is located within the Saldanha Bay Local Municipality, West Coast District Municipality, Western Cape Province. The project site is located 9 km North-East of the Port of Saldanha Bay, West of the regional road R27, in an area excluded from the provisions of the Subdivision of Agricultural Land Act and already earmarked for Industrial Uses. The Eskom Blouwater Distribution Substation is located 3.2 km South-West of the project site; the Saldanha Steel Works is 5km West-South-West from the project site; the Langebaanweg Military Airport is 7.5 km East of the project site. The study area appears in map sheet **3218CA**, generally at the following geographical references:

- Thermal Plant Site: **S32.962850° E18.077825°**
- Access Road: **S32.959473° E18.058957°**
- Power Line Corridor Western Offset: **S32.979181° E18.054479°**
- Power Line Corridor Eastern Offset: **S33.009382° E18.234484°**
- Power Line Corridor Southern periphery: **S33.055345° E18.160632°**
- Natural Gas / Fuel Supply Pipeline Option 1 Southern Offset: **S33.000766° E18.001570°**
- Natural Gas / Fuel Supply Pipeline Option 2 North-eastern Offset **S32.976252° E18.086452°**

2.2 Area Description: Receiving Environment

The farm Langeberg 188 lies inland from Saldanha Bay within the Fynbos biome and the Cape Floristic Region (CFR). The study area is part of the greater West Coast region, and lies within the Saldanha peninsula bioregion. This bioregion has a fairly distinct flora, and a particularly high number of locally and regionally endemic plant species, as well as plant Species of Conservation Concern. The study area is within the planning domain of the Saldanha Fine Scale Conservation Plan.

2.3 Site Description

The project site for the Vortum Thermal Plant as well as the access road has largely been transformed by past agricultural activity that includes ploughing for grain crops such as wheat and lucerne. The fields in surrounding areas has also been cleared and ripped for agricultural purposes. There are no significant landscape features on the proposed site. Excavations, stock piles as well as offices of the SA Lime & Gypsum company occur along the south-western periphery of the study area. The site offices are presumably located at the former Langeberg homestead. The proposed power line corridor, running parallel to an existing Eskom power line crosses more pristine dune veld and Fynbos areas but some disturbance as a result of maintenance of the power lines do occur. The two gas / fuel pipeline options runs through a combination of transformed fields, pristine fynbos and dune veld and coastal dunes and coastal zones. The landscape directly surrounding the Saldanha harbour and the Transnet port has been entirely transformed and developed to accommodate relevant infrastructure (roads, railway lines, buildings).

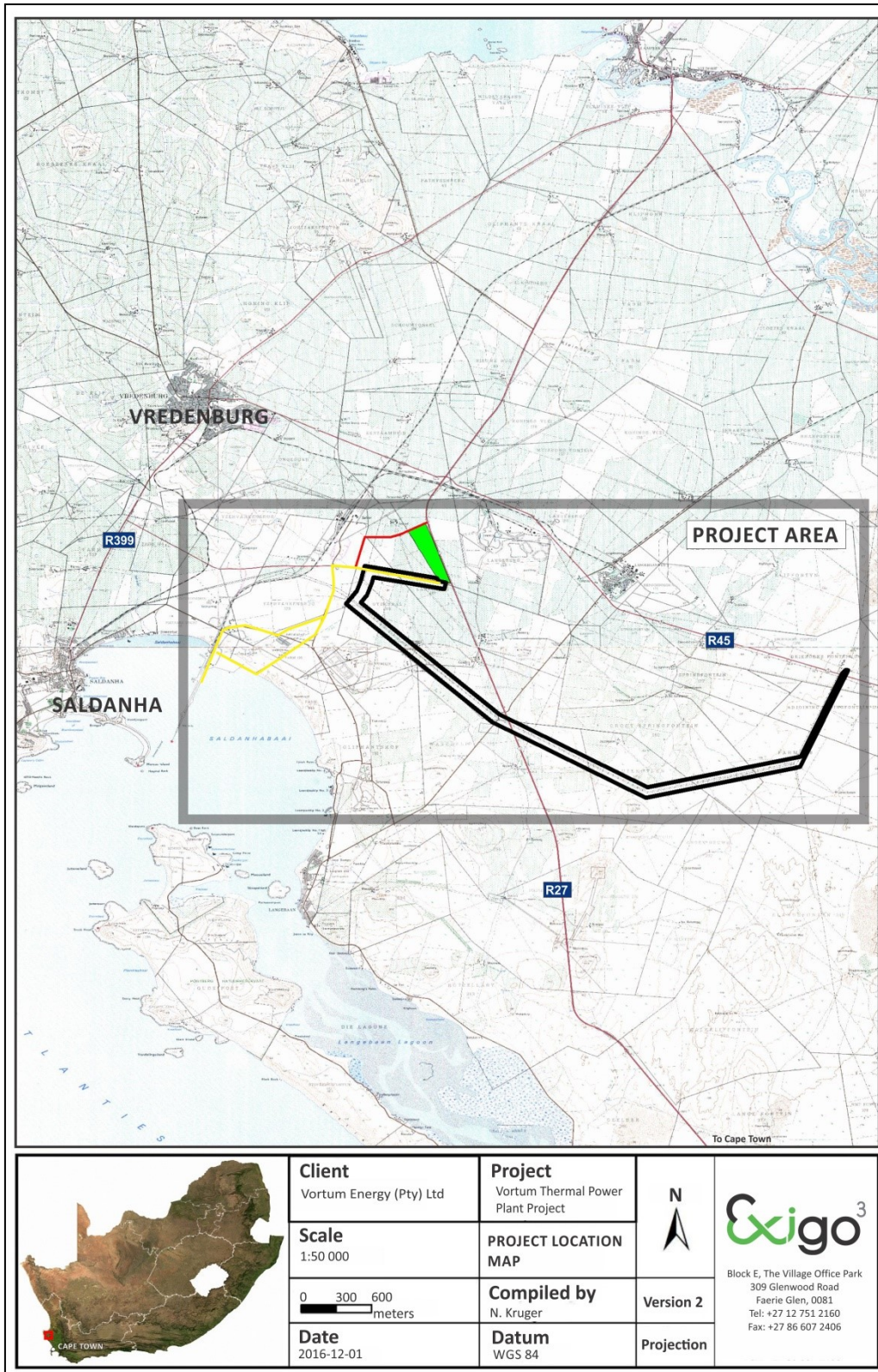


Figure 2-1: 1:50 00 Map representation of the location of the Vortum Thermal Power Plant Project Area (sheet 3218CA). The plant footprint is indicated in green, the proposed power line route is indicated in black, the access road is indicated in red and proposed gas / fuel pipeline options are indicated in yellow.

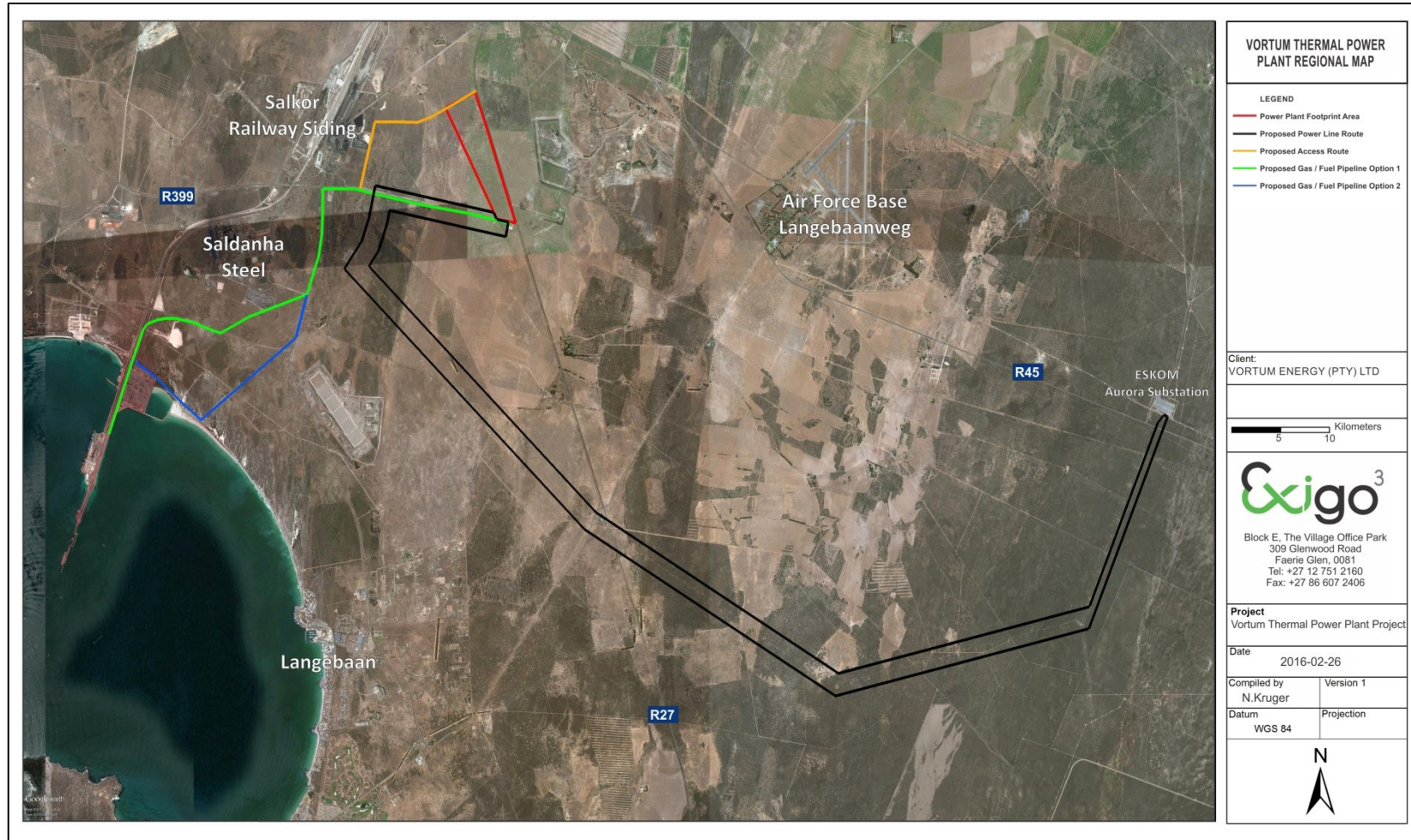


Figure 2-2: Aerial representation of the regional setting for the Vortum Thermal Power Plant project infrastructure components.



Figure 2-3: Panoramic view of the study area along the existing ESKOM power line at the time of the November 2015 survey.



Figure 2-4: View of general surroundings towards Saldanha Steel and the general study area at the time of the February 2016 survey.

3 METHOD OF ENQUIRY

3.1 Sources of Information

Data from detailed desktop, aerial and field studies were employed in order to sample surface areas systematically and to ensure a high probability of heritage site recording.

3.1.1 Desktop Study

A desktop study was prepared in order to contextualize the proposed project within a larger historical milieu. The study focused on relevant previous studies, archaeological and archival sources, aerial photographs, historical maps and local histories, all pertaining to the Richards Bay area and the larger landscape of this section of the Western Cape Province.

3.1.2 Aerial Representations and Survey

Aerial photography is often employed to locate and study archaeological sites, particularly where larger scale area surveys are performed. This method was applied to assist the foot and automotive site surveys where depressions, variation in vegetation, soil marks and landmarks were examined. Specific attention was given to shadow sites (shadows of walls or earthworks which are visible early or late in the day), crop mark sites (crop mark sites are visible because disturbances beneath crops cause variations in their height, vigour and type) and soil marks (e.g. differently coloured or textured soil (soil marks) might indicate ploughed-out burial mounds). Attention was also given to moisture differences, as prolonged dampening of soil as a result of precipitation frequently occurs over walls or embankments. By superimposing high frequency aerial photographs with images generated with Google Earth, potential sensitive areas were subsequently identified, geo-referenced and transferred to a handheld GPS device. These areas served as referenced points from where further vehicular and pedestrian surveys were carried out. From the aerial survey it is evident that the majority of surface areas subject to the Vortum Thermal Power Plant Project have been transformed by historical and more recent disturbances and impacts as a result of natural agents as well as cattle grazing.

3.1.3 Field Survey

Archaeological survey implies the systematic procedure of the identification of archaeological sites. An archaeological survey of the footprint area proposed for the thermal plant, the access road and the power line route was conducted in November 2015 and an additional field survey of the route options proposed for the fuel / gas pipeline was conducted in February 2016. In both instances, the process encompassed a systematic field survey in accordance with standard archaeological practice by which heritage resources are observed and documented. In order to sample surface areas systematically and to ensure a high probability of site recording, the footprint was systematically surveyed on foot by means of a transect survey and the entire power line route, access road route and route options for the pipeline were investigated on foot and by motor vehicle. GPS reference points identified during the aerial survey were also visited and random spot checks were made (see detail in previous section). Using a Garmin E-trex Legend GPS objects and structures of archaeological / heritage value were recorded and photographed with a Canon 450D Digital camera. Real time aerial orientation, by means of a mobile Google Earth application was also employed to investigate possible disturbed areas during the survey.

Since the landscape directly surrounding the Salanha harbour and the Transnet port has been entirely transformed and developed to accommodate relevant infrastructure, it is assumed that these areas are of low heritage concern and they were excluded from the site survey.

3.2 Limitations

3.2.1 Access

Access to the farm Langeberg is gained by means of a road that connects to the R27 West Coast road. The properties subject to the power line survey are accessed from the R45 and areas demarcating the pipeline options are accessed directly from the R399 road. Access control applies to a small developed area around the Saldanha harbour and Transnet port demarcating the offset of the proposed pipeline options and these areas were not surveyed. Besides for this limitation, no access constraints onto any further properties site subject to this study were encountered.

3.2.2 Survey Time

Survey time proved to be a constraint due to the large surface extent covered by the different project infrastructure components. In all cases, pedestrian site surveys focused around the proposed footprint for the thermal plant, as well as areas tentatively identified as sensitive (i.e. along drainage lines and those noted during the aerial survey) during aerial surveys.

3.2.3 Visibility

The surrounding vegetation in the larger landscape around Langeberg is mostly comprised out of Coastal Fynbos and deep sands with scattered trees and bushes. The general visibility at the time of the AIA surveys (November 2015, February 2016) was moderate to high due to vast surface disturbances occurring at the site. In single cases during the survey sub-surface inspection was possible. Where applied, this revealed no archaeological deposits.



Figure 3-1: View of general surroundings and old agriculture fields at the site of the power plant.



Figure 3-2: View of general surroundings and old agriculture fields at the site of the power plant, looking south.



Figure 3-3: View of general surroundings and old agriculture fields at the site of the power plant. The old Langeberg farmstead is visible in the distance.



Figure 3-4: View of general surroundings along the proposed access road route.



Figure 3-5: Large stone heaps, the result of agricultural activities, along the power line corridor



Figure 3-6: The proposed power line corridor, running parallel to the ESKOM power line.



Figure 3-7: The proposed power line corridor, running parallel to the ESKOM power line. Note deep coastal dunes.



Figure 3-8: The proposed power line corridor, running parallel to the ESKOM power line.



Figure 3-9: General surroundings along the proposed Option 1 for the gas / fuel pipeline.



Figure 3-10: Transformed surroundings near the Saldanha port along Option 1 for the gas / fuel pipeline.



Figure 3-11: General surroundings along the R399 demarcating a section of the proposed gas / fuel pipeline routes.



Figure 3-12: General surroundings in an old agricultural field along Option 2 for the gas / fuel pipeline.



Figure 3-13: Fynbos and coastal dunes along Option 2 for the gas / fuel pipeline.



Figure 3-14: View of fynbos and coastal dunes along Option 2 for the gas / fuel pipeline.



Figure 3-15: View towards the Saldanha port and the eastern offset of the gas / fuel pipelines. Note Fynbos and coastal dunes.

3.2.4 Limitations and Constraints

The pedestrian site survey for the Vortum Thermal Power Plant Project AIA primarily focused around areas tentatively identified as sensitive and of high heritage probability (i.e. those noted during the aerial survey) as well as areas of high human settlement catchment. The following constraints were encountered:

- **Survey Time and Extent:** Survey time proved to be a constraint due to the relatively large surface extent of the project area. Therefore, pedestrian site surveys focused around the proposed footprint for the thermal plant, as well as areas tentatively identified as sensitive (i.e. along drainage lines and those noted during the aerial survey) during aerial surveys.
- **Visibility:** Visibility proved to be a minor constrain in areas with denser surface cover, as well as portions where vegetation is more pristine.

Thus, even though it might be assumed that survey findings are representative of the heritage landscape of the project area for the Vortum Thermal Power Plant, it should be stated that the possibility exists that individual sites could be missed due to the localised nature of some heritage remains as well as the possible presence of sub-surface archaeology. Therefore, maintaining due cognisance of the integrity and accuracy of the archaeological survey, it should be stated that the heritage resources identified during the study do not necessarily represent all the heritage resources present in the project area. The subterranean nature of some archaeological sites, dense vegetation cover and visibility constraints sometimes distort heritage representations and any additional heritage resources located during consequent development phases must be reported to the Heritage Resources Authority or an archaeological specialist.

3.3 Impact Assessment

For consistency among specialists, impact assessment ratings by Exigo Specialist are generally done using the Plomp³ impact assessment matrix scale supplied by Exigo. According to this matrix scale, each heritage receptor in the study area is given an impact assessment. A cumulative assessment for the proposed project is also included.

4 ARCHAEO-HISTORICAL CONTEXT

4.1 The archaeology of Southern Africa

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

Table 1 Chronological Periods across southern Africa

Period	Epoch	Associated cultural groups	Typical Material Expressions
Early Stone Age 2.5m – 250 000 YCE	Pleistocene	Early Hominins: <i>Australopithecines</i> <i>Homo habilis</i> <i>Homo erectus</i>	Typically large stone tools such as hand axes, choppers and cleavers.
Middle Stone Age 250 000 – 25 000 YCE	Pleistocene	First <i>Homo sapiens</i> species	Typically smaller stone tools such as scrapers, blades and points.
Late Stone Age 20 000 BC – present	Pleistocene / Holocene	<i>Homo sapiens sapiens</i> including San people	Typically small to minute stone tools such as arrow heads, points and bladelets.
Early Iron Age / Early Farmer Period 300 – 900 AD	Holocene	First Bantu-speaking groups	Typically distinct ceramics, bead ware, iron objects, grinding stones.
Middle Iron Age (Mapungubwe / K2) / early Later Farmer Period 900 –	Holocene	Bantu-speaking groups, ancestors of present-day groups	Typically distinct ceramics, bead ware and iron / gold / copper objects, trade goods and grinding stones.

³ Plomp, H.,2004

1350 AD			
Late Iron Age / Later Farmer Period 1400 AD -1850 AD	Holocene	Various Bantu-speaking groups including Venda, Thonga, Sotho-Tswana and Zulu	Distinct ceramics, grinding stones, iron objects, trade objects, remains of iron smelting activities including iron smelting furnace, iron slag and residue as well as iron ore.
Historical / Colonial Period ±1850 AD – present	Holocene	Various Bantu-speaking groups as well as European farmers, settlers and explorers	Remains of historical structures e.g. homesteads, missionary schools etc. as well as, glass, porcelain, metal and ceramics.

4.2 Discussion: An archaeo-historical background of the Saldanha Region

A number of academic archaeological and historical studies have been conducted in this section of West Coast and these studies all infer a rich and diverse archaeological landscape, representative of critical phases of human and cultural development in southern Africa. These studies include a large number of Archaeological Impact Assessment Studies (e.g. Kaplan 1994, 1996a, 1996b, 1997a, 1997b, 2006a, 2006b) as well as studies on the area’s Palaeontology (Roberts 1997a, 1997b, Pether 2012), the Stone Age (Volman 1978, Grine & Klein 1993, Berger & Parkington 1995, Avery 1997).

4.2.1 Palaeontology & Stone Age

Saldanha Bay has a past which spans millions of years, and it’s the heritage is diverse and ancient including both land and marine components. In recent years, the West Coast of South Africa has become famous for its fossil wealth with the largest Miocene fossil deposit in the world, dating to 5-6 million years BCE. This deposit is situated just inland of Langebaan. Close to Hopefield, further inland, are the Pleistocene fossil beds at Elandsfontein (dating to the last million years) which are famous for the discovery of the early human species *Homo ergaster*, also known as the Saldanha man. Several Middle Stone Age (MSA) shell middens have been identified along coastal regions in this part of South Africa (Avery *et al.* 2008; Berger & Parkington 1995) but, even though these resources are generally of scientific value, they are linked to the coast and thus similar finds would not occur in the study area. Further Middle Stone Age material is known to occur at inland fossil sites such as Elandsfontein. A wealth of Later Stone Age (LSA) sites dating to within the last 5000 years have been documented in the Saldanha area, demonstrating a pronounced hunter gatherer, and later Khoekhoen pastoralist presence, where these groups camped on parts of the bay where there were rocky shorelines that could provide them with shellfish and other marine foods. As such, LSA sites are known to occur in association with specific landscape features e.g. silcrete outcrops where people have been quarrying stone for artefact manufacture (Kasteelberg 10 km northwest of Vredenburg and other smaller granite hills on the Vredenburg Peninsula), rocky outcrops where shelter was sought (shell middens associated with the rocky promontories of Lynch Point and Leentjiesklip) or sand dunes. With respect to the latter, some 20 km south of the study area Conard and Kandel (2006; Conard *et al.* 1999; Kandel & Conard 2005; Kandel *et al.* 2003) have described numerous occurrences of both MSA and LSA material located in deflating areas between the dunes. The same researchers have also worked in a large deflation at Anyskop, in the grounds of the Langebaanweg Fossil Park, where they found limited ESA and MSA artefacts as well as numerous LSA artefacts and burnt stones indicative of hearths (Dietl *et al.* 2005; Kandel & Conard n.d.). In particular, the Langebaan Limestone deposits in Saldanha Bay, has provided some of the earliest evidence for the human exploitation of coastal resources more than 100 000 years ago (Grine & Klein 1993).



Figure 4-1: A large shell midden on the West Coast of South Africa.

4.2.2 Pastoralism and the last 2000 years

Until 2000 years ago, hunter-gatherer communities traded, exchanged goods, encountered and interacted with other hunter-gatherer communities. From about 2000 years ago the social dynamics of the southern African landscape started changing with the immigration of two 'other' groups of people, different in physique, political, economic and social systems, beliefs and rituals. One of these groups, the Khoekhoe pastoralists or herders entered southern Africa with domestic animals, namely fat-tailed sheep and goats, travelling through the south towards the coast. They also introduced thin-walled pottery common in the interior and along the coastal regions of southern Africa. Their economic systems were directed by the accumulation of wealth in domestic stock numbers and their political make-up was more hierarchical than that of the hunter-gatherers.

4.2.3 Historical and Colonial Times and Recent History

The Historical period in southern Africa encompass the course of Europe's discovery of South Africa and the spreading of European settlements along the East Coast and subsequently into the interior. In addition, the formation stages of this period are marked by the large scale movements of various Bantu-speaking groups in the interior of South Africa, which profoundly influenced the course of European settlement. Finally, the final retreat of the San and Khoekhoen groups into their present-day living areas also occurred in the Historical period in southern Africa.

4.2.4 Historical Period / Recent Sites

Since its discovery Saldanha Bay (named after Antonio de Saldanha who visited the Cape in the early 1500's) was used as a safe anchorage by virtually all seafaring nations. However, it was never permanently settled until late in the history of the Cape. The Dutch East India Company or the VOC (*Vereenigde Oostindische Compagnie*) selected Table Bay as their favoured location to establish a permanent re-victualing station even though the anchorage of Table Bay was far inferior and much more dangerous than that of Saldanha. The reason being that Table Bay had permanent water, arable land, supplies of wood and was generally well suited to land based settlement. Being anxious to maintain a presence at Saldanha Bay,

the VOC established a small garrison on the Posberg Peninsula in 1666. The handful of men equipped with one or two small cannons kept a watch on maritime traffic as the French who were frequently at war with the Dutch used the bay to invade the tiny Dutch garrison. The bay remained in Dutch hands until the first British occupation of 1795. Development of the area was restricted to sparse farms and fishing which was centred at the small hamlet of Hoedjiesbaai. In 1820 a group of Irish settlers landed at Saldanha Bay and lived there for a period of time before moving inland where they established the town of Clanwilliam in the Olifants River Valley where they were allocated land. In the early 20th century whale fisheries were established at Donkergat and Salamander Bay which saw increased growth of the hamlet with the installation of jetties and coaling facilities. By the late 1930's the whaling industry had collapsed. Several ex-whale catchers were converted for military service and served with distinction through World War 2; others were scuttled at Salamander Bay and Donkergat. In 1942 Saldanha Bay became a defended anchorage with boom defences, a mine field and batteries on each side of the entrance to the bay. The bay itself was extensively used by convoys and warships alike. A permanent naval base was established and the area's water problems were at last resolved when military engineers established a water supply which was piped from the Berg River.

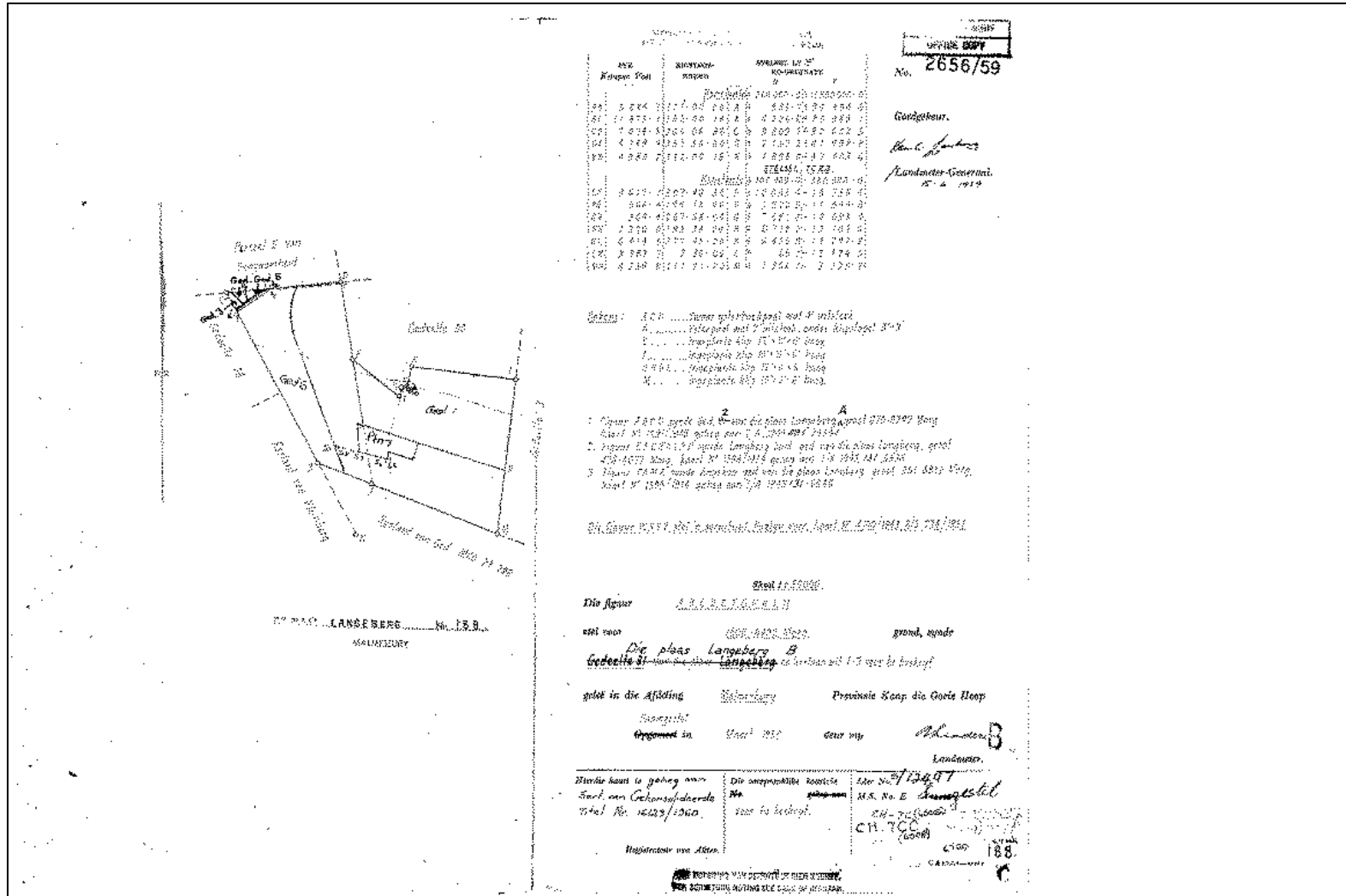


Figure 4-2: The original title deed for the farm Langeberg.

4.2.5 Burial Sites / Human Remains

Human remains and burials are commonly found close to archaeological sites; they may be found in "lost" graveyards, or occur sporadically anywhere as a result of prehistoric activity, victims of conflict or crime. It is often difficult to detect the presence of archaeological human remains on the landscape as these burials, in most cases, are not marked at the surface. Human remains are usually observed when they are exposed through erosion. In some instances packed stones or rocks may indicate the presence of informal pre-colonial burials. If any human bones are found during the course of construction work then they should be reported to an archaeologist and work in the immediate vicinity should cease until the appropriate actions have been carried out by the archaeologist. Where human remains are part of a burial they would need to be exhumed under a permit from either HWC (for pre-colonial burials) or SAHRA (Burials later than about AD 1500).

5 RESULTS: ARCHAEOLOGICAL SURVEY

In terms of heritage resources, the landscape around Saldanha is primarily well known for the occurrence of Stone Age and Colonial Period heritage remains. However, the landscape directly surrounding the project area has been adversely transformed where agricultural fields sterilising these zones of heritage remains. A Colonial Period occupation site was identified in the project area and this occurrence was uniquely coded **EXIGO-VTP-HPxx** (Exigo Vortum Thermal Plant Historical Period xx).

5.1 The Stone Age

The Agency for Cultural Resource Management (ACRM) conducted a heritage survey on the entire Langeberg farm in 2007 (Kaplan 2007). Their survey located a small number of quartz artefacts and a piece of weathered ostrich eggshell in a wind-deflated hollow elsewhere on the property. Single Earlier Stone Age (ESA) quartzite lithics as well as a Middle Stone Age (MSA) flake in quartzite were also found on the steep west facing vegetated slopes. These archaeological occurrences were been rated as having low local significance. However, no Stone Age remains were observed during the survey for the Vortum Thermal Plant, access road and power line corridor. However, Stone Age material occurs in the larger landscape and the remains of e.g. pastoralist sites such as Kasteelberg in the Vredenburg Peninsula are likely to be encountered in areas that have not been transformed by farming.

5.2 Historical / Colonial Period and recent times

- Site Exigo-VTP-HP01 S33.003421° E18.022815°

A Colonial Period occupation site was documented on the farm Hopefield 195 directly west of the proposed second option for the gas / pipeline and approximately 1km from the Saldanha coastline. Initial observations indicate that the site, measuring approximately 100m x 50m, consists of the following features and structures:

- The dilapidated remains of a rectangular stone building, measuring approximately 4m x 8m. The walls have been constructed out of a mud-based mortar and calcrete rocks.
- A square foundation structure measuring approximately 5m x 5m, constructed out of plat stones.
- The dilapidated remains of rectangular multi-room structure, measuring approximately 3m x 6m. It seems that 3 individual rooms formed part of the building, which has been constructed out of a mud-based mortar and calcrete rocks.
- A number of flat stones protruding from the surface and arranged in a curricular pattern, probably demarcating the remains of a threshing floor. The Structure measures approximately 15m in diameter.

- At least two middens rich in material culture such as glass fragments and glass objects, ceramic (porcelain), rusted metal as well as faunal remains.

Generally, the site might be associated with the early phases of settlement of the farm Hopefield, which was proclaimed in 1891 since material culture such as bottle fragments and porcelain clearly indicate a Colonial Period provenience. The West Coast region around Saldanha and Langebaan is rich in Colonial remnants and similar occurrences have been documented directly north of the study area on the farm Uyekraal and the remains of a 19th Century shepherds hut occur on the nearby Mittal Steel/Saldanha Steel Site (Kaplan 1996b).

Since the site is, according to indications older than 60 years, it is a protected heritage resource. In addition, the site is highly significant since it has the potential to add to a better understanding of Colonial architectural and social developments in the Saldanha farming landscape and along the West Coast historical frontier. The periphery of the site occurs no more than 50m from the proposed second option for the fuel / gas pipeline and impact on the site is probable.

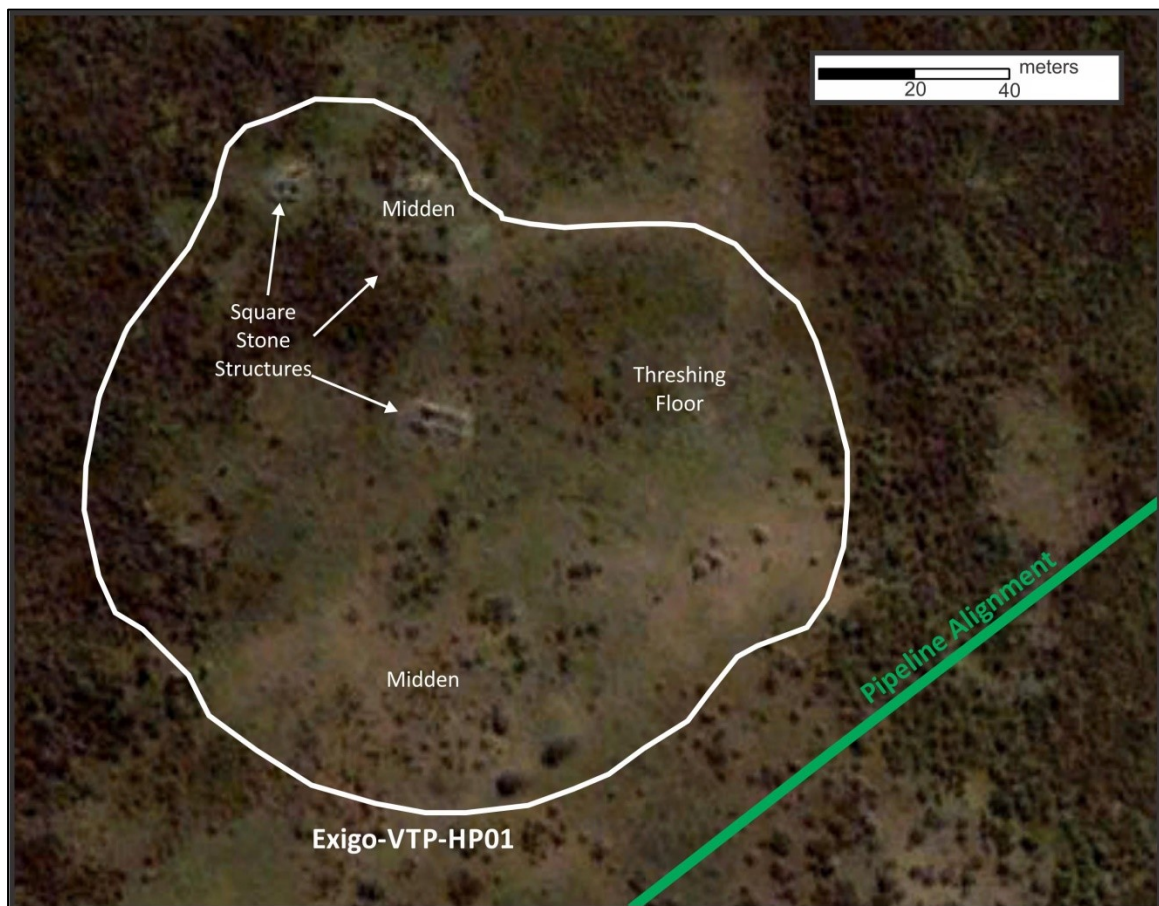


Figure 5-1: Aerial site plan indicating the location of heritage features at Site EXIGO-VTP-HP01.



Figure 5-2: A large rectangular stone structure at Site EXIGO-VTP-HP01. Note mortar fill in wall construction.



Figure 5-3: The remains of a square foundation structure at Site EXIGO-VTP-HP01.



Figure 5-4: A small multi-room stone structure at Site EXIGO-VTP-HP01.



Figure 5-5: Upright stones indicating the edge of a threshing floor at Site EXIGO-VTP-HP01.



Figure 5-6: Colonial Period glass bottle fragments from a midden at Site EXIGO-VTP-HP01.



Figure 5-7: Rusted metal and glass fragments from Site EXIGO-VTP-HP01.



Figure 5-8: A surface occurrence of glass, porcelain, metal and fauna from Site EXIGO-VTP-HP01.



Figure 5-9: A broken fragment of a glass bowl and faunal remains from a midden at Site EXIGO-VTP-HP01.

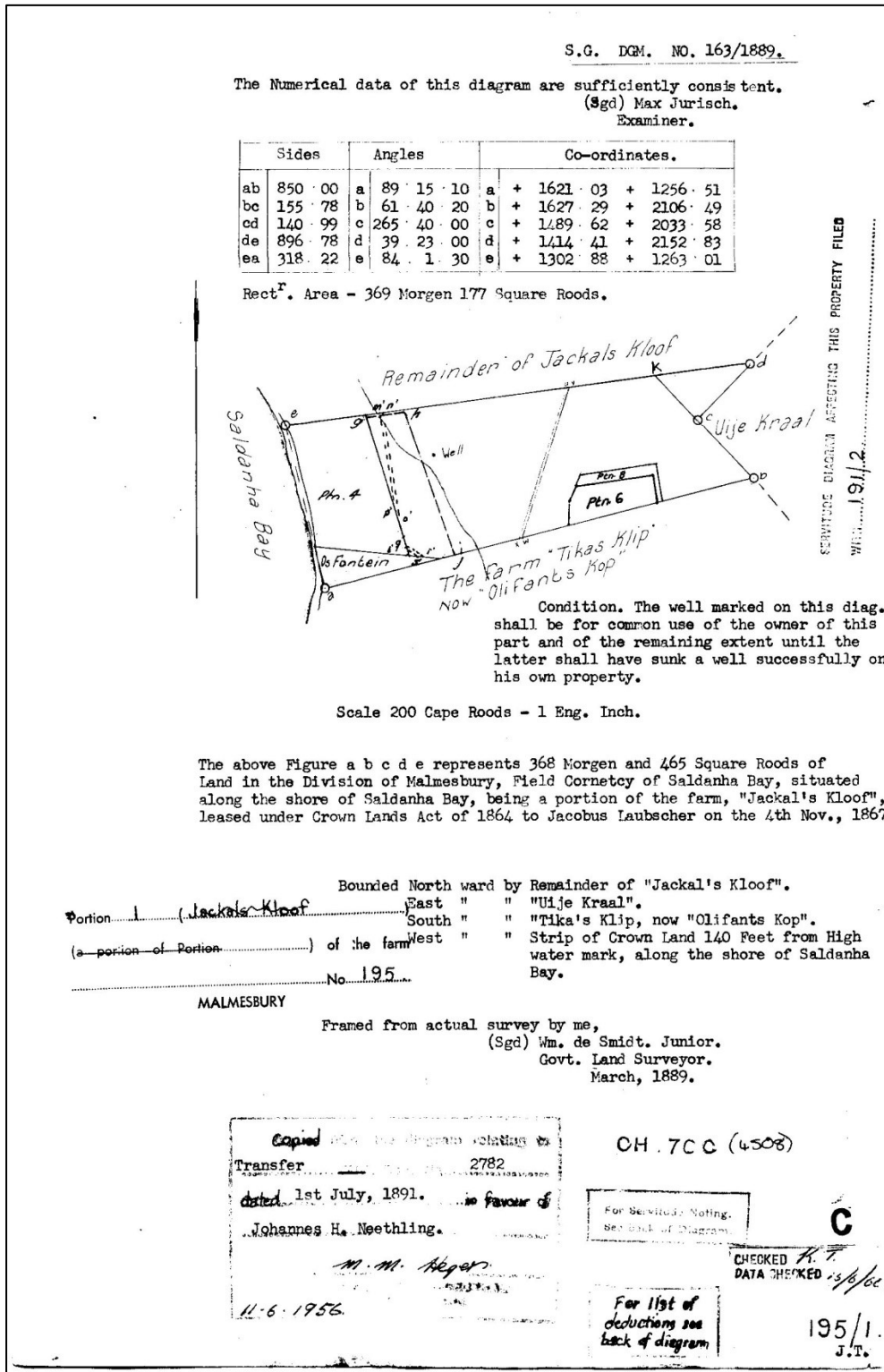


Figure 5-10: Title deed for the farm Hopefield indicating the founding date of 1891 of the farm.

5.3 Graves

No human burials were observed in the survey area but graves may be exposed or uncovered during earthmoving operations.

5.4 Other Features

A number of large stone heaps are scattered along both options for the gas / fuel pipeline on the farm Hopefield 195 but the provenance and context of these features are not known. It is unlikely that the heaps are archaeological or historical in nature. They are probably the result of large scale clearing in order to improve grazing for livestock. This might also be implied by the occurrence of *Cynodon dactylon* (fynkweek); a grazing grass sowed on the site at some point, and still present on site⁴.



Figure 5-11: A large stone heap in the study area.

⁴ See Helme, N. 2011. *Botanical fatal flaw analysis of proposed development site on Uyekraal 189/o, near Saldanha, Western Cape.*

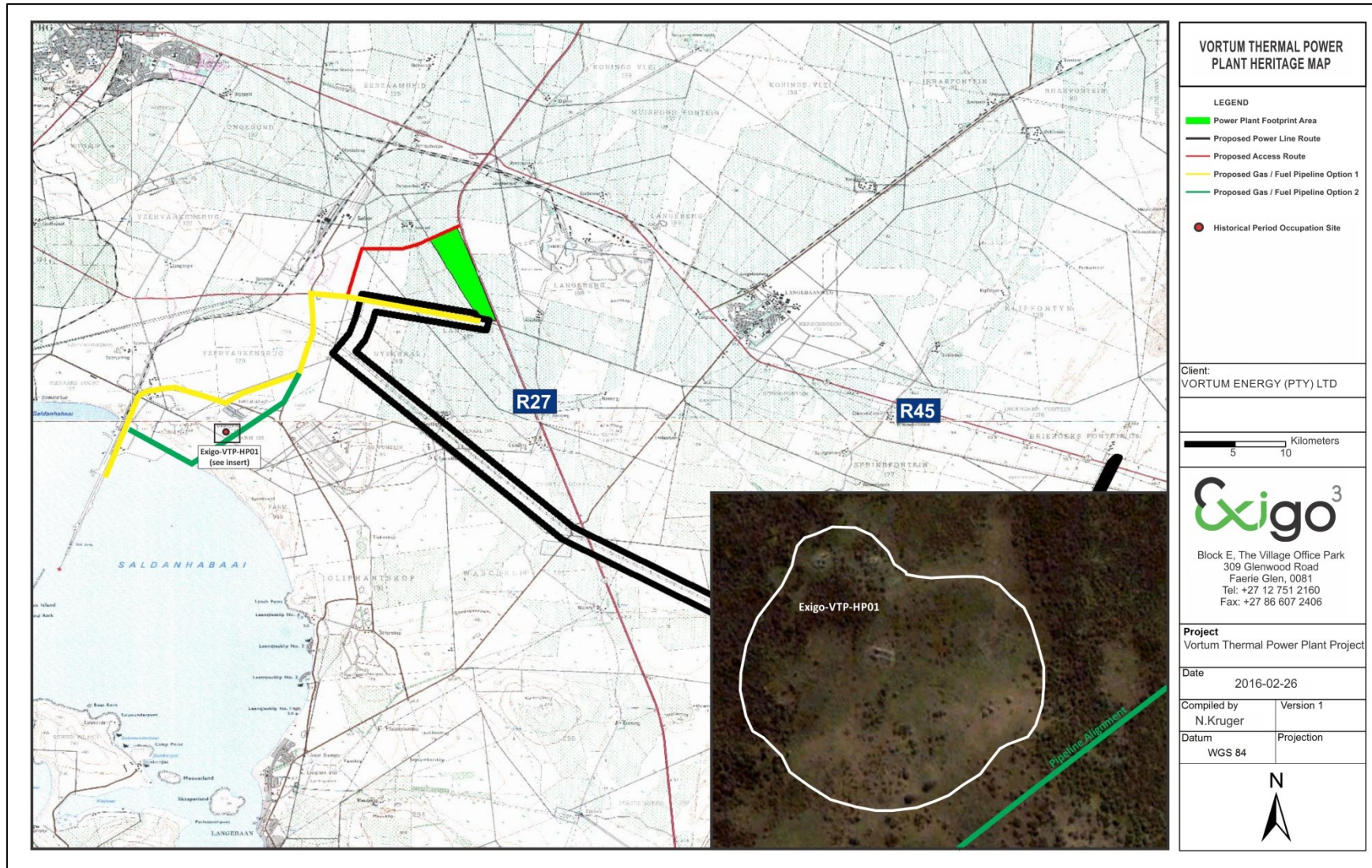


Figure 5-12: Map indicating the location of the heritage occurrence discussed in the text.

6 RESULTS: STATEMENT OF SIGNIFICANCE AND IMPACT RATING

6.1 Potential Impacts and Significance Ratings⁵

The following section provides a background to the identification and assessment of possible impacts and alternatives, as well as a range of risk situations and scenarios commonly associated with heritage resources management. A guideline for the rating of impacts and recommendation of management actions for areas of heritage potential within the study area is supplied in Section 10.2 of the Addendum.

6.1.1 General assessment of impacts on resources

Generally, the value and significance of archaeological and other heritage sites might be impacted on by any activity that would result immediately or in the future in the destruction, damage, excavation, alteration, removal or collection from its original position, any archaeological material or object (as indicated in the National Heritage Resources Act (No 25 of 1999)). Thus, the destructive impacts that are possible in terms of heritage resources would tend to be direct, once-off events occurring during the initial construction period. However, in the long run, the proximity of operations in any given area could result in secondary indirect impacts. The EIA process therefore specifies impact assessment criteria which can be utilised from the perspective of a heritage specialist study which elucidates the overall extent of impacts.

6.1.2 Direct impact rating

Direct or primary effects on heritage resources occur at the same time and in the same space as the activity, e.g. loss of historical fabric through demolition work. **Indirect effects or secondary effects** on heritage resources occur later in time or at a different place from the causal activity, or as a result of a complex pathway, e.g. restriction of access to a heritage resource resulting in the gradual erosion of its significance, which is dependent on ritual patterns of access (refer to Section 10.3 in the Addendum for an outline of the relationship between the significance of a heritage context, the intensity of development and the significance of heritage impacts to be expected). The following table summarizes impacts to archaeological material anticipated for the Vortum Thermal Plant Project:

- **Site EXIGO-VTP-HP01**

NATURE OF IMPACT: Impact could involve displacement or destruction of Historical Period material along in the project area footprint.		
	Without mitigation	With mitigation
EXTENT	Local	Local
DURATION	Permanent	Permanent
MAGNITUDE	Major	Minor
PROBABILITY	Probable	Very improbable
SIGNIFICANCE	Low	Low
STATUS	Negative	Neutral
REVERSIBILITY	Non-reversible	Non-reversible
IRREPLACEABLE LOSS OF RESOURCES?	Yes	No

⁵ Based on: Winter, S. & Baumann, N. 2005. *Guideline for involving heritage specialists in EIA processes: Edition 1.*

CAN IMPACTS BE MITIGATED?	Yes
MITIGATION: Avoidance, Site monitoring by ECO, Phase 2 Investigation & destruction permitting (if avoidance is not feasible).	
CUMULATIVE IMPACTS: No cumulative impact is anticipated.	
RESIDUAL IMPACTS: n/a	

6.1.3 Discussion: Evaluation of Results and Impacts

Previous studies conducted in the larger Saldanha area suggest a rich and diverse archaeological landscape and cognisance should be taken of archaeological material that might be present in surface and sub-surface deposits along drainage lines, in coastal dune fields and pockets of natural vegetation.

A Colonial Period occupation site (**EXIGO-VTP-HP01**) is of high significance and it is located in close proximity of the proposed fuel / gas pipeline option 2. A PERIPHERAL impact on the structure could occur but the threshold of the potential impact could be limited to a LOW impact by the implementation of mitigation measures (avoidance, site monitoring, site documentation and Phase 2 assessment, destruction permitting). As such, the author of this assessment is of the opinion that Option 1 is better suited for the gas / fuel pipeline in terms of regional heritage sensitivity.

A significant heritage receptor occurs in proposed Vortum Thermal Plant Project area and unmitigated impact to the heritage resource is probable. However, it is the opinion of the author of this Archaeological Impact Assessment Report that the proposed Vortum Thermal Plant Project may proceed from a culture resources management perspective, provided that mitigation measures included in this assessment, and endorsed by the relevant Heritage Resources Agency are implemented.

6.2 Management actions

Recommendations for relevant heritage resources management actions are vital to the conservation of heritage resources. A general guideline for recommended management actions is included in Section 10.4 of the Addendum. The following management measures would be required during implementation of the proposed Vortum Thermal Power Plant Project.

OBJECTIVE: prevent unnecessary disturbance and/or destruction of previously undetected heritage receptors.

- ***For the remains of a Colonial Period settlement (EXIGO-VTP-HP01) the following are required in terms of heritage management and mitigation:***

PROJECT COMPONENT/S	All phases of construction and operation.
POTENTIAL IMPACT	Damage/destruction of sites.
ACTIVITY RISK/SOURCE	Digging foundations and trenches into sensitive deposits that are not visible at the surface.
MITIGATION: TARGET/OBJECTIVE	To locate previously undetected heritage remains / graves as soon as possible after disturbance so as to maximize the chances of successful rescue/mitigation work.

MITIGATION: ACTION/CONTROL		RESPONSIBILITY	TIMEFRAME
Fixed Mitigation Procedure (required)			
Site Monitoring: Regular examination of trenches and excavations in order to detect and preserve previously undocumented heritage receptors.		ECO, HERITAGE ASSESSMENT PRACTITIONER	Monitor as frequently as practically possible.
Preferred Mitigation Procedure			
<p>Exclusion: Exclude this option for the gas / fuel pipeline in the design for the project.</p> <p>Avoidance & Redesign: If the option cannot be excluded, implement a heritage conservation buffer of at least 100m around the heritage resource; avoid the heritage resource and the proposed conservation buffer. Redesign the pipeline alignment (option 2) to avoid the heritage resource and the proposed conservation buffer. Implement a site management plan in terms of site access and general conservation measures.</p>		DEVELOPER, HERITAGE ASSESSMENT PRACTITIONER	Prior to the commencement of construction and earth-moving.
Alternative Mitigation Procedure (if preferred mitigation procedure is not feasible)			
If site will be impacted on, conduct a Phase 2 Specialist Study (mapping, suite sampling, desktop study). Excavation and destruction permitting if and when required.		HERITAGE ASSESSMENT PRACTITIONER	Prior to the commencement of construction and earth-moving.
PERFORMANCE INDICATOR	Archaeological sites are discovered and mitigated with the minimum amount of unnecessary disturbance.		
MONITORING	Successful location of sites by person/s monitoring.		

7 RECOMMENDATIONS

The larger landscape around Saldanha Bay is primarily well known for the occurrence of Palaeontological, Stone Age and Colonial Period heritage remains. However, much of the landscape demarcating the project area has been adversely transformed where agricultural lands have been established in the past and it might be assumed that many areas have largely been sterilised of heritage remains. The following recommendations are made based on heritage findings and general observations in the proposed Vortum Thermal Power Plant Project development areas:

- The coastal dune veld of the survey area along the second option for the gas / fuel pipeline constitutes the area of main heritage conservation priority where a Colonial Period occupation site (Exigo-VTP-HP01) was recorded. It is primarily recommended that Option 2 be excluded for consideration for the gas / fuel pipeline. However, should the option remain it is recommended that a conservation buffer zone of 100m be implemented around the site. In addition, the design of the pipeline should be adjusted to avoid the site and of the proposed conservation buffer. A heritage site management plan should be compiled in order to stipulate consecration measures for the site. Should impact on the site prove inevitable a Phase 2 archaeological specialist assessment of the site will be required. Such an assessment should minimally include mapping of all features, sampling of cultural and other remains that will adequately allow the temporal, cultural and spatial classification of the site and further desktop studies in order to contextualize the site within the larger historical landscape. This measure should be undertaken subject to the

relevant permitting requirements from the competent heritage authority (HWC). A destruction permit should be obtained prior to the final destruction of the site.

- Considering the localised nature of heritage remains, the general monitoring of the development progress by an ECO or by the heritage specialist is recommended for all stages of the project. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during construction activities, all activities should be suspended and the archaeological specialist should be notified immediately
- Since the area is situated in a palaeontologically sensitive landscape, a Palaeontological Impact Assessment should be conducted by a qualified specialist. Should fossil remains such as fossil fish, reptiles or vitrified wood be exposed during construction, these objects should be carefully safeguarded and the relevant heritage resources authority (HWC) should be notified immediately so that the appropriate action can be taken by a professional palaeontologist.
- It is essential that cognisance be taken of the larger archaeological landscape of the area in order to avoid the destruction of previously undetected heritage sites. It should be stated that it is likely that further undetected archaeological remains might occur elsewhere in the Study Area along water sources and drainage lines, fountains and pans would often have attracted human activity in the past. Also, since Stone Age material seems to originate from below present soil surfaces in eroded areas, the larger landscape should be regarded as potentially sensitive in terms of possible subsurface deposits. Burials and historically significant structures dating to the Colonial Period occur on farms in the area and these resources should be avoided during all phases of construction and development, including the operational phases of the thermal plant.

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

- As Palaeontological remains occur where bedrock has been exposed, all geological features should be regarded as sensitive.
- Water sources such as drainage lines, fountains and pans would often have attracted human activity in the past. As Stone Age material the larger landscape should be regarded as potentially sensitive in terms of possible subsurface deposits.

8 GENERAL COMMENTS AND CONDITIONS

This AIA report serves to confirm the extent and significance of the heritage landscape of the proposed Vortum Thermal Power Plant Project Development area. The larger heritage horizon encompasses rich and diverse archaeological landscapes and cognisance should be taken of heritage resources and archaeological material that might be present in surface and sub-surface deposits. If, during construction, any possible archaeological material culture discoveries are made, the operations must be stopped and a qualified archaeologist be contacted for an assessment of the find. Such material culture might include:

- Formal Earlier Stone Age stone tools.
- Formal MSA stone tools.
- Formal LSA stone tools.
- Potsherds
- Iron objects.
- Beads made from ostrich eggshell and glass.
- Ash middens and cattle dung deposits and accumulations.
- Faunal remains.
- Human remains/graves.

- Stone walling or any sub-surface structures.
- Historical glass, tin or ceramics.
- Fossils.

If such site were to be encountered or impacted by any proposed developments, recommendations contained in this report, as well as endorsement of mitigation measures as set out by AMAFA, SAHRA, the National Resources Act and the CRM section of ASAPA will be required.

It must be emphasised that the conclusions and recommendations expressed in this archaeological heritage sensitivity investigation are based on the visibility of archaeological sites/features and may not therefore, represent the area's complete archaeological legacy. Many sites/features may be covered by soil and vegetation and might only be located during sub-surface investigations. If subsurface archaeological deposits, artefacts or skeletal material were to be recovered in the area during construction activities, all activities should be suspended and the archaeological specialist should be notified immediately (**cf. NHRA (Act No. 25 of 1999)**, Section 36 (6)). It must also be clear that Archaeological Specialist Reports will be assessed by the relevant heritage resources authority (SAHRA).

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10 ADDENDUM 1: CONVENTIONS USED TO ASSESS THE SIGNIFICANCE OF HERITAGE

10.1 Site Significance Matrix

According to the NHRA, Section 2(vi) the **significance** of heritage sites and artefacts is determined by its aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technical value in relation to the uniqueness, condition of preservation and research potential. It must be kept in mind that the various aspects are not mutually exclusive, and that the evaluation of any site is done with reference to any number of these. The following matrix is used for assessing the significance of each identified site/feature.

2. SITE EVALUATION			
2.1 Heritage Value (NHRA, section 2 [3])	High	Medium	Low
It has importance to the community or pattern of South Africa's history or pre-colonial history.			
It possesses unique, uncommon, rare or endangered aspects of South Africa's natural or cultural heritage.			

It has potential to yield information that will contribute to an understanding of South Africa's natural and cultural heritage.			
It is of importance in demonstrating the principle characteristics of a particular class of South Africa's natural or cultural places or objects.			
It has importance in exhibiting particular aesthetic characteristics valued by a particular community or cultural group.			
It has importance in demonstrating a high degree of creative or technical achievement at a particular period.			
It has marked or special association with a particular community or cultural group for social, cultural or spiritual reasons (sense of place).			
It has strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa.			
It has significance through contributing towards the promotion of a local sociocultural identity and can be developed as a tourist destination.			
It has significance relating to the history of slavery in South Africa.			
It has importance to the wider understanding of temporal changes within cultural landscapes, settlement patterns and human occupation.			
2.2 Field Register Rating			
National/Grade 1 [should be registered, retained]			
Provincial/Grade 2 [should be registered, retained]			
Local/Grade 3A [should be registered, mitigation not advised]			
Local/Grade 3B [High significance; mitigation, partly retained]			
Generally Protected A [High/Medium significance, mitigation]			
Generally protected B [Medium significance, to be recorded]			
Generally Protected C [Low significance, no further action]			
2.3 Sphere of Significance	High	Medium	Low
International			
National			
Provincial			
Local			
Specific community			

10.2 Impact Assessment Criteria

The following table provides a guideline for the rating of impacts and recommendation of management actions for sites of heritage potential.

Significance of the heritage resource

This is a statement of the nature and degree of significance of the heritage resource being affected by the activity. From a heritage management perspective it is useful to distinguish between whether the significance is embedded in the physical fabric or in associations with events or persons or in the experience of a place; i.e. its visual and non-visual qualities. This statement is a primary informant to the nature and degree of significance of an impact and thus needs to be thoroughly considered. Consideration needs to be given to the significance of a heritage resource at different scales (i.e. sitespecific, local, regional, national or international) and the relationship between the heritage resource, its setting and its associations.

Nature of the impact

This is an assessment of the nature of the impact of the activity on a heritage resource, with some indication of its positive and/or negative effect/s. It is strongly informed by the statement of resource significance. In other words, the nature of the impact may be historical, aesthetic, social, scientific, linguistic or architectural, intrinsic, associational or contextual (visual or non-visual). In many cases, the nature of the impact will include more than one value.

Extent

Here it should be indicated whether the impact will be experienced:

- On a site scale, i.e. extend only as far as the activity;
- Within the immediate context of a heritage resource;
- On a local scale, e.g. town or suburb
- On a metropolitan or regional scale; or
- On a national/international scale.

Duration

Here it should be indicated whether the lifespan of the impact will be:

- Short term, (needs to be defined in context)
- Medium term, (needs to be defined in context)
- Long term where the impact will persist indefinitely, possibly beyond the operational life of the activity, either because of

natural processes or

by human intervention; or

- Permanent where mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the

impact can be considered transient.

Of relevance to the duration of an impact are the following considerations:

- Reversibility of the impact; and
- Renewability of the heritage resource.

Intensity

Here it should be established whether the impact should be indicated as:

- Low, where the impact affects the resource in such a way that its heritage value is not affected;
- Medium, where the affected resource is altered but its heritage value continues to exist albeit in a modified way; and
- High, where heritage value is altered to the extent that it will temporarily or permanently be damaged or destroyed.

Probability

This should describe the likelihood of the impact actually occurring indicated as:

- Improbable, where the possibility of the impact to materialize is very low either because of design or historic experience;
- Probable, where there is a distinct possibility that the impact will occur;
- Highly probable, where it is most likely that the impact will occur; or
- Definite, where the impact will definitely occur regardless of any mitigation measures

Confidence

This should relate to the level of confidence that the specialist has in establishing the nature and degree of impacts. It relates to the level and reliability of information, the nature and degree of consultation with I&AP's and the dynamic of the broader socio-political context.

- High, where the information is comprehensive and accurate, where there has been a high degree of consultation and the socio-political

context is relatively stable.

- Medium, where the information is sufficient but is based mainly on secondary sources, where there has been a limited targeted consultation

and socio-political context is fluid.

- Low, where the information is poor, a high degree of contestation is evident and there is a state of socio-political flux.

Impact Significance

The significance of impacts can be determined through a synthesis of the aspects produced in terms of the nature and degree of heritage significance and the nature, duration, intensity, extent, probability and confidence of impacts and can be described as:

- Low; where it would have a negligible effect on heritage and on the decision
- Medium, where it would have a moderate effect on heritage and should influence the decision.
- High, where it would have, or there would be a high risk of, a big effect on heritage. Impacts of high significance should

have a major

influence on the decision;

- Very high, where it would have, or there would be high risk of, an irreversible and possibly irreplaceable negative impact on heritage. Impacts

of very high significance should be a central factor in decision-making.

10.3 Direct Impact Assessment Criteria

The following table provides an outline of the relationship between the significance of a heritage context, the intensity of development and the significance of heritage impacts to be expected

HERITAGE CONTEXT	TYPE OF DEVELOPMENT			
	CATEGORY A	CATEGORY B	CATEGORY C	CATEGORY D
CONTEXT 1 High heritage Value	Moderate heritage impact expected	High heritage impact expected	Very high heritage impact expected	Very high heritage impact expected
CONTEXT 2 Medium to high heritage value	Minimal heritage impact expected	Moderate heritage impact expected	High heritage impact expected	Very high heritage impact expected
CONTEXT 3 Medium to low heritage value	Little or no heritage impact expected	Minimal heritage impact expected	Moderate heritage impact expected	High heritage impact expected
CONTEXT 4 Low to no heritage value	Little or no heritage impact expected	Little or no heritage impact expected	Minimal heritage value expected	Moderate heritage impact expected
NOTE: A DEFAULT "LITTLE OR NO HERITAGE IMPACT EXPECTED" VALUE APPLIES WHERE A HERITAGE RESOURCE OCCURS OUTSIDE THE IMPACT ZONE OF THE DEVELOPMENT.				
HERITAGE CONTEXTS	CATEGORIES OF DEVELOPMENT			
<p>Context 1: Of high intrinsic, associational and contextual heritage value within a national, provincial and local context, i.e. formally declared or potential Grade 1, 2 or 3A heritage resources</p> <p>Context 2: Of moderate to high intrinsic, associational and contextual value within a local context, i.e. potential Grade 3B heritage resources.</p> <p>Context 3: Of medium to low intrinsic, associational or contextual heritage value within a national, provincial and local context, i.e. potential Grade 3C heritage resources</p> <p>Context 4: Of little or no intrinsic, associational or contextual heritage value due to disturbed, degraded conditions or extent of irreversible damage.</p>	<p>Category A: Minimal intensity development</p> <ul style="list-style-type: none"> - No rezoning involved; within existing use rights. - No subdivision involved. - Upgrading of existing infrastructure within existing envelopes - Minor internal changes to existing structures - New building footprints limited to less than 1000m2. <p>Category B: Low-key intensity development</p> <ul style="list-style-type: none"> - Spot rezoning with no change to overall zoning of a site. - Linear development less than 100m - Building footprints between 1000m2-2000m2 - Minor changes to external envelop of existing structures (less than 25%) - Minor changes in relation to bulk and height of immediately adjacent structures (less than 25%). <p>Category C: Moderate intensity development</p> <ul style="list-style-type: none"> - Rezoning of a site between 5000m2-10 000m2. - Linear development between 100m and 300m. - Building footprints between 2000m2 and 5000m2 - Substantial changes to external envelop of existing structures (more than 50%) - Substantial increase in bulk and height in relation to immediately adjacent buildings (more than 50%) <p>Category D: High intensity development</p> <ul style="list-style-type: none"> - Rezoning of a site in excess of 10 000m2 - Linear development in excess of 300m. - Any development changing the character of a site exceeding 5000m2 or involving the subdivision of a site into three or more erven. - Substantial increase in bulk and height in relation to immediately adjacent buildings (more than 100%) 			

10.4 Management and Mitigation Actions

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

No further action / Monitoring

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

Avoidance

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

Mitigation

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

Compensation

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

Rehabilitation

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

- The heritage resource is degraded or in the process of degradation and would benefit from rehabilitation.
- Where rehabilitation implies appropriate conservation interventions, i.e. adaptive reuse, repair and maintenance, consolidation and minimal loss of historical fabric.
- Where the rehabilitation process will not result in a negative impact on the intrinsic value of the resource.

Enhancement

Enhancement is appropriate where the overall heritage significance and its public appreciation value are improved. It does not imply creation of a condition that might never have occurred during the evolution of a place, e.g. the tendency to sanitize the past. This management action might result from the removal of previous layers where these layers are culturally of low significance and detract from the significance of the resource. It would be appropriate in a range of heritage contexts and applicable to a range of resources.

In the case of formally protected or significant resources, appropriate enhancement action should be encouraged. Care should, however, be taken to ensure that the process does not have a negative impact on the character and context of the resource. It would thus have to be carefully monitored