

ENVIRONMENTAL MANAGEMENT PROGRAMME

REF.NO. WC30/5/1/2/2/10043

In terms of the MPRDA, 2002 - Portion 4 of the farm Elandsfontein No. 349 and a Portion of Portion 2 of the farm Elandsfontein No. 349, Malmesbury RD, Western Cape Province



BRAAF

ENVIRONMENTAL PRACTITIONERS

ENVIRONMENTAL IMPACT ASSESSMENT
AND
ENVIRONMENTAL MANAGEMENT PROGRAMME
SUBMITTED FOR AN APPLICATION
FOR A MINING RIGHT
IN TERMS OF SECTION 39 AND OF
REGULATIONS 50 AND 51 OF THE MINERAL
AND PETROLEUM RESOURCES DEVELOPMENT
ACT, 2002, (ACT NO. 28 OF 2002) (the Act)



mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

STANDARD DIRECTIVE

All applicants for mining rights are herewith, in terms of the provisions of Section 29 (a) and in terms of section 39 (5) of the Mineral and Petroleum Resources Development Act, directed to submit an environmental Impact Assessment, and an Environmental Management Programme strictly in accordance with the subject headings herein, and to compile the content according to all the sub items to the said subject headings referred to in the guideline published on the Departments website, within 30 days of notification by the Regional Manager of the acceptance of such application.

PROJECT INFORMATION

TITLE : REVISED SCOPING REPORT FOR A PROPOSED PHOSPHATE MINE ON FARM ELANDSFONTEIN NO. 349, PORTION 4 AND A PORTION OF PORTION 2, MALMESBURY RD		
REPORT NO. : BEP EMP0701-1	DATE : 2014-09-01	REPORT STATUS : Revision (Draft)
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SYNOPSIS : EIA/EMP for Elandsfontein Phosphate Mine		

KEY WORDS :

EIA/EMP


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Appendix C2: Botanical Study

Appendix C3: Visual Assessment

Appendix C4: Geohydrological Study

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DEFINITIONS

Buffer zone

Includes the immediate setting of the national park and attributes that are functionally important as a support to the national park and its protection;

Environment:

- The surroundings (biophysical, social and economic) within which humans exist and that are made up of:
- The land, water and atmosphere of the earth;
- Micro-organisms, plant and animal life;
- Any part or combination of (i) and (ii) and the interrelationships among and between them; and
- The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing.

Environmental aspects:

Environmental aspects are elements of an organization's activities, products or services that can interact with the environment.

Environmental degradation:

Refers to pollution, disturbance, resource depletion, loss of biodiversity, and other kinds of environmental damage; usually refers to damage occurring accidentally or intentionally as a result of human activities.

Environmental impacts:

Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services.

Environmental impact assessment (EIA):

An EIA is a study of the environmental consequences of a proposed course of action.

Environmental impact report:

A report assessing the potential significant impacts as identified during the EIA.

Environmental impact:

An environmental change caused by some human act.

Land use:

Land use is the various ways in which land may be employed or occupied. Planners compile, classify, study and analyse land use data for many purposes, including the identification of trends, the forecasting of space and infrastructure requirements, the provision of adequate land area for necessary types of land use, and the development or revision of comprehensive plans and land use regulations.

Pollution prevention:

This is any activity that reduces or eliminates pollutants prior to recycling, treatment, control or disposal.

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Public participation process:

A process of involving the public in order to identify needs, address concerns, in order to contribute to more informed decision making relating to a proposed project, programme or development.

Topography:

Topography is a term in geography, referring to the "lay of the land" or the physio- geographic characteristics of land in terms of elevation, slope and orientation.

Vegetation:

Vegetation is all of the plants growing in and characterizing a specific area or region; the combination of different plant communities found there.

Waste:

Waste is unwanted or undesired material left over after the completion of a process. "Waste" is a human concept: in natural processes there is no waste, only inert end products.

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ABBREVIATIONS

Average Annual Daily Demand	AADD
Background Information document	BID
Department of Environmental Affairs and Development Planning	DEA&DP
Department of Environmental Affairs	DEA
Department of Mineral Resources	DMR
Environmental Authorisation	EA
Elandsfontyn Aquifer System	EAS
Electrical Conductivity	EC
Environmental impact assessment	EIA
Environmental management programme	EMPR
Environmental scoping report	ESR
Heritage impact assessment	HIA
Heritage Western Cape	HWC
Integrated water use license	IWULA
Interested and affected parties	IAPs
Lower Aquifer Unit	LAU
Life of Mine	LOM
metres above mean sea level	mamsl
metres below ground level	mbgl
Langebaan Road Aquifer System	LRAS
milliSiemens per meter	mS/m
Minerals and Petroleum Resources Development Act no 28 of 2002	MPRDA
Mining works programme	MWP
Million tons	Mt
Department of Water Affairs	DWA
National Environmental Management Act no 107 of 1998	NEMA
National Environmental Management: Air Quality Act No. 39 of 2004	NEM:AQA
National Environmental Management: Biodiversity Act No. 10 of 2004	NEMBA
National Environmental Management: Waste Act No. 59 of 2008	NEMWA
National Water Act no 36 of 1998	NWA
National Groundwater Archive	NGA
Natural ground level	ngl
not measured	nm
West Coast District Municipality	WCDM
Public participation process	PPP
Pollution control dam	PCD

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Residual Deposit Facility	RDF
Run-of-mine	ROM
Raw Water Dam	RWD
South African National Parks	SANParks
Social impact assessment	SIA
Social and labour plan	SLP
South African Heritage Resource Agency	SAHRA
Saldanha Bay Municipality	SBM
Tons per annum	tpa
Upper Aquifer Unit.	UAU
Waste Management Licence	WML
Waste rock dump	WRD
Water Use License	WUL

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CLIENT NAME: EEM	EMPR	
PROJECT NAME: ELANDSFONTEIN PHOSPHATE MINE		OWNER: BRAAF ENVIRONMENTAL PRACTITIONERS

1. INTRODUCTION AND SCOPE OF REPORT

The Elandsfontein phosphate deposit is currently the second biggest known resource in South Africa. The deposit is located on the farm Elandsfontein 349, approximately 95km to the NNW of Cape Town and 14km to the east of Langebaan. The nearest towns/villages Elandsfontein Phosphate Mine Operations are identified below (line of sight distances) in Table 1-1.

Table 1-1: Project Area in relation to adjacent towns and villages

Town/Village	Approximate Distance & Direction from mine property boundary
Langebaan	14.5km to the west
Hopefield	13 km to the east
Saldanha	20km to the west
Vredenburg	30km to the north west

Phosphate has no natural or synthetic substitute and as a finite and limited resource it can be expected that a growing demand as a result of increasing population will place a strain on the existing phosphate resources in the future.


The company Samancor, that operated a phosphate mine near Langebaan, identified and drilled the deposit during 1985. Although the phosphate mineralisation was initially identified on portion 3 of Elandsfontein 349, drilling results indicated the extension of the deposit onto portion 4 of Elandsfontein.

During 2009, Elandsfontein Exploration and Mining (Pty) Ltd (EEM) applied for a prospecting right over portion 4 and a portion of portion 2 (1,428.81ha) of Elandsfontein 349. The prospecting right was subsequently granted by the Department of Mineral Resources (DMR) on 30 April 2013, with a validity of 3 years. The Environmental Management Program (EMP) for the EEM prospecting program was approved by the DMR on 26th July 2013. The surface owner of Elandsfontein 349, Elandsfontein Land Holdings (Pty) Ltd (ELH) granted written permission to EEM to undertake prospecting on the property. The company is currently fully compliant with all conditions, fees and limitations prescribed by the DMR.

EEM is considering an open-cast mining operation, using the method of strip mining to mitigate environmental impact to the surrounding area. Turgis Consulting (Pty) Ltd, now part of Royal Haskoning DHV, was appointed to complete a scoping study on the project in 2013. DRA International (Pty) Ltd is currently busy with a feasibility study to finalise the design of the mine and metallurgical facility and increase the accuracy of the associated capital and operating cost estimates.

EEM must comply with Section 102, read with the environmental requirements covered by Section 37 – 39 and regulations 50 & 51 of the MPRDA, which stipulates the environmental process to be followed when applying for a mining right. The mining right and associated EMP must be compiled and approved by the Department of Mineral Resources (DMR). The mining right process in terms of the MPRDA requires the compilation of a Scoping Report and an Environmental Impact Assessment (EIA) in terms of Regulation 50 and 51 of the MPRDA (This Report).

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Billet Trade (Pty) Ltd T/A Braaf Environmental Practitioners has been appointed as the independent environmental consultant, by EEM, to conduct the environmental authorisation for the proposed project. This report serves the objectives of the EMPR phase (of the MPRDA) and will be finalized after the 30 day review period by stakeholders.

This report is the EIA / Environmental Management Program (EMP) Report which includes a background description of the proposed project including an overview of the EIA process, together with public participation followed to date. A baseline description of the current environmental status quo as well as the identification of potential environmental issues and impacts which have been identified is provided for in this report. The EIA-EMP Report provides a comprehensive Impact Assessment of the proposed impacts in relation to the surrounding environment and land use.

This EIA serves to document the results of work undertaken during the Scoping and Impact Assessment Phase of this project. The EIA/EMP will be submitted to the lead regulatory authority, DMR, for approval. The EIA-EMP process will include the following:

- MPRDA Application;
 - Scoping Phase;
 - EIA/EMP phase;
- A Public Participation Process.

1.1. PROJECT DETAILS

The following sections provide details of the various parties involved in the Elandsfontein Phosphate Mine, the affected surface areas as well as the report structure of this EIA/EMP Report.


1.2. PROPONENT DETAILS

Table 1-2 presents the details of the applicant and mine owner in terms of the proposed project.

Table 1-2: Name and address of applicant

Name of Mine	Elandsfontein Phosphate Mine
Applicant	Elandsfontein Exploration and Mining (Pty) Ltd
Postal Address	P O Box 12599, N1 City, 7463
Responsible Person	Mr. Philip le Roux
Telephone Number	021 930 0927
Facsimile Number	021 930 2587
Email Address	philip@elandsfontein.co.za
Company Registration No.	2010/006791/07

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1.3. DETAILS OF THE PROPERTIES AFFECTED BY PROPOSED PROJECT

The affected surface areas where the proposed project activities will occur are tabulated in Table 1-3 and illustrated in Figure 1-1.

Table 1-3: Properties where proposed mining activities will occur

Farm Name	Portions	Owners
Elandsfontein 349	2	Elandsfontein Land Holding (Pty) Ltd
Elandsfontein 349	4	Elandsfontein Land Holding (Pty) Ltd

1.4. DETAILS OF ENVIRONMENTAL ASSESSMENT PRACTITIONER

Braaf Environmental Practitioners has been appointed as lead Environmental Assessment Practitioner (EAP) and the associated project team to undertake the necessary environmental authorisation process. The EAP and project team's details are provided in Table 1-4.

Table 1-4: EAP details


Name of firm	Braaf Environmental Practitioners	
Postal Address	P O Box 692, Kuils River, 7579	
Telephone Number	0860 111 382	
Facsimile Number	086 658 7676	
Email Address	info@braafsa.com	
EIA project team		
Name	Qualifications	Responsibility
Olivia Braaf	BSc Hons Zoology	Report compilation
Regan Rose	BSc Hons Geohydrology	Technical reviewer

Braaf Environmental Practitioners (BEP) was appointed by EEM as the independent environmental practitioners to facilitate the environmental authorisation process for the proposed Elandsfontein Phosphate project. The project team assigned to this project has over 20 years experience in the environmental field. The professional staff member assisting on this project has an Honours Degree in Geohydrology and is a professionally registered scientist with the South African Council of Natural Scientific Professionals support Ms. Braaf. BEP is also supported by specialists in the field of natural sciences, social sciences and the economic fields.

1.5. COMPETENT AUTHORITIES

As per the MPRDA, the DMR is identified as the competent authority for the mining right authorisation which includes the Scoping and EIA/EMP. Approval is also needed from the National Department of Environmental Affairs (DEA) in terms of National Environmental Management: Waste Act (No. 59 of 2008) (NEM:WA), and the

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Western Cape Provincial Department of Environmental Affairs and Development Planning (DEA&DP) in terms of the National Environmental Management Act (No. 107 of 1998) (NEMA) and associated Environmental Impact Assessment (EIA) Regulations GN.R543 (as amended) (NEMA EIA Regulations) which has commenced. The Department of Water Affairs (DWA) is the competent authority for the Water Use License Application (WULA). Further approvals are required from the competent heritage authority in terms of the National Heritage Resources Act (No. 25 of 1999) (NHRA) and Saldanha Bay Municipality (SBM) in terms of the land use. Table 1-5 outlines the applicable legislative approvals and competent authorities responsible.

Table 1-5: Competent Authority Details.

Department	Legal Process
DMR	MPRDA
DEA	NEM:WA
DEA&DP	NEMA: EIA
DWA	NWA
SBM	LUPO
HWC	HIA

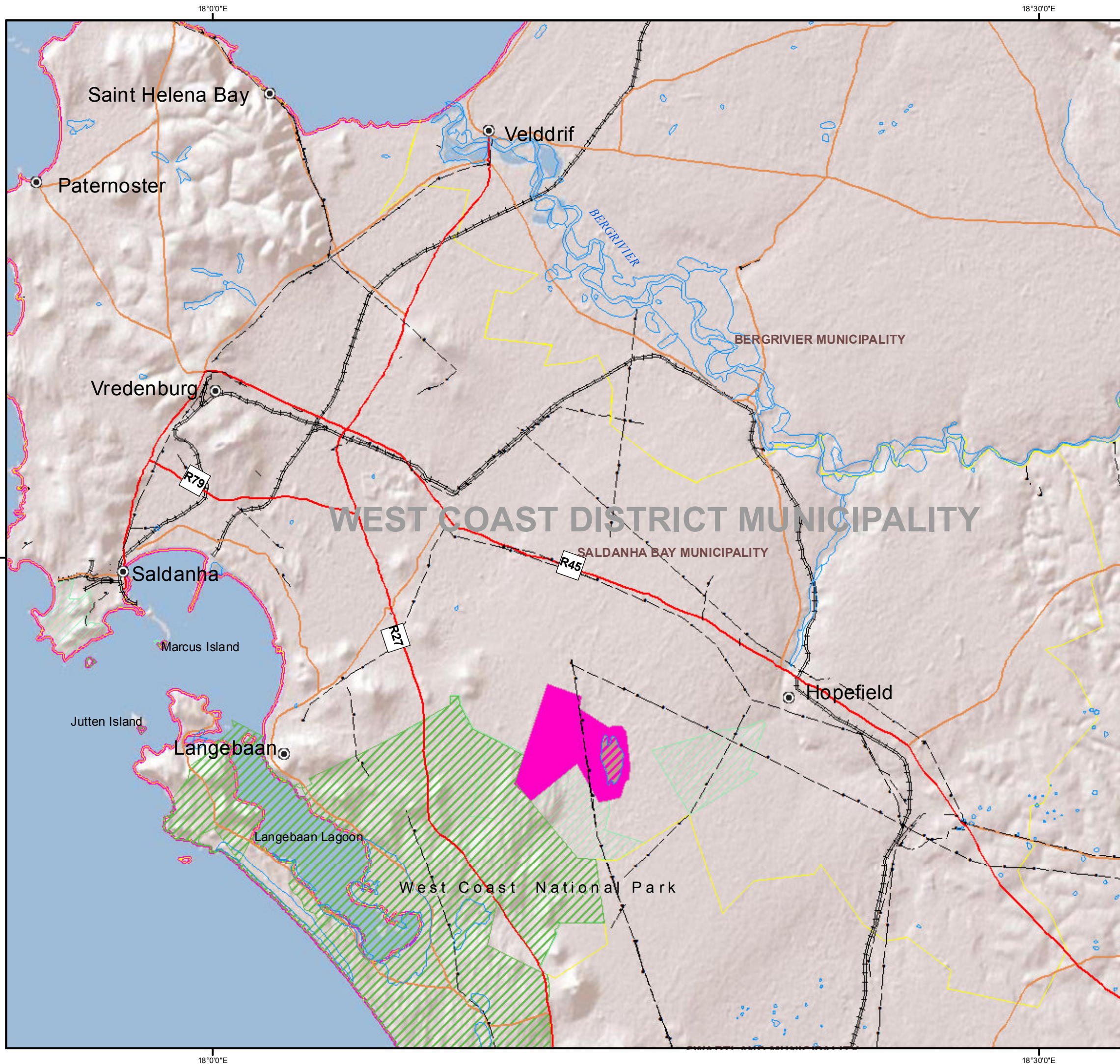
1.6. LOCAL AUTHORITIES

The project area falls within the jurisdiction of the Saldanha Bay Municipality (SBM) of the West Coast District Municipality (WCDM), Western Cape Province. Local ward councillors have been identified within the municipal area and specifically the affected ward. Details of the relevant municipality are given in Table 1-6.

Table 1-6: Municipality Details

Municipality	Contact Person
WCDM (Municipal Manager)	Mr. H. Prins
WCDM (Town Planner)	Mr. C. Malherbe
SBM (Mayor)	Mr. F. Schippers
SBM (Municipal Manager)	Mr. L.A. Scheepers
SBM (Environmental Officer)	Mrs. N. Duarte

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Legend


- District Municipality
- Local Municipality
- Towns
- Main Road
- Secondary Road
- WC_rail
- Eskom Powerline
- Rivers
- National Park
- Fossil Area
- Elandsfontein Land Parcels

SCALE:

0 2 4 8 12 16 km

PROJECT: Elandsfontein Phosphate Mine


Figure 1-1: Location of Elandsfontein Study Area

CLIENT: 


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Scale: 1:250 000	A3	
Drawn:	06/06/2014	OB
Checked:	06/06/2014	RR
Approved:	06/06/2014	GA

P O Box 692
Kuil's River
7579
Tel: 0860 111382
Fax: 0866587676
Email: info@braafsa.com

N




Projection: Geographic, Datum: WGS 1984
Source: Enpat (2001),
Demarcation Board (Dec 2005)
Inset ESRI Data and Maps

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1.7. DOCUMENT STRUCTURE


Information presented in this report is set out as follows:

CHAPTER	DESCRIPTION	MPRDA FULFILMENT	REGULATION
Chapter 1: Introduction	This chapter provides background to EEM and the proposed Elandsfontein Phosphate Project. It presents information regarding the applicant and the EAP, as well as the competent authority.		
Chapter 2: Legal Framework	This chapter describes the environmental authorization process followed to date for the proposed Elandsfontein Mine and explains the legislative framework under which a mining right is necessary and application compiled.	This chapter describes the public engagement process that was followed for this project in fulfilment of Section (39)(b)(ii) of the MPRDA read together with Regulation 50(f).	
Chapter 3: Project Background and Motivation	Discusses the benefits of the projects.	In fulfilment of MPRDA Regulation 50(b) and (d).	
Chapter 4: Project Description	The proposed project details and infrastructure required for the proposed Elandsfontein Phosphate Project are provided.		
Chapter 5: Project alternatives	Discusses the alternatives considered for this project as well as the No-Go Option.	In fulfilment of MPRDA Regulation 50(b) and (d).	
Chapter 6: Description of the Baseline Environment	Provides a description of the environment (baseline status) prior to the commencement of the construction, and subsequent operation, of the proposed project.	In compliance with Section 39(3)(a) of the MPRDA Act read together with Regulation 50(a).	
Chapter 7: Waste Management			
Chapter 8: Methodology for the assessment of impacts & Impact Assessment	Provides details on the methodology used to assess the anticipated impacts associated with the proposed project.	In fulfilment of Section 39(3)(b)(i)(ii) and (iii) of the MPRDA Act read together with Regulation 50(c) and (e).	
	Identifies all the anticipated impacts and an assessment of these based on the information provided by both specialists (on information available at the time of compilation of this report)		
Chapter 9: Environmental	Provides mitigation / management	In compliance with Section	

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Management Programme & Monitoring and EMP Performance Assessment & Environmental Objectives and Goals & Environmental Emergencies and Remediation Procedures & Environmental Awareness Plan: & Closure Plan	measures to be implemented in order to mitigate potential negative impacts and enhance potential positive impacts associated with the proposed project.	39(3)(d) of the MPRDA Act, read together with Regulation 50(e), (f) and (i) and Regulation 51(b)(i) and (ii) and Section 39(4)(a)(iii) of the MPRDA Act.
	Provides details and commitment of on-going monitoring and performance assessment of the Elandsfontein EMP.	In fulfillment of MPRDA Regulation 50(h) and Regulation 51(b)(iv).
	Describes the environmental, social, heritage and closure objectives and goals to be achieved through the implementation of the EMP should the proposed project be approved and commence.	In fulfillment of MPRDA Regulation 51(a).
		In fulfillment of MPRDA Regulation 51(b)(iii).
	Provides details of the closure plan Act.	In compliance with Section 39(3)(c) of the MPRDA Act read together with Regulation 51(vi) and (vii).
		In fulfillment of MPRDA Regulation 51(b)(v) and also provides of the financial provision in compliance with Section 39(4)(a)(ii) read together with Section 41(1) of the MPRDA
Chapter 10: Financial Provision	Provides a summary of the financial provision required in compliance with the closure plan	Provides of the financial provision in compliance with Section 39(4)(a)(ii) read together with Section 41(1) of the MPRDA
Chapter 11: Identified Knowledge Gaps	Provides a summary of identified gaps, in certain areas of knowledge, with reference to relevant appendices.	In fulfillment of MPRDA Regulation 50(g).
Chapter 12: Undertaking to Comply with the Provision of the Act	Provides the commitment of EEM to comply with the relevant legislation applicable to the proposed project	
Chapter 13: Conclusions	Provides the conclusion and recommendations of the study to date as well as concluding remarks of the EAP.	
Chapter 14: References	This section Provides details on the bibliography which was consulted during the drafting of this Report.	

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2. LEGAL REQUIREMENTS FOR AUTHORISATION FOR ELANDSFONTEIN MINE

2.1. LEGISLATIVE FRAMEWORK

The proposed Elandsfontein mine is subject to legislative and policy requirements at national, provincial and local level as well as international guidelines and conventions. This chapter presents a summary of the administrative framework governing the development of the proposed mine. It focuses on legal requirements related to environmental licensing of activities, as well as legal requirements for environmental protection such as: standards for environmental quality control and pollution, biodiversity protection, and natural, cultural and historic heritage sites.

There are a number of regulatory requirements at local, provincial and national level with which the proposed project must conform. Some of the key environmental legal requirements include the following:

- Mineral and Petroleum Resources Development Act (No. 28 of 2002) (MPRDA);
- National Environmental Management Act 107 of 1998, as amended (NEMA);
- Environmental Impact Assessment (EIA) Regulations 2010;
- National Environmental Management: Waste Act 59 of 2008 (NEM:WA);
- National Water Act 36 of 1998 (NWA);
- National Heritage Resources Act 25 of 1999 (NHRA); and
- National Environmental Management: Biodiversity Act 10 of 2004 (NEM:BA).

A brief summary of BEP's understanding of the relevant Acts and Regulations that are applicable to this study is provided below. Note that other legislative requirements may also pertain to the proposed project. As such, the summary provided below is not intended to be definitive or exhaustive, and serves only to highlight key environmental legislation and obligations.


2.2. NATIONAL LEGISLATIVE AND POLICY REQUIREMENTS

2.2.1. MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT (NO. 28 OF 2002)

The MPRDA makes provision for equitable access to and sustainable development of South Africa's mineral resources. It further promotes equitable access to the nations minerals and petroleum resources, expand opportunities for previously disadvantaged individuals, promote economic growth and mineral and petroleum resources development (objective), employment opportunities and ensure that the holders of the mining right contribute to the socio-economic development on the surrounding communities.

In order for EEM to mine the phosphate resources within the Elandsfontein project area, a mining right must be obtained from the Department of Mineral Resources (DMR). Section 22 of the MPRDA specifies that an Environmental Impact Assessment (EIA) must be undertaken and an Environmental Management Programme (EMP) submitted to the DMR prior to the authorisation of the mining right. In addition it specifies that a public should be consulted as part of the application process.

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The following regulations contained in Government Notice R. 527 Mineral and Petroleum Resources Development Act (28/2002): Mineral and Petroleum Resources Development Regulations have particular relevance to the contents of EIA/EMP's:

- Provide baseline information concerning the affected environment to determine protection, remedial measures and environmental management objectives;
- Investigate, assess and evaluate the impact of his or her prospecting or mining operations on –
 - The environment;
 - The socio-economic conditions of any person who might be directly affected by the prospecting or mining operation; and
 - Any national estate referred to in section 3(2) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999), with the exception of the national estate contemplated in section 3(2)(i)(vi) and (vii) of that Act;
- Develop an environmental awareness plan describing the manner in which the applicant intends to inform their work and the manner in which the risks must be dealt with in order to avoid pollution or the degradation of the environment; and
- Describe the manner in which he or she intends to-
 - Modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;
 - Contains or remedy the cause of pollution or degradation and migration of pollutions; and
 - Comply with any prescribed waste standard or management standards or practices.

2.2.2. NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NO 107 OF 1998) (NEMA) AND THE NATIONAL ENVIRONMENTAL MANAGEMENT AMENDMENT ACT (NO 62 OF 2008)


NEMA requires that the potential impact on the environment, socio-economic conditions, and cultural heritage of activities that require authorisation or permission by law must be considered, investigated and assessed prior to implementation, and reported to the relevant authority.

An EIA Application must be submitted to the Western Cape Provincial Department of Environmental Affairs and Development Planning (DEA&DP). This process has now commenced.

The EIA Regulations (R543) promulgated in terms of the NEMA, identifies a suite of activities, which “could have a substantial detrimental effect on the environment”. The listed activities identified require an environmental authorisation from the environmental authority, i.e. the Provincial Department of Environmental Affairs and Development Planning (DEA&DP), prior to commencement of the activity. The proposed phosphate mine and associated infrastructure triggers a list of activities, tabulated in Table 2-1 below.

Activities listed in terms of R544 and R546 require a Basic Assessment, while activities listed in R545 require a full Scoping and EIA process. Despite the proposed project triggering the need for a Basic Assessment process, a single Scoping and ESIA process will be undertaken to meet the requirements in terms of NEMA. However,

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due to Eskom requirements related to the eventual transfer of rights associated to components of the electrical infrastructure EEM has submitted a separate environmental application. Hence a Basic Assessment Process will be undertaken for the powerlines which the competent authority DEA&DP has agreed to. However, one public participation process will be undertaken for the powerlines and remainder of the mine application.

Refer to Appendix D for DEA&DP's acknowledgement letters.

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Table 2-1: NEMA Listed Activities for the Elandsfontein Phosphate Mine Project


Government Notice R544 of 2010 (Basic Assessment)		Applicability to Project
Activity 10	The construction of facilities or infrastructure for the transmission and distribution of electricity - outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or inside urban areas or industrial complexes with a capacity of 275 kilovolts or more.	A transmission line will be constructed to supply the mine with electricity
Activity 22	The construction of a road, outside urban areas, with a reserve wider than 13,5 meters or, where no reserve exists where the road is wider than 8 metres, or for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Notice 544 of 2010.	The proposed mine will require an access and internal roads.
Activity 23	The transformation of undeveloped, vacant or derelict land to – residential, retail, commercial, recreational, industrial or institutional use, inside an urban area, and where the total area to be transformed is 5 hectares or more, but less than 20 hectares, or residential, retail, commercial, recreational, industrial or institutional use, outside an urban area and where the total area to be transformed is bigger than 1 hectare but less than 20 hectares; - except where such transformation takes place for-linear activities; for purposes of agriculture or afforestation, in which case Activity 16 of Notice No. R. 545 applies.	The project area exceeds 5 hectares.
Activity 26	Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).	Activity 26 of GN. No. R544 is also not applicable to your proposed development as no process or activity has been identified in terms of section 53(1) of the NEMBA. Refer to DEA&DP Acknowledgement Letter confirming that this activity is not listed. See Appendix D.

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Activity 47	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre - where the existing reserve is wider than 13,5 meters; or where no reserve exists, where the existing road is wider than 8 metres – excluding widening or lengthening occurring inside urban areas.	Existing gravel service roads may have to be widened within and around the site to accommodate traffic.
Government Notice R545 of 2010 (Full Scoping and EIA)		Applicability to Project
Activity 5	The construction of facilities or infrastructure for any process or activity which requires a permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent and which is not identified in Notice No. 544 of 2010 or included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the activity is regarded to be excluded from this list.	The activities related to the processing plant will trigger this activity.
Activity 15	Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more; except where such physical alteration takes place for: linear development activities; or agriculture or afforestation where activity 16 in this Schedule will apply.	The Project area exceeds 20 hectares.
Activity 19	The construction of a dam, where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 metres or higher or where the high- water mark of the dam covers an area of 10 hectares or more.	On-site dams will be constructed that may exceed 5 m in height or cover 10 hectares or more.
Government Notice R546 of 2010 (Basic Assessment)		Applicability to Project
Activity 4	The construction of a road wider than 4 metres with a reserve less than 13,5 metres. Geographical areas in the Western Cape province to which this activity is applicable includes: (d) i. In an estuary; ii. All areas outside urban areas; iii. In urban areas: Areas zoned for use as public open space within urban areas; and areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority, or zoned for a conservation purpose.	Internal road networks will be constructed.
Activity 10	The clearance of an area of 300 square metres or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation. Geographical areas in the Western Cape province to which this activity is applicable includes: <ul style="list-style-type: none"> Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA 	The proposed establishment of the mine may result in the loss of more than 300 m ² of vegetation, with 75% being indigenous.

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	<p>or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004;</p> <ul style="list-style-type: none"> • Within critical biodiversity areas identified in bioregional plans; • Within the littoral active zone or 100 metres inland from high water mark of the sea or an estuary, whichever distance is the greater, excluding where such removal will occur behind the development setback line on erven in urban areas. 	
Activity 12	<p>The clearance of an area of 300 square metres or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation.</p> <p>— Geographical areas in the Western Cape province to which this activity is applicable includes:</p> <p>(a) Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004;</p> <p>(b) Within critical biodiversity areas identified in bioregional plans;</p> <p>Within the littoral active zone or 100 metres inland from high water mark of the sea or an estuary, whichever distance is the greater, excluding where such removal will occur behind the development setback line on erven in urban areas.</p>	<p>Be further advised that activity 12 of GN No. R546 is not applicable to your proposed development as the proposed site is not located within a critically endangered or endangered ecosystem in terms of the National Environmental Management: Biodiversity Act (Act no. 10 of 2004) (NEMBA) National List of Threatened Ecosystems, December 2011. Refer to DEA&DP Acknowledgement Letter confirming that this activity is not listed. See Appendix D.</p>
Activity 13	<p>The clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation, except where such removal of vegetation is required for: the undertaking of a process or activity included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008), in which case the activity is regarded to be excluded from this list. The undertaking of a linear activity falling below the thresholds mentioned in Listing Notice 1 in terms of GN No. 544 of 2010.</p> <p>Geographical areas in the Western Cape province to which this activity applies, include: Critical biodiversity areas and ecological support areas as identified in systematic biodiversity plans adopted by the competent</p>	<p>The proposed establishment of the mine may result in the loss of more than 1 hectare of vegetation, with 75% being indigenous.</p>

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	<p>authority.</p> <p>National Protected Area Expansion Strategy Focus areas. (other areas also identified in the Western Cape province): In an estuary;</p> <p>Outside urban areas, the following:</p> <ul style="list-style-type: none"> • A protected area identified in terms of NEMPAA, excluding conservancies; National Protected Area Expansion Strategy Focus areas; • Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; • Sites or areas identified in terms of an International Convention; Core areas in biosphere reserves; • Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve; • Areas seawards of the development setback line or within 1 kilometre from the high-water mark of the sea if no such development setback line is determined. In urban areas, the following: • Areas zoned for use as public open space; • Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose; Areas seawards of the development setback line; • Areas on the watercourse side of the development setback line or within 100 metres from the edge of a watercourse where no such setback line has been determined. 	
Activity 14	<p>The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation, except where such removal of vegetation is required for:</p> <ul style="list-style-type: none"> • purposes of agriculture or afforestation inside areas identified in spatial instruments adopted by the competent authority for agriculture or afforestation purposes; • the undertaking of a process or activity included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the activity is regarded to be excluded from this list; • the undertaking of a linear activity falling below the thresholds in Notice 544 of 2010. 	The proposed establishment of the mine may result in the loss of more than 5 hectares of vegetation, with 75% being indigenous.

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	Geographical areas in the Western Cape province to which this activity is applicable includes: (e) i. All areas outside urban areas.	
Activity 19	The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.	Existing road networks may need to be widened or lengthened by more than 4 m or 1 km, respectively.

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2.2.3. NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT, 2008 (NO. 59 OF 2008) (NEMWA)

The NEM:WA aims to (amongst other things) regulate waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development.

The Act makes provision for the listing of waste management activities that have, or are likely to have, a detrimental effect on the environment and may not be undertaken without a Waste Management Licence (WML) issued by the competent authority. The competent authority for WML applications is the national Department of Environmental Affairs (DEA) for applications involving hazardous waste. NEM:WA must be read in conjunction with NEMA (see above). The principles of NEMA and the NEMA EIA Regulations, 2010 (specifically GN 543), are applicable to the application process for WMLs.

Two categories of listed waste management activities were published in terms of NEM:WA in GN R718 on 3 July 2009. A person wishing to undertake:

- An activity listed under Category A, must conduct a BA process,
- An activity listed under Category B, must conduct a S&EIR process, as set out in the NEMA EIA Regulations, 2010 (see above), as part of the WML application process.


The Act makes provision for a single environmental assessment process in instances where both EA and WML applications are required. A separate application form must be submitted at the beginning of the EIA process, and additional stakeholder engagement (advertising) would apply to an EIA process for a WML application. The WML process has not been commenced with as yet.

In light of the nature of the proposed project, the following activities identified in terms of Government Notice 718, Category A and B, are anticipated to be triggered:

Table 2-2: Listed activities in terms of NEMA:WA Regulations

Category A: Requiring a Basic Assessment Process	
Activity 1	The storage, including the temporary storage of general waste at a facility that has the capacity to store in excess of 100m ³ of general waste at any one time, excluding the storage of waste in lagoons.
Activity 2	The storage, excluding the temporary storage, of hazardous waste at a facility that has the capacity to store in excess of 80m ³ of hazardous waste at an one time.
Activity 4	The storage of waste tyres in a storage area exceeding 500m ²

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Activity 7	The recycling of general waste at a facility that has an operational area in 500m ²
Activity 12	The remediation of contaminated land
Activity 18	The construction of facilities for activities listed in Category A of this Schedule (not in isolation to associated activity)
Category B: Requiring a Full Scoping and EIA	
Activity 2	The reuse and recycling of hazardous wastes
Activity 5	The treatment of hazardous waste using any form of treatment regardless of the size or capacity of such a facility to treat such waste
Activity 7	The treatment of effluent, wastewater or sewage with an annual throughput capacity of 15 000 cubic metres or more.
Activity 9	The disposal of any quantity of hazardous waste to land
Activity 10	The disposal of general waste to land covering an area in excess of 200m ²
Activity 11	The construction of facilities for activities listed in Category B of this Schedule (not in isolation to associated activity).

2.2.4. NATIONAL HERITAGE RESOURCES ACT (NO. 25 OF 1999)

The National Heritage Resources Act (Act No. 25 of 1999) makes provision for a compulsory Heritage Impact Assessment (HIA) when an area exceeding 5000 m² is being developed. This is to determine if the area contains heritage sites and to take the necessary steps to ensure that they are not damaged or destroyed during development.

The NHRA provides protection for the following categories of heritage resources:


- Landscapes, cultural or natural (Section 3 (3))
- Buildings or structures older than 60 years (Section 34);
- Archaeological sites, palaeontological material and meteorites (Section 35);
- Burial grounds and graves (Section 36);

The mining of the proposed open pit may trigger the following heritage activities:

2.2.4.1. PERMIT APPLICATION SECTION 38 (REF: NHRA 1999: 62)

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

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- b. the construction of a bridge or similar structure exceeding 50 m in length;
- c. any development or other activity which will change the character of a site exceeding 5000 m² in extent; or
 - i. involving three or more existing erven or subdivisions thereof; or
 - ii. involving three or more erf or divisions thereof which have been consolidated within the past five years; or
 - iii. 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.

2.2.4.2. PERMIT APPLICATION SECTION 35 – FOSSILS, BUILT ENVIRONMENT FEATURES, SHIPWRECKS, AND STONE AGE ARCHAEOLOGY (REF: NHRA 1999: 58):

- a. destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or paleontological site or any meteorite;
- b. destroy, damage, excavate, remove from its original position, collect or own any archaeological or paleontological 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 paleontological material or object, or any meteorite.

2.2.4.3. PERMIT APPLICATION SECTION 36 – BURIAL GROUNDS AND GRAVES (REF: NHRA 1999: 60)


- 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) any excavation equipment, or any equipment which assists in the detection or recovery of metals; or
- d. SAHRA or a provincial heritage resources authority may not issue a permit for The destruction or damage of any burial ground or grave referred to in subsection (3)(a) unless it is satisfied that the applicant has made satisfactory arrangements for the exhumation and re-interment of the contents of such graves, at the cost of the applicant.

The heritage practitioner will determine which activities in terms of the NHRA will be triggered and include these in the application to Heritage Western Cape.

2.2.5. NATIONAL WATER ACT (NO. 36 OF 1998) (NWA)

The NWA recognises that water is a scarce and unevenly distributed national resource which must managed encompassing all aspects of water resources.

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In terms of Chapter 4 of the NWA, activities and processes associated with the Elandsfontein Phosphate Mine project are required to be licensed by the Department of Water Affairs. An Integrated Water Use Licence Application (IWULA) will be lodged with the DWA. Furthermore, an Integrated Water and Waste Management Plan (IWWMP) will be compiled in support of the IWULA.

Section 21 of the NWA lists 11 water uses that require a Water Use Licence from the DWA. In terms of Section 21 of the NWA the mining of the proposed open pit will trigger the following water use activities:

- a. taking water from a water source;
- b. storing water;
- g. disposing of wastes that may impact water resources; and
- j. removing, discharging or disposing of water found underground.

Please note this list may be revised during the WULA depending on the specific designs.

2.2.6. THE NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT, 2008 (NO. 10 OF 2004) (NEMBA) AND ASSOCIATED LEGISLATION

The purpose of the NEM:BA is to provide for the management and conservation of South Africa's biodiversity and the protection of species and ecosystems that warrant national protection. Threatened or Protected Species (TOPS) Regulations (2007) and a National List of Ecosystems that are Threatened and in Need of Protection (2011) have been promulgated in terms of NEM:BA. In terms of Section 56(1) of NEM:BA a person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7.

Should a project result in the loss of biodiversity identified in terms of GN 151 of 2010, a permit application will need to be submitted to the Provincial Department of Environmental Affairs and Development Planning for approval, before proceeding with the activity. A specialist botanical impact assessment has been undertaken as part of the EIA/EMP phase of the proposed project.


The Act also identifies ecosystems as critically endangered, endangered, vulnerable and protected species. The Elandsfontein Phosphate Mine area consists of four distinct vegetation types which have been assigned the following ratings in terms of the National List of Threatened Ecosystems:

- Hopefield Sand Fynbos is rated as Vulnerable;
- Saldanha Flats Strandveld is rated as Vulnerable;
- Langebaan Dune Strandveld is rated as Least Threatened; and
- Saldanha Limestone Strandveld is rated as Least Threatened.

2.2.7. CONSERVATION OF AGRICULTURAL RESOURCES ACT (NO. 43 OF 1983)

The Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA) includes the use and protection of land, soil, wetlands and vegetation and the control of weeds and invader plants. This is the only legislation that is directly aimed at conservation of wetlands in agriculture. In 1984, regulations were passed in terms of the

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CARA regulations declaring about 50 species “weeds” or “invader plants”. On 30 March 2001 the Minister of Agriculture promulgated an amendment to these regulations. This amendment now contains a comprehensive list of species that are declared weeds and invader plants dividing them into three categories. These categories are as follows:

- Category 1: Declared weeds that are prohibited on any land or water surface in South Africa. These species must be controlled, or eradicated where possible.
- Category 2: Declared invader species that are only allowed in demarcated areas under controlled conditions and prohibited within 30m of the 1:50 year floodline of any watercourse or wetland.
- Category 3: Declared invader species that may remain, but must be prevented from spreading. No further planting of these species are allowed.

In terms of the amendments to the regulations under the CARA, landowners are legally responsible for the control of alien species on their properties. Various Acts administered by the DEA and DWA, as well as other laws (including local by-laws), spell out the fines, terms of imprisonment and other penalties for contravening the law. Although no fines have yet been placed against landowners who do not remove invasive species, the authorities may clear their land of invasive alien plants and other alien species entirely at the landowners cost and risk.

Specific management measures for the conservation of agricultural resources will be included in the project and the areas disturbed from mining activities will be rehabilitated to a predefined land use.


2.2.8. NATIONAL FOREST ACT (NO. 84 OF 1998)

One of the objectives of this Act is to provide special measures for the protection of certain forests and tree species and to promote the sustainable use of forests for environmental, economic, educational, recreational, cultural, health and spiritual purposes. Section 15(1) – Protected Tree Species, forest trees or protected tree species may not be cut, disturbed, damaged, destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold; except under license granted by the DWA/ DEA (or a delegated authority). GNR.817 of 2007 comprises lists of protected tree species under the National Forests Act (No. 84 of 1998). The criteria used to select tree species for inclusion in the protected tree list were:

- Red List Status (rare or threatened species);
- Keystone Species Value (whether species play a dominant role in an ecosystem’s functioning);
- Sustainability of Use (whether a species is threatened by heavy use of its products such as timber, bark etc.);
- Cultural or Spiritual Importance (outstanding landscape value or spiritual meaning attached to certain tree species);
- Other Legislation (whether a species is already adequately protected by other legislation).

The botanical specialist will be responsible for assessing the target area and identifying any protected tree species. The trees identified will be protected, as far as is practical. Should the removal of any protected

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species be required, the necessary authorisation will be sought prior to removal. This will commence during the ESIA phase.

2.2.9. LEGAL PROCESS FOLLOWED TO DATE FOR OBTAINING THE MINING RIGHTS

The DMR granted EEM a Prospecting Right on 30 April 2013. Currently these rights are being exercised in line with the approval over the prospecting area. Subsequent to this EEM, appointed BEP to conduct the Environmental Impact Assessment (EIA) in terms of section 39(1) of the MPRDA i.e., to compile a Scoping Report, Environmental Management Plan and EIA report as required by the MPRDA for the granting of a Mining Right for the phosphate deposit. In addition, BEP were also appointed to undertake an EIA process in terms of NEMA for those activities triggered by the mining of phosphate. The NEMA Process has now commenced.

The potential significant environmental, social and cultural impacts of the Proposed Elandsfontein Mining Project (including the cumulative effects) necessitates the undertaking of additional specialist studies, to determine the significance of the potential impacts and put forward mitigation to reduce such potential impacts. Some of these preliminary studies have already been completed and their results were included into the Scoping Report. These specific specialist studies were undertaken in order to guide the Environmental Impact Assessment (EIA) process required in terms of section 39(1) of the MPRDA, which will in so-doing ensure the most appropriate procedure to plan and develop the proposed mining operation.

At the onset of the public participation process (PPP) required in terms of the MPRDA (Scoping) the following activities were undertaken:

Identification of Interested and Affected Parties

A key principle informing the PPP is that it should be an inclusive process. Given the sensitivities around the biodiversity associated with the Project location and high rate of unemployment in the region, it is important that stakeholders from the district and local municipalities, environmental bodies and landowners are given the opportunity to participate in the process.


Notification activities have been designed to ensure that stakeholders are invited to be involved in the process.

Stakeholders were invited to become part of the process in two ways:

- Through notification activities which were designed to ensure that the broader public were informed of the process and invited to be involved;
- Through BEP proactively registering stakeholders identified as potentially interested or affected through the mining right application process; and
- Networking with key stakeholders throughout consultations.

Stakeholders have been notified and invited to register as I&APs in the Project through a series of English and Afrikaans PPP notification materials.

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Stakeholders are grouped into the following categories:

- Government: National, Provincial, District and Local authorities;
- Landowners: Directly affected and surrounding landowners;
- Communities: Surrounding communities;
- Adjacent Landowners: Neighbouring farm owners and communities;
- Non-Governmental Organisations (NGOs): Environmental organisations and social focused organisations; and
- Business: small medium enterprises and formal organisations.

A stakeholder database has been compiled and will continue to be updated throughout the PPP. The existing stakeholder database is appended as Appendix B1.

First Notification of the Scoping Process:

Notification of the scoping process and availability of information was advertised for public comment (as required in terms of regulation 49(f) of the MPRDA) (on 19 December 2013 in the local Weslander newspaper [English and Afrikaans] and in the regional Die Burger newspaper [Afrikaans]) in order to include the views and concerns of IAPs. I&APs were provided with a 30 day comment period. I&APs were informed that all comments submitted to BEP by 8 January 2014 would be included in the Scoping Report submission to DMR on 10 January 2014 in order to meet the deadline, but that comments received afterward within the 30 day comment period, ending 19 January 2014 would be included in the EIA/EMP. These comments were however, included in the revised Scoping Report. Comments were categorised into key environmental categories, which in turn were divided into key issues. All the key issues were responded to by BEP.


Two Open Days and Public Meetings (see table below) were held and notes were taken at the meetings.

Date and Time	Meeting format	Venue
Monday, 6 January 2014	Open House Session (posters and one-on-one sessions was held with the project team) from 16h00 – 18h00 Public Meeting (a formal presentation by the project team followed by a question and answer session) from 18h00-20h00 Language: English/Afrikaans	Hopefield Self-Catering Chalets and Recreational Park
Wednesday, 8 January 2014		Dial Rock Hall, Saldanha Bay

On submission of the results of scoping to the DMR, they consulted the Scoping Report with other Government Departments in terms of Regulation 49(3) of GN No. R 527 of 23 April 2004, under section 107(1) of MPRDA, and requested for these organs of state to provide written comment, namely:

- DEA&DP;
- CapeNature;
- Department of Water Affairs;

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- SANParks;
- Local Authority (Saldanha Bay Municipality); and
- Heritage Western Cape.

After review of the Scoping Report by DMR and the organs of state listed above they sent a letter to EEM on 14 March 2014 providing them with the key issues that required further input. Amongst others, EEM were requested to submit a revised scoping report addressing the outstanding issues indicted by DMR.

Second Notification of the Scoping Process- Scoping Report:

This report was made available for public review and comment from 2 May 2014 till 2 June 2014 at the following venues.

Hopefield Public Library	Diazville Public Library	Louwville Public Library
Saldanha Bay Library	Langebaan Public Library	Project website: www.braafsa.com

The release and availability of the report was advertised in the Weslander and Die Burger. All registered I&APs were notified of the release and availability of the report. All comments received by 2 June 2014 were incorporated as part of the draft EIA/EMP which is to be submitted to the DMR on 10 June 2014. The EIA/EMP will be released for a 30 day public comment after which all comments will be submitted to the DMR for consideration as part of the EIA/EMP. Registered I&APs was notified of the release and availability of the EIA/EMP and related comment period. All public participation material related to this project is attached as Appendix B.

Notification of the EIA-EMP for comment and Public Meetings


Release and availability of the EIA/EMP in terms of the MPRDA as well as the 30 day comment period .The DMR has requested the submission of the proof of I&AP consultation on the EIA/EMP by 16 September 2014. For your comments to be submitted as a part of the proof of consultation to the DMR please forward your comments to BEP by 15 September 2014. All comments received after 15 September 2014 will be forwarded to the DMR for consideration as part of the application process.

The report has been made available at the following venues:

- Langebaan Public Library
- Hopefield Public Library
- Saldanha Bay Public Library
- Vredenberg Public Library
- Project website: www.braafsa.com

All registered I&APs have been informed of the release of the EIA/EMP, the respective comment period as well as the Public Meetings:

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Public meetings will be held at:

Item	Date and Time	Where?
Public Meetings		
Hopefield	11 September 2014 - 6pm – 8pm	Hopefield Sports Club
Saldanha Bay	12 September 2014 - 6pm – 8pm	Diazville Community Centre
Langebaan	15 September 2014 - 6pm – 8pm	Langebaan Country Estate

2.2.9.1. INTEGRATED LEGISLATIVE PROCESSES

Due to nature of the proposed project, a suit of environmental legislation will be applicable. In order to meet the various legislative requirements, the environmental process for the mining activity may be divided into a number of components as a result of discussions held with key stakeholders and service providers.

The following environmental applications will be undertaken as part of the overall application process for the activity:


- a) As the project will require environmental approval in terms of the extension of the ESKOM powerlines a separate application will be submitted to the Provincial Department of Environmental Affairs and Development Planning (DEA&DP).
- b) A Scoping/EIA application in terms of NEMA: EIA Regulations to the DEA&DP and an application in terms of the Waste Management Licence (WML) to the National Department of Environmental Affairs; and Water Use Licence Application (WULA) to the Department of Water Affairs; and application to Provincial Heritage Western Cape in terms of heritage aspects. It is envisaged that this will be a single application where the proposed Environmental and Social Impact Assessment (ESIA) process will be undertaken in terms of NEMA and the associated EIA Regulations of 2010 (as amended). The requirements for the WML can be met as part of the ESIA process. The public participation requirements in terms NEM:WA will be met through the EIA Regulations requirement for public participation.

A meeting took place between the competent authority, DEA&DP in terms of the NEMA EIA Regulations, EEM and the EAP on 15 May 2014 (see Appendix B3). It was decided that a single application be undertaken as described in point b above and a separate application will be lodged for the powerline extension. These applications will be subjected to the requirements of the NEMA.

Based on the identification of the potential water uses, an Integrated Water Use License Application (IWULA) will be compiled and released for a 40 day public comment period, together with the Draft ESIA Report (under NEMA). Upon completion of the comment period, the final IWULA will be submitted to the DWA for review and comment.

Should the proposed project result in the loss of listed ecosystems in terms of NEM:BA, a permit application will be submitted to the provincial authorities for consideration during the release of the Draft ESIA Report.

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The outcome of this permit application will be advertised, together with the decision made in terms of NEMA, NEM:WA, and NHRA.

2.2.10. BROADER POLICY AND PLANNING CONTEXT

This section discusses a number of key formal planning policies relevant to the project. As this is a large-scale project backed by State departments and empowerment funds, national plans are also considered in this section, in addition to regional and local policies. The policies and plans briefly discussed below include:

- National development plans and policies, such as the:
 - National Development Plan: Vision for 2030 (NDP);
 - National Industrial Policy Framework (NIPF).
- Regional and local development and spatial plans, such as the:
 - Integrated Development Plans (IDPs) for district and local municipalities, which formulate the specific needs in, and desirable developments for, municipalities;
 - Spatial Development Frameworks (SDFs) for the province, and district and local municipalities, which translate the aims of the IDP into a spatial dimension and, together with the IDP, aim to give effect to the national imperative to increase economic growth and promote social inclusion whilst ensuring that such growth is environmentally sustainable (DEA&DP, 2009);
 - Saldanha Bay Industrial Development Zone (IDZ);
 - Saldanha Bay Municipality Local Economic Development (LED) Strategy; and
 - Draft Environmental Management Framework (EMF), currently under development for the Greater Saldanha Bay area.

2.2.10.1. NATIONAL DEVELOPMENT PLAN: VISION FOR 2030 (NDP)

The NDP: Vision for 2030 was released by the National Planning Commission in November 2011. The National Planning Commission comprises 26 commissioners appointed by the President of South Africa to advise on issues affecting long-term development in South Africa. The overarching vision of the NDP is to eliminate poverty and reduce inequality by 2030 by addressing a number of key priority areas in the South African economy and society.


The NDP proposes to create 11 million jobs by 2030 by:

- Realising an environment for sustainable employment and inclusive economic growth;
- Promoting employment in labour-absorbing industries;
- Raising exports and competitiveness;
- Strengthening government's capacity to give leadership to economic development; and
- Mobilising all sectors of society around a national vision.

The NDP proposes to increase employment and growth by raising exports, focussing on those areas where South Africa already has the endowments and comparative advantage, such as mining, construction, mid-skill manufacturing, agriculture and agri-processing, tourism and business services.

2.2.10.2. NATIONAL INDUSTRIAL POLICY FRAMEWORK (NIPF);

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The NIPF sets out the South African Government's approach to South Africa's industrialisation trajectory to help align both private and public sector efforts towards this end. The NIPF vision for this industrialisation trajectory is as follows (DTI, 2008):


- To facilitate diversification beyond South Africa's current reliance on traditional commodities and non-tradable services. This requires the promotion of increased value-addition per capita characterised particularly by movement into non-traditional tradable goods and services that are competitive in both export markets and the domestic economy;
- The long-term intensification of South Africa's industrialisation process, and movement towards a twenty-first century knowledge economy;
- The promotion of a more labour-absorbing industrialisation path with a particular emphasis on tradable labour-intensive goods and services and economic linkages that catalyse employment creation;
- The promotion of a broader-based industrialisation path characterised by greater levels of participation by historically disadvantaged economic citizens and marginalised regions in the mainstream of the industrial economy; and
- Contributing to industrial development in Africa, with a strong emphasis on building regional productive capabilities.

The NIPF indicates five sectors with particular potential for industrial growth and employment opportunities. Three of those are of particular relevance to the proposed project (DTI, 2008):

- Natural resource-based sectors: Secondary, new value-adding opportunities may arise through new primary activities such as mining or agriculture as well as the further processing of the resource base.
- Medium technology sectors (including downstream mineral beneficiation): While it does not automatically follow that because South Africa possesses the underlying natural resource, it should automatically be producing a more beneficiated product further down the value chain, a number of opportunities arise for downstream processing of South Africa's mineral base. These include various sources of local demand, existing capabilities and underdeveloped value chains. Further development of these value chains could add significant value and employment opportunities due to the much higher labour intensity than their upstream counterparts.
- Advanced manufacturing sectors: The predominance of medium- to high-tech products in global trade signifies that more efforts should be directed to value- addition and improving efficiencies along manufacturing value chains. More importantly, new advanced manufacturing processes need to be promoted and accumulated industrial capabilities enhanced. This is particularly important in the context of relatively sluggish export performance in terms of both growth and technological composition.
- Advanced manufacturing is generally characterized by relatively high levels of skills and technology requirements. These sectors are often driven by foreign direct investors who own the proprietary knowledge involved and who subcontract original equipment manufacturing. However, there are areas in which South Africa is developing its own proprietary technologies, such as in mining capital goods and nuclear energy.

2.2.10.3. WEST COAST DISTRICT MUNICIPALITY INTEGRATED DEVELOPMENT PLAN (2011-2015 ((DRAFT)

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The West Coast District Municipality (WCDM) Integrated Development Plan (IDP) reiterates the significance of the Saldanha-Vredenburg node as an area with high development potential, a 'regional motor' within the Western Cape. Major industrial development is expected as an economic spin-off from the proposed upgrading and expansion of the Saldanha Bay Port and "Back of Port" area. The IDP also notes a high level of poverty in the WCDM and a definite need to enhance job creation projects that 'ultimately will foresee the alleviation of poverty in the West Coast District'. The IDP has acknowledged that in order to retain existing employment levels, key sectors need to be restructured, including agriculture, fishing and aquaculture, construction and mining, tourism and oil and gas.

The WCDM, in its mandate to ensure a 'better quality of life for all', is determined to improve the human capital in the region, thereby encouraging an 'economically active population with skills that can ensure opportunities for them to better their livelihoods and well-being' (WCDM, 2011). Strategic objectives included in the IDP are:


Creating opportunities for businesses and individuals to grow the economy	Double the current Gross Regional Product by 2014
Improving education outcomes	Create 50% more jobs in the local economy by 2014
Increasing access to efficient and safe transport	Train an additional 750 technical tertiary qualified people by 2014
Maximising health outcomes	Achieve a 90% matric pass rate of grade 7 enrolled people by 2016, with an emphasis on maths and science
Reducing crime	Train 1000 people with the skills required in industry and manufacturing with a key focus on the engineering and oil and gas industry
Optimising human settlement integration	Create high profile partnerships
Mainstreaming and optimising resource efficiency and sustainability	
Increasing social cohesion	
Reducing poverty	

2.2.10.4. WESTERN CAPE SPATIAL DEVELOPMENT FRAMEWORK

The Western Cape Provincial Spatial Development Framework (PSDF) is a spatial planning document that guides metropolitan, district and local spatial initiatives such as IDPs and SDFs. The PSDF seeks to guide development in such a way as to maximise social benefits while protecting sensitive environmental and cultural features, with an emphasis on correcting previous socially damaging spatial initiatives (apartheid). The PSDF is broad based document and does not guide development at a micro-scale (e.g. Erf boundaries), and is therefore only useful in most cases insofar as it describes the overarching planning imperatives of provincial authorities.

The overarching objectives of the PSDF are as follows (PGWC, 2009):

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Socio-Economic Development Objectives:

- Align the future settlement pattern of the Province with areas of economic potential and the location of environmental resources.
- Deliver human development programs and basic needs programs wherever they are required.
- Strategically invest scarce public resources where they will generate the highest socio-economic returns.
- Support Land Reform.
- Conserve and strengthen the sense of place of important natural, cultural and productive landscapes, artefacts and buildings.

Urban Restructuring Objectives:

- End the apartheid structure of urban settlements.
- Conveniently locate urban activities and promote public and non-motorised transport.

Environmental Sustainability Objectives:

- Protect biodiversity and agricultural resources.
- Minimise the consumption of scarce environmental resources, particularly water, fuel, building materials, mineral resources, electricity and land – in the latter case especially pristine and other rural land, which is the Province's 'goldmine-above-the-ground'.

The PSDF identifies the Saldanha-Vredenburg node as a 'regional motor' with a 'growing industrial hub' which does, however, face constraints mainly in the form of water shortages. At the same time, the Langebaan-Veldrdrif tourism development area is one of the eleven identified tourism development areas in the Western Cape and is within a coastal ecological corridor and hence core biodiversity area (PGWC, 2009).

A number of issues and strategies were identified specifically for the West Coast region within the PSDF:


Issues:

- Saldanha Bay oil and gas potential;
- Drought;
- Access to the Olifants River irrigation scheme;
- Cederberg / West Coast tourism;
- How to balance pressure for urbanisation vs. water shortages vs. demands from agriculture; and
- South African region that is likely to be most extremely affected by global climate change.

Strategies:

- Prepare an industrial development / environmental conservation plan for Saldanha Bay that acknowledges this sub-region's extreme environmental and economic sensitivities;
- Prepare an action plan to adapt to global climate change;
- Investigate the potential for an Olifants River development corridor with particular emphasis on improved access to land for small farmers;
- Formulate a coastal management plan to address pressure for development along the coast; and
- Promote ecological corridors linking the coastal zone to the Cederberg Mountains.

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2.2.10.5. SALDANHA BAY MUNICIPALITY INTEGRATED DEVELOPMENT PLAN (2012 – 2017)

The Saldanha Bay Municipality (SBM) IDP 2012 – 2017 (SBM, 2012) defines a number of strategic objectives and key strategies that serve as the foundation on which the municipality will be able to realise its vision, help to drive National and Provincial Government's agenda, expand and enhance infrastructure, and make sure that all residents have access to essential services.

Strategic objectives include the diversification of the economic base of the municipality through industrialisation, whilst at the same time nurturing traditional economic sectors while also developing safe, integrated and sustainable neighbourhoods. Some relevant key strategies in this regard include:

- To create an enabling environment for the promotion of economic development as well as tourism and the elevation of the industrial potential;
- To grow IDZ initiatives as one of the key focus areas of this IDP period; and
- To promote the conservation of the environment and facilitating responsible spatial development and use of resources.

The IDP notes that the most important economic assets of the municipal area are the Saldanha Port and its pristine coastline and that the region's potential to create more sustainable jobs and expand its business activity should be closely linked to industrial development and the tourist opportunities the coastline offer.


The industrial, tourism and agricultural sectors are seen as the primary economic drivers in the SBM economy. However, employment in the agricultural sector has declined substantially due to increased mechanization, and farm workers have migrated to urban areas in search of employment opportunities, which could for example be provided by the industrial and tourism sectors. As the natural environment is the main attraction for tourists in the area, industrial development should take place in such a way that the natural environment and tourist attractions are not affected negatively.

2.2.10.6. SALDANHA BAY MUNICIPALITY SPATIAL DEVELOPMENT FRAMEWORK (2010)

The objective of the overarching Spatial Management Concept for the SBM area, as contained in the SDF, is to provide a broad guide to future development and land use management at the conceptual level. The primary elements that have informed the proposed Spatial Management Concept are as follows:

- The need to protect areas which;
- Have a high irreplaceability factor in terms of meeting targets for biodiversity conservation;
- Are important for the maintenance of ecological and evolutionary processes; and
- Are critical to the provision of ecological services and special habitats;
- The integration of the river systems and coastline as ecological corridors into the regional open space system;
- The incorporation of protected natural areas and areas under conservation management into the regional open space system;

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- The protection of high soil-based agricultural production potential areas;
- The promotion of urban development and growth within an established growth potential hierarchy which takes cognisance of the main functions, growth potentials, comparative economic advantages and specific location and spatial capacities of the various urban areas; and
- The maintenance, protection and promotion of high quality urban (including historical/cultural environments) and natural environments.

Service infrastructure, including road linkages, is however lacking at present and their provision is regarded to be a key public investment required to unlock the development potential of the mine area on Farm 349/4 and a portion of Farm 349/2 as well as the associated infrastructure which includes roads and powerline extensions.

2.2.10.7. SALDANHA BAY MUNICIPALITY LOCAL ECONOMIC DEVELOPMENT STRATEGY (2005)


The goals of the LED Strategy (2005) for the SBM area are:

- The alleviation of poverty through the broadening of the economic base in the agriculture, manufacturing, trade and tourism sectors. Implied in this goal is a lesser dependence on the local manufacturing sector as a provider of jobs and income;
- To become a world-class economical manufacturer and exporter of steel and steel products;
- To create opportunities in the agricultural, manufacturing and tourism sectors that would result in the community increasing their involvement in the economy and increasing their skills levels, becoming more competitive within the regional labour force and increasing employment opportunities;
- To provide more effective infrastructure, especially tourism infrastructure that will help the community in attaining supplies. This will also help local businesses and SMMEs by boosting investor's confidence in the area;
- To address the various problems of the different sectors, such as water shortage, unemployment etc., in order to remain economically competitive and environmentally sustainable in the future;
- To create a fertile environment for economic growth through developmental planning policies and land use management regulations that is conducive to local small business development;
- To deliver basic services to all areas and people, which will enhance participation in the mainstream economy; and
- The municipality to champion a process to encourage all major employment creators to use procurement and employment policies that favour local entrepreneurs.

The outcomes for economic growth in the SBM area were identified together with nine associated strategic interventions:

- Industrial development;
- Well-developed tourism Infrastructure;
- Promotion of SMME development;
- Conducive environment for investment;
- Creation of employment opportunities;

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- Diversity of the economic base in the SBM area;
- Empowerment of local communities to participate in local economic activities;
- Environmental sustainability;
- Promotion of value added agricultural activities; and
- Skills development.

2.2.10.8. GREATER SALDANHA BAY AREA DRAFT ENVIRONMENTAL MANAGEMENT FRAMEWORK

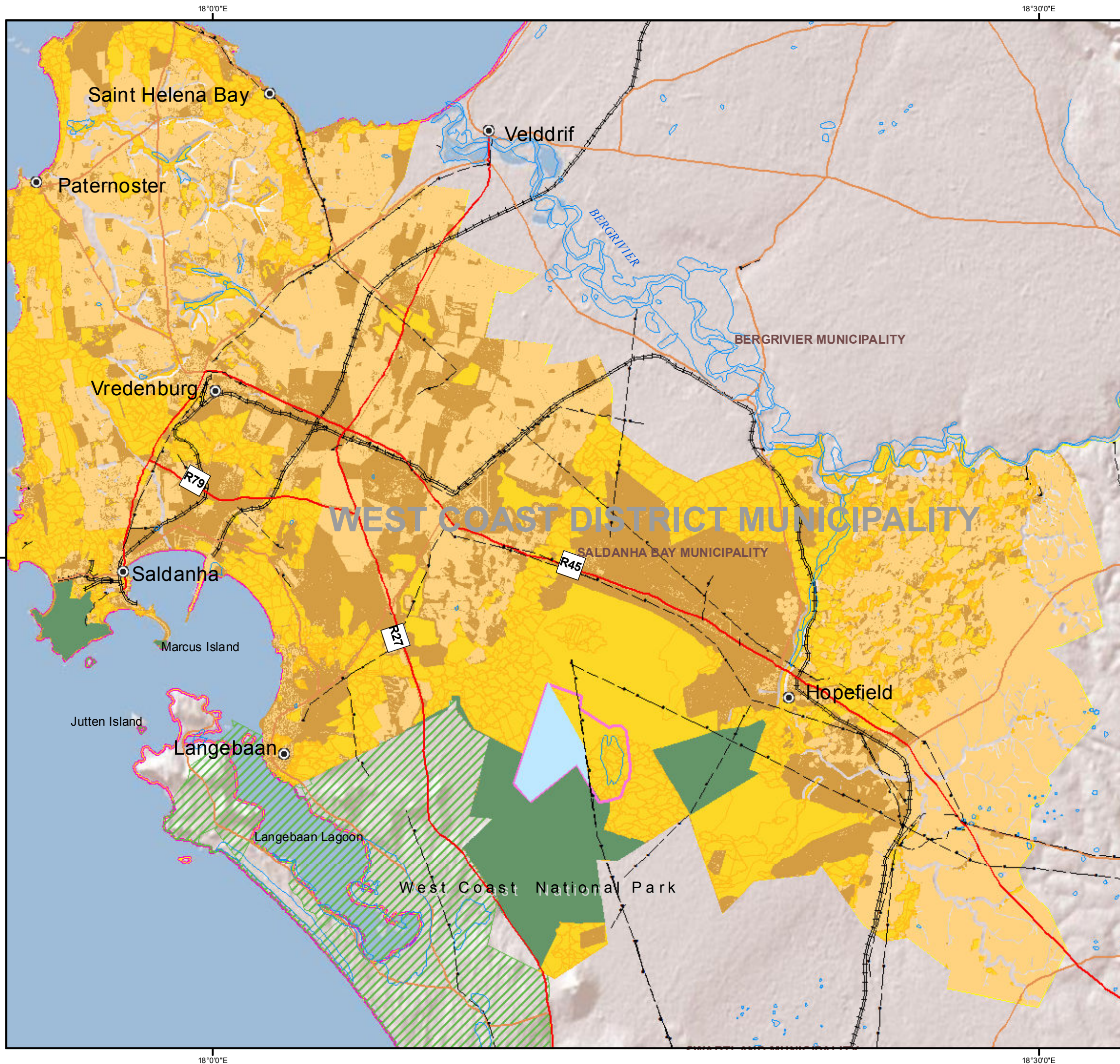
The Draft EMF was released in February 2013 and is briefly summarised below. The EMF may still be amended during the finalisation process and must be adopted by the Minister. Once adopted, EMFs must be taken into consideration in decision making.

The Draft EMF highlights a number of key trends that are relevant to the proposed project, including the following (MEGA, 2013):

- Development capacity is limited by water scarcity, as there is limited opportunity for abstracting additional water from surface water (i.e. Lower Berg River tributaries) or aquifers;
- Climate change is likely to result in:
 - Changes in flood patterns and flooding;
 - Increasingly stormy seas, which could impact on port activities;
 - Increasing coastal erosion and resulting impacts on recreation and tourism opportunities;
 - Decreasing farming and fishing productivity; and
 - Increasing demand for water;
 - Biodiversity resources are lost through transformation of land, particularly urban development;
- Air pollution modelling undertaken for the IDZ feasibility study has indicated that particulate emissions are of concern at certain locations. Areas most affected are located in the vicinity of the iron ore handling facility and the ArcelorMittal and Tronox plants;
- Pollutants associated with heavy industrial activity and increased urbanization are entering Saldanha Bay and place strain on the supporting environment and fisheries; and
- The poverty gap within the community in the SBM has expanded between 1996 and 2002, implying that many people in the area are becoming poorer. This is related to the general scarcity of available jobs and the low skills level of the local population (Urban-Econ, 2005, cited in MEGA, 2013).

According to the maps contained in the Draft EMF, the proposed location of the Elandsfontein Mine area on Farm 349/4 and a portion of Farm 349/2 fall within an area identified as a Critical Biodiversity Area (see Figure 6-14).

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Legend

- District Municipality
- Local Municipality
- Towns
- Main Road
- Secondary Road
- Railway Line
- Eskom Powerline
- Mine Area
- Critical Biodiversity Area
- No natural remaining
- Other natural area
- Protected Areas
- Rivers
- National Park

SCALE:



PROJECT: Elandsfontein Phosphate Mine

Figure 2-1: Critical Biodiversity Areas

CLIENT:



Project No: 10043

Rev No. 1.0

Scale: 1:250 000

A3

Drawn: 06/06/2014

OB

Checked: 06/06/2014

RR


Approved: 06/06/2014

GA

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Projection: Geographic, Datum: WGS 1984
Source: Enpat (2001),
Demarcation Board (Dec 2005)
Inset ESRI Data and Maps

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3. PROJECT BACKGROUND AND MOTIVATION

3.1. INTRODUCTION

3.1.1. PROJECT HISTORY

The Geological Survey (currently the Council of Geoscience) initiated a multidisciplinary project in 1975 to study the recent sediments on the coastal plain between Cape Town and the Olifants River. During this study a potential economic phosphate deposit was discovered on the farm Elandsfontein 349, situated some 15km southeast of the Langebaan Phosphate Works, which was then in operation.

Samancor, the company that operated the Langebaan Mine, obtained an option to purchase the surface and mineral rights over Portion 3 of Elandsfontein, adjacent to Portion 4 currently investigated by Elandsfontein Mining and Exploration (Pty) Ltd. (EEM), where the phosphate was intersected during the regional exploration program conducted by the Geological Survey.

Subsequent drilling program by Samancor confirmed the presence of phosphate on Portion 3, and also indicated the extension of the ore body to the northwest into Portion 4 of Elandsfontein 349. A drilling program between 1984 and 1986, consisting of 18 boreholes on Portion 4 (533m), confirmed the presence of potentially economical phosphate. A deposit restricted to the inside of the drilling indicated a resource of 50Mt at grade of 10.1% P₂O₅.

Metallurgical test work has also conducted on the samples that prove that the ore could be upgraded to a saleable grade of 32% P₂O₅ by means of flotation.


EEM applied for prospecting rights over Portion 4 and a sub-portion of Portion 2, with the Department of Mineral Resources during 2009. The right was granted on 30 April 2013. The Samancor data (including drilling logs, assay results and metallurgical test results) was purchased by EEM from the Council of Geoscience in 2012.

Using this information a 3D geological model was built, to assist with the planning of EEM drilling. EEM initiated its drilling campaign in October 2013, the initial aim of replicating 3 of the previous Samancor holes, to verify the historical Samancor results. The results from the initial drilling and assays by an independent laboratory (SGS South Africa (Pty) Ltd), ascertained that the Samancor data could be used for the resource calculations. EEM drilled an additional 4 holes to verify and confirm the 3D geological resource model.

In addition, a Lidar survey of the area was also conducted to assist with the generation a resource model.

EEM is currently conducting additional exploration drilling outside of the planned mining area to increase the resource. Metallurgical test work is currently underway to finalise the plant configuration.

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Following the findings of a series of investigations into updated reserve estimates, product handling and ship loading, it was decided that the final product would be transported via road in containerized trucks directly from the mine site to the Saldanha Port. The motivation for the change in transport options is detailed in chapter 5.

3.1.2. PROPOSED MOTIVATION

Phosphate rock is a naturally occurring compound of the element phosphorus, found in rocks, soils and organic material. Phosphorus is a key element in all known forms of life, both plant and animal. Phosphate rock is a non-renewable resource that has taken millions of years to be formed through geological cycles and events.

The dominant application of phosphorus is in fertilisers. Due to the essential nature of phosphorus to living organisms, the low solubility of natural phosphorus-containing compounds, and the slow natural cycle of phosphorus, the agricultural industry relies on fertilisers that contain phosphate.

The most important characteristic of phosphorus is that there are no substitutes for it.

Global phosphate demand is rising due to a growing world population and increasing food demand. The significance of phosphate for the future existence of humanity was realised some decades ago when phosphate was declared a strategic mineral based on its significant role in food production (USGS, 1984). Food security not just in South Africa but the world over became an ever growing issue in the last decade. The Langebaan phosphate deposit has been listed as a strategic phosphate resource by the International Strategic Minerals Inventory (ISMI Working Group).

According to phosphate marketing company CRU, the long-term industry forecast shows that the growth in phosphate rock demand will require that new mining capacity will be required before 2022.

Increased consumption is envisaged within the Africa region, when compared to the anticipated production. However, it is forecast that no African country will become a net importer of phosphate rock in the near future.

Within South Africa, South Africa has fourteen known phosphate deposits of which four are igneous deposits (Phalaborwa, Schiel, Glenover and Spitskop) with the other ten being sedimentary deposits located in the Varswater formation in the Western Cape.

Refer to Appendix C13 for the Economic and Strategic Significance Study by Dr. J. Hattingh.

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Table 3-1: Sedimentary Phosphate Projects in South Africa

Deposit	Nearest Town	Size (MT)	Grade (%P ₂ O ₅)	Status
Elandsfontyn Portion 4	Langebaan	70	9.6	Prospected
Elandsfontein Portion 3	Langebaan	20	10.9	Prospected
Duyker Eiland	Vredenburg	33	7.2	Prospected
New Varswater Quarry	Langebaanweg	25	8.5	Mined, prospected
Zandheuwel	Vredenburg	20	5.6	Prospected
Old Varswater Quarry	Langebaanweg	5	8.0	Mined, prospected
Muishondfontein	Langebaanweg	5	9.8	Prospected
Baard Quarry	Langebaanweg	1	12.8	Mined out
Langeberg Portion 7	Langebaanweg	1	20.0	Mining in Progress
Graven's Gift	Atlantis	1	22.0	Prospected

According to the Council of Geoscience, Elandsfontein Portion 4 is the only new viable large scale phosphate mine in South Africa. The property is the second largest deposit in South Africa after Foskor, and the highest grade of all of the large scale deposit in South Africa.


In addition to the good phosphate grade, the ore is one of the purest phosphate deposits in terms of deleterious elements. The ore contains very low values of contaminants often associated with sedimentary phosphate deposits, such as arsenic, cadmium, uranium and thorium.

In addition to the strategic importance of phosphates, the development of a phosphate mine will make a significant positive contribution to the neighbouring communities. The project has the potential to:

- Promote economic growth and development in the Western Cape.
- Promote employment and advance the social and economic welfare of the people in the West Coast District Municipality.
- Provide direct job opportunities as well as the incubation of sustainable small and medium enterprises.
- Provide skills development and the support of an entrepreneurial culture in the communities.

In addition to the skills and human resource development associated with industrial development, direct, indirect and induced revenue streams will be tangible in the area.

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According to 2012 statistics released by the Chamber of Mines, mining in South Africa created 524 632 jobs directly with another 841 260 jobs were created in the industries that either supply goods and services to the mining sector, or use mining products for downstream value addition, or which are related to the spending multipliers from mining and mining employees in the economy. In addition to direct and indirect jobs created, it must be noted that the social multiplier of mining is very significant for South Africa, who has a dependency ratio of about 10 to 1.

Expenditure

Construction phase – Mine development is expected to take approximately 12-15 months with a capital investment of USD 120 million.

Operational phase – At full production, annual costs associated with the mining activity are estimated to be in the order of USD800million, of which R430million is direct labour costs. Of the total expenditure, approximately 40% is targeted to be spent on BEE / HDSA suppliers and contractors at full production.

Mine closure – Mine closure will inject money into the regional and local economy largely through use of contractors in dismantling surface infrastructure and finalizing the rehabilitation process of any remaining spoil dumps and pits in the opencast mining areas.

Employment

Construction phase – During the 12-15 month construction period, contractor labour levels will peak at approximately 800, of which a large percentage will be targeted to be drawn from the local area and be employed for construction activities.

Operational phase – • The proposed new development will employ approximately 300 permanent employees with varying skills. Approximately 82 skilled and management and 218 low and semi-skilled. This implies an impact on the direct livelihood (direct workers and dependents) of approximately 1495 people. Indirect employment opportunities amount to 32,908 during the operational phase. The average wage bill would be R430 million over 15 years.

Mine closure – The mine closure operation will provide employment for between 60 -100 people (declining) over the three to five-year period, following the end of mining activities.


Income profile

According to the socio-economic study the total Gross Domestic Product (GDP) impact in South Africa of the construction phase will amount to R1 billion over the three year construction period.

Broad-Based Black Economic Empowerment

Elandsfontein Exploration and Mining (Pty) Ltd is a 30 % BEE owned company of which the shares are held by the following entities:

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Pico Diamonds (Pty) Ltd	15%
Adistra 11 CC	15%
Phosfanatio (Pty) Ltd	70%

In terms of employment equity targets in the empowerment charter to ensure diversity as well as participation of HDSA at all decision-making positions and core occupational categories, Elandsfontein mine will strive to achieve a minimum of 40% HDSA demographic representation at:

- Executive Management (Board) level
- Senior management (EXCO)
- Core and Critical skills
- Middle management
- Junior management


The intention of the Mine is to comply with the provisions of the Employment Equity Act (Act No.55 of 1998), and to implement an Employment Equity Plan (EEP) in compliance with the Mining Charter. The Mine's EEP will continue to be implemented until the Mine's workforce is sufficiently reflecting the demographics of the region - and of SA at large. Three specific targets areas will be focused on:

- a) HDSA participation in management
- b) Women participation in mining
- c) Empowerment of the disabled

Environmental commitment EEM is committed to:

- Sustainable business models for all stakeholders, including shareholders, employees, communities and the environment;
- Compliance with all applicable environmental legislation;
- Environmental best practice;
- Adherence to first world standards;
- Restoring and rehabilitating affected areas;
- Establishing appropriate and effective mitigation measures;
- Progressive and innovative programmes to minimise environmental impacts
- In line with the environmental commitment, the following potential biodiversity offset and rehabilitation programmes have been identified and will be investigated further and implemented if feasible during the life of mine. The detail regarding this process :
 - Restoration of degraded/areas infested with alien vegetation such as the fossil site in collaboration with SANParks;
 - Donating areas of heritage importance (fossil area in –dunefield) within the project area and where the surface rights is held by Elandsfontein Land Holdings (Pty) Ltd for declaration, management and use for further research by relevant parties (tertiary institutions and students such as UCT); as well as possible development as a paleo tourist attraction for the West Coast (fossil park).


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- Provide bursaries to tertiary students at institutions such as UWC and to encourage postgraduate students to focus their studies on aspects related to the mine including earth sciences, life sciences (monitoring and rehabilitation, etc).
- Local Economic Development Injection as per projects identified in the Social and Labour Plan (SLP) a requirement of all mining right applications (in terms of the MPRDA).
- Possible offset areas related to the impact on sensitive vegetation (this will however, be investigated as part of the ESIA where potential impacts cannot be mitigated, such as removal of vegetation over areas which will accommodate the mine and related infrastructure).
- Improvement of the conservation contribution of land areas to be affected.
- Establishment of a “Sustainable Science and Technology Research, Education and Visitor Centre” as a Major Attraction on the West Coast.
- Development of Satellite Fossil Sites.
- Small scale farming injection.
- Utilising grey water from the Vredenburg Wastewater Treatment Works (WWTW) which will be purified to a level required for use in the processing plant. Currently the treated effluent is being disposed into a well and eventually ends up in the Langebaan Lagoon. By utilizing the grey water as part of the processing plant, this will eliminate the need to dispose of it in the manner it currently is which may affect the groundwater and surface water of adjacent water bodies, such as the Langebaan Lagoon. The use of recycled water eliminates the need to use potable water (such as abstracting water from the aquifer) and minimising the potential to impact groundwater sources at the mine site. Utilising recycled water as part of the process adds to water conservation and management measures currently being promoted by National and Provincial Department of Environmental Affairs in light of climate change adaptation strategies.

Information extrapolated from the EEM Social and Labour Plan.

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4. PROJECT DESCRIPTION

4.1. PROJECT LOCATION

The proposed mine site is located at 33°06'05.69"S and 18°12'26.85"E. EEM holds the prospecting rights to the Elandsfontein deposit over Portion 4 and a portion of Portion 2 of the Farm Elandsfontein No. 349. All comments including infrastructure will be located on the aforementioned farms. Excluded from this are portions of the powerline and main access road requirements, which will cross additional properties, not owned by Elandsfontein Land Holdings (Pty) Ltd (see Figure 1-1).

4.2. PROPOSED PROJECT

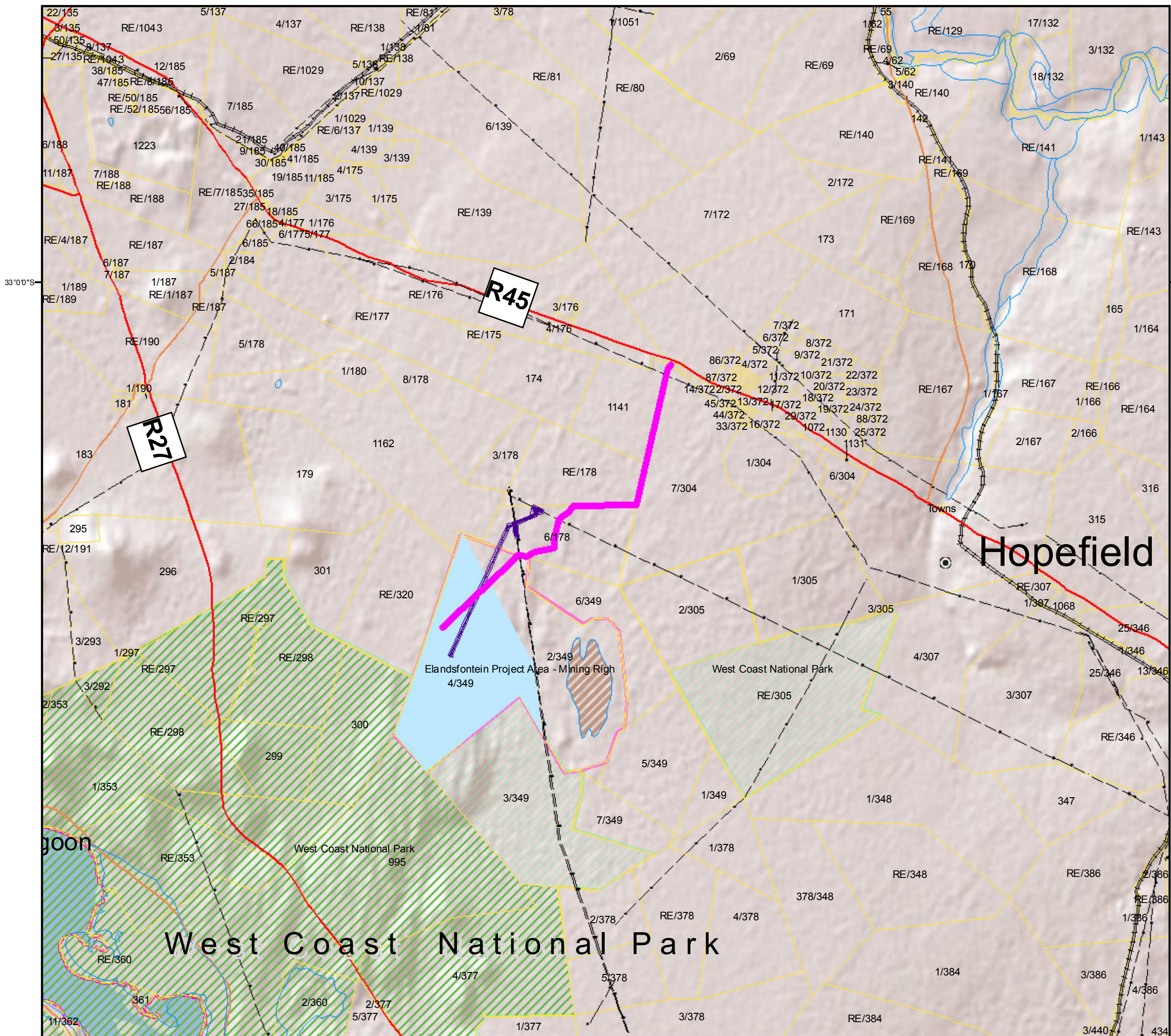
The Elandsfontein deposit is a greenfield project (a project which lacks any constraints imposed by prior work). The intent is to adopt an open-pit strip mining method using a combination of truck and shovel, and conveyor belts to extract the deposit, phosphate ore. The deposit is sandy in nature, and no blasting will be required.

4.3. PROPERTY DETAILS

The table below indicates the properties found within the Elandsfontein Phosphate Mine project boundary areas and associated land owners. The properties found within the Elandsfontein Phosphate Mine project boundary area is illustrated in (refer to Figure 4-1). The project boundary covers an area of 942.185ha at Elandsfontein.

Component	Farm Name	Portion	Extent (Ha)	Landowner
Main mine (pit, buildings, processing plant)	Elandsfontein	2/349	1999.1217	Elandsfontein Land Holdings (Pty) Ltd
	Elandsfontein	4/349	942.1852	Elandsfontein Land Holdings (Pty) Ltd
Powerline	Elandsfontein	6/178	697.6567	QCK Lezmin 4443 CC
		2/349 and 4/349		Elandsfontein Land Holdings (Pty) Ltd
Mine access road	Langverwacht	6/178	697.6567	QCK Lezmin 4443 CC
	Elandsfontein	2/349 and 4/349		Elandsfontein Land Holdings (Pty) Ltd
	Langverwacht	RE/178	667.5264	Horseshoe Investments 0025 CC
	Elandsfontein	1141	527.7263	L. Scullard
	Elandsfontein	7/304		Saldanha Bay Municipality

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Legend

- District Municipality
- Local Municipality
- Towns
- Main Road
- Secondary Road
- Railway Line
- Eskom Powerline
- Farm Portion
- Mine Area
- Elandsfontein Land Parcels
- Rivers
- National Park
- Fossil Area

SCALE:
0 1 2 4 6 8 km

PROJECT: Elandsfontein Phosphate Mine


Figure 4-1: Cadastral Map

CLIENT: 

Project No: 10043	Rev No. 1.0
Scale: 1:125 000	A3
Drawn: 06/06/2014	OB
Checked: 06/06/2014	RR
Approved: 06/06/2014	GA

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Projection: Geographic, Datum: WGS 1984
Source: Enpat (2001),
Demarcation Board (Dec 2005)
Inset ESRI Data and Maps

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4.4. MINING

4.4.1. ESTIMATE RESERVES AND EXTENT OF TARGET AREA

4.4.1.1. RESOURCE ESTIMATE

A summary of the Mineral Resource is shown below. On 28 November 2013, based on drilling results of 18 boreholes drilled by Samancor and 3 boreholes drilled by EEM, a resource of 70 million tonnes was declared.

The resource estimate was updated on 8 April 2014, based on an additional 26 boreholes drilled by EEM. The average drill spacing of the boreholes is has been reduced 300m, which would classify the resource as an indicated resource, with the resource on the drilling perimeter being classified as inferred.

Table 4-1: Updated Mineral Resource for Elandsfontein

Classification	Date	Grade	In Situ Volume	In Situ Mass	Geological Loss	Resource Mass
		(%P ₂ O ₅)	(m ³)	(Tonnes)	(%)	(Tonnes)
Inferred	Nov 13	9.65	46,903,550	75,983,751	7.5	70,284,970
Indicated	Apr 14	10.83	54,335	91,283	5.0	86,719,506
Inferred	Apr 14	9.80	30,957,757	52,009,031	7.5	48,380,494


EEM has a Total Resource of 135Mt at an average grade of 10.46% P₂O₅ as at 8 April 2014.

The Run of Mine (ROM) ore to the plant is expected to contain an average grade of 10.5% P₂O₅. The ore will be upgraded to a concentrate grade of 32.5% P₂O₅ through several flotation stages. The concentrate will be upgraded at the mine site and hauled via containerized trucks to the Saldanha Port.

Table 4-2: Proposed Mine Plan

Project Activity	Detail
Mine Products	A concentrated rock phosphate (at 32.5% P ₂ O ₅) will be produced through a <u>beneficiation plant on the mine site</u>
Mining Rate	5,000,000 tonnes per annum
Estimated Reserves	132,000,000 tonnes
Planned Life of Mine	20 years
Production Rate	1,500,000 tonnes per annum
Extent of area	431 ha

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4.4.2. PROPOSED LAYOUT AND PIT DESIGN

The mine design was based on the geological model information and using various grades, varying recoveries, mining cost, process costs and selling costs as well as the predicted phosphate commodity prices to optimise and prove the economical viable of the mineral resource that could be declared as a mineral reserve and feasibly mined. Based on these factors the planned mining depletion has been categorised into phases one to four as depicted in Figure 4-2. Due to the shallow and uniform nature of the deposit, only surface mining methods were considered. The results from the current prospecting indicate that the material to be mined is sandy in nature, with only occasional lenses of hard calcrete, and the operation would not require drilling or blasting.

Apart from the economic parameters used to draft the mine design, the following technical considerations have been applied:

- Pit Slope angle: 35°
- Max Bench height: 5m
- Min berm width: 5m
- Minimum pit bottom width: 30m

The type of mining method applied influenced the layout and design to a degree. A number of surface mining methods were investigated, and strip mining has been selected as the preferred option, based primarily on environmental considerations. The strip mining will take place in a number of discrete phases, which will reduce the overall mining, foot print:


- a) topsoil is removed and stockpiled;
- b) overburden layer is stripped and stockpiled;
- c) phosphate ore is mined; then
- d) the strip is backfilled with the overburden and slimes from the plant; and
- e) the topsoil returned to the strip and rehabilitated.

With this type of mining method concurrent rehabilitation (i.e. after mining a strip, rehabilitation can commence) can be employed which was considered a key element by EEM.

The draft production schedule will be updated once the definitive geological model and metallurgical test work is completed to allow for a final optimised production schedule to be generated. The draft schedule with the first 6 years highlighted in yellow is shown in table the below.


ELANDSFONTEIN PHOSPHATE LOM PRODUCTION SCHEDULE				
Area/Year	Topsoil BCMs	Soft Burden BCMs	ROM Ore BCMs	Total BCMs/A
2015	37,450	2,623,069	-	2,660,519
2016	77,749	7,482,631	2,366,001	9,926,381
2017	54,074	7,483,748	2,653,458	10,191,280

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2018	61,436	7,486,634	2,520,568	10,068,637
2019	73,559	7,482,864	2,539,322	10,095,746
2020	57,430	9,557,571	2,653,458	12,268,459
2021	66,693	9,368,935	2,635,265	12,070,893
2022	64,746	9,057,835	2,560,819	11,683,400
2023	71,705	9,348,118	2,637,927	12,057,750
2024	102,407	8,700,752	2,653,458	11,456,617
2025	75,067	9,028,759	2,592,667	11,696,493
2026	178,009	9,611,091	2,507,831	12,296,931
2027	106,002	9,614,519	2,653,458	12,373,979
2028	18,672	9,464,047	1,272,754	10,755,473
2029	34,618	9,438,675	1,052,667	10,525,960
2030	10,742	6,972,824	531,593	7,515,159
LOM Total	1,090,359	132,722,071	33,831,247	167,643,677

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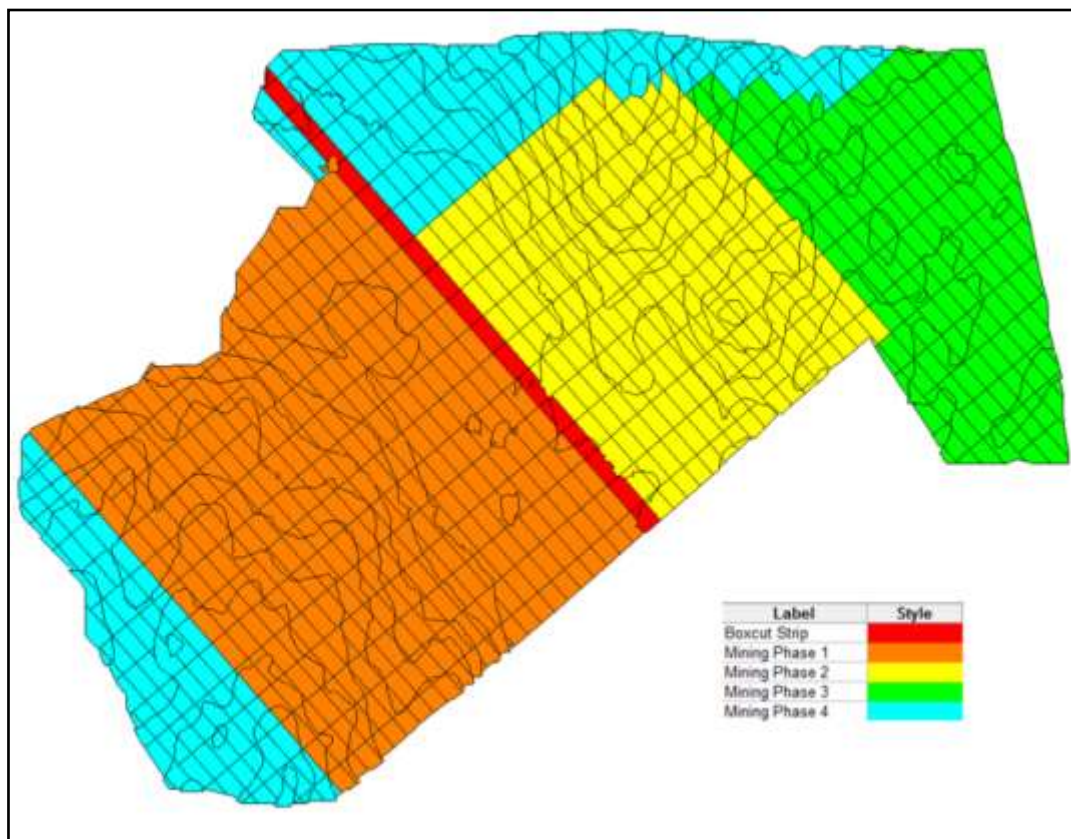



Figure 4-2: Showing the pit shell and mining phases

The current mine design is based on strips with widths of 50m and 750m long. Top soil and over burden will be transported from the pit via a mobile conveyor network, while the ore will be hauled by conventional trucks. The final slope angle has been determined at 35°.

As the mining activities intersect the upper Elandsfontyn aquifer and any open bodies of water are prohibited, continuous perimeter borehole pumping will be required to remove the excess water from the mining strips. It is currently proposed that the pumped water will be piped downstream of the mining operation. The aquifer water will immediately be reintroduced to the aquifer through a series of covered horizontal trenches (±4m deep), via a sealed water distribution hub, minimising the exposure of water to atmospheric conditions. Borehole dewatering of mining operations has been successfully employed at a number of mining operations both in South Africa and abroad (refer to Section 4.9.2.1 for examples).

The recommendation for the use of horizontal trenches was made by Fanus Fourie, Groundwater Specialist, DWA. Pumping tests have recently been conducted to determine the extents of the Cone of depression, and the volumetric flow rate of the aquifer. The results of the tests are not yet available, but observations indicate that the aquifer flow rate is significantly lower than anticipated.

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Any water that drains into the pit, and becomes contaminated by the mining activities will be consumed for activities on site.

4.4.3. MINING METHOD

The proposed mining method for Elandsfontein is strip mining (see Figure 4-3). In strip mining the resource area is mined in strips that are 50m wide running the entire width of the pit. All material is removed in strips along the length of the strip. Once material from one strip has been removed, material from the next unmined strip is removed. Depending on the depth of the pit, several benches will be mined (see Figure 4-4). Due to the sandy nature of both the overburden and ore, these benches will have a maximum height of 5m. Topsoil from the boxcut area will be removed and stockpiled for later reuse in rehabilitation. Overburden material from first 2-3 strips will be removed and placed on the softs stockpile located to the west of the pit. Once the ore from these strips have been mined out, the overburden material from strips 4 onwards will be placed back in the mined out area to backfill this area. Topsoil that is being removed in advance of the overburden operation will then be placed back on top of this overburden material. As the topsoil have been removed together with the vegetation, no reseeding of this rehabilitated area will be necessary as the vegetation will re-establish itself, unless reseeding is required.


The proposed mining method for Elandsfontein is strip mining. A boxcut will be established to ramp through the topsoil and softs to and through the mineralised zone. In strip mining the resource area is mined in strips that are 50m wide running the entire width of the pit. All material is removed along the length of the each strip. Once material from one bench strip has been removed, material from the next unmined bench strip is removed. Depending on the depth of the pit, and the size of excavator used several benches will be mined simultaneously. Due to the sandy nature of topsoil, softs and ore, these benches will have a maximum height of 5m. Topsoil (0.3m) will be dozed into heaps and loaded, hauled and stockpiled for later reuse in rehabilitation near the pit edges prior to the mining of the softs. Overburden material from first 2-3 strips will be removed and placed on the softs stockpile located to the west of the pit. The softs material is then removed in 5m benches down to the top of the mineralised material. The softs material post ramp completion is tipped at the softs tip for feeding, breaking and conveying to an external softs storage dump located close to the pit until such time there is sufficient area to replace it in the mined out area.

The softs material benches continue to be advanced and expose mineralised material as the mining of the mineralised material is commences. The mineralised material is also removed in 5m benches down to its base of the mineralised zone (G). The mineralised material is loaded and conveyed to the ROM tip for feeding, breaking and conveying to the ROM plant feed stockpile.

Once there is sufficient in pit area available all soft and dried tailings will be conveyed around the pit edge and deposited in the mined out area. The material will be graded, levelled and compacted and once the material reaches the required elevation and is stabilised then final rehabilitation will take place.

During final rehabilitation the stored topsoil that has being removed in advance of the softs operation is placed back on top of the stabilised softs and tailing materials.

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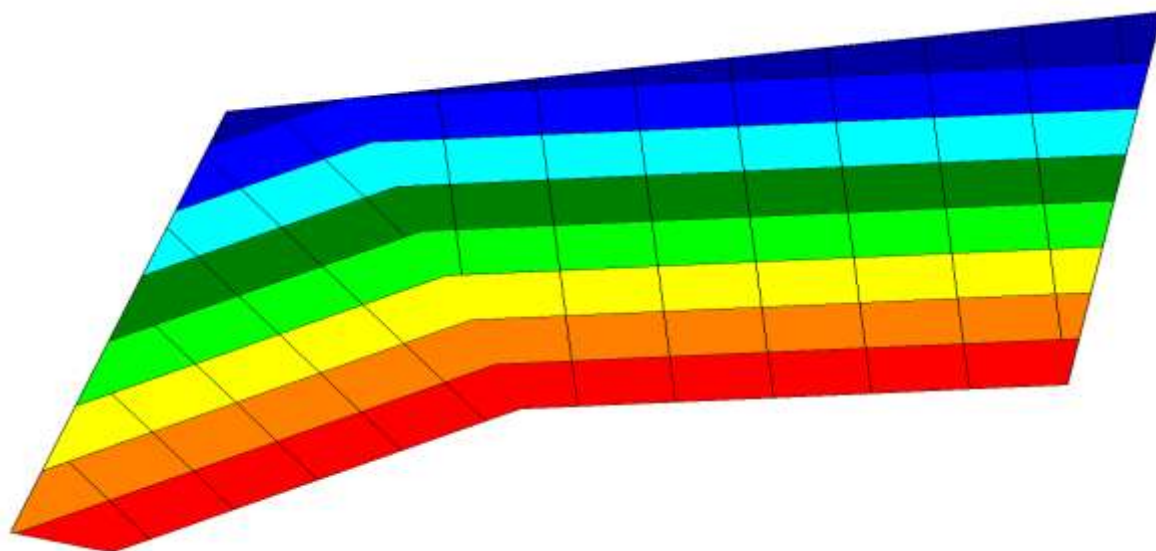


Figure 4-3: Typical Strip Mine

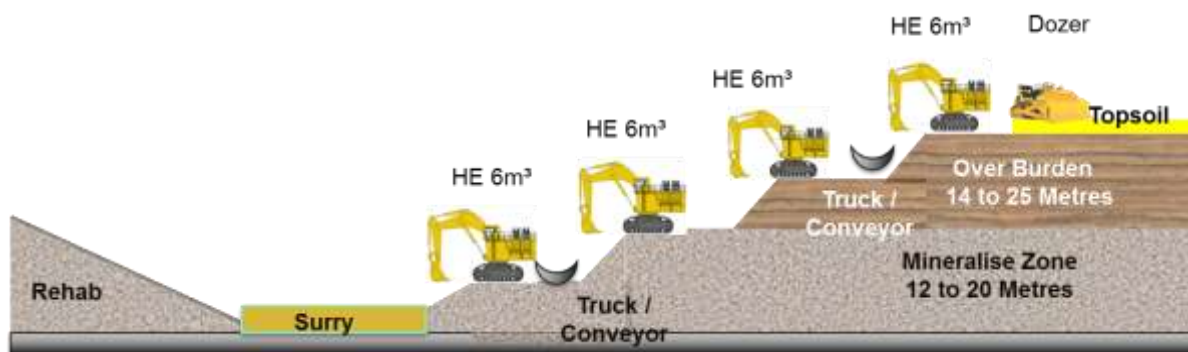



Figure 4-4: Multiple benches being mined in a Strip mine

The operation will require a high rate of mobility and will try with limit the requirement for powered infrastructure. Mining equipment selected for the operations is planned to be diesel mobile equipment. Optimised material logistics equipment (conveyors and/or pumps) are planned to be electric mobile equipment.

The mining method utilises excavators to load 100 % of the overburden and mineralised material, while hauling of overburden and mineralised material will be done with a combination of trucks and / or, conveyors and / or pumps.

The two most critical design elements of the Project are water management and haul road maintenance.

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First, all mining areas must be dewatered in advance of mining activities. In addition to advance dewatering, in-pit water management is also critical (see Section 4.9.2). Pollution control berms and trenches will limit the ingress of any rain / flood water into the pit. Roads must be well-graded and crowned with a thick layer works of appropriately sized materials. Mobile equipment (excavators, trucks, and auxiliary mobile equipment) will require good roads throughout the active mine at all times to ensure productive operations.

The five key factors driving the mining schedule are listed below in decreasing order of importance:


- annual product target,
- mineralised material grade,
- product yield recovery,
- stripping ratio, and
- backfill opportunities.

Backfilling was maximised to minimise re-handle and related controllable operating costs for the Project. A constant ± 1.0 Mt of beneficiated phosphate rock concentrate product was targeted each year with stripping ratio increasing from low to high to defer capital and operating costs and to minimise investment risk.

4.5. MINING SEQUENCE

Based on the maximum pit-shell (Figure 4-2: Showing the pit shell and mining phases) a detailed mine production schedule (targeting 5 million ore tonnes per annum) was developed and evaluated to determine the economic pit limit as depicted in Figure 4-2 Should the commodity price improve this economic mining limit may increase.

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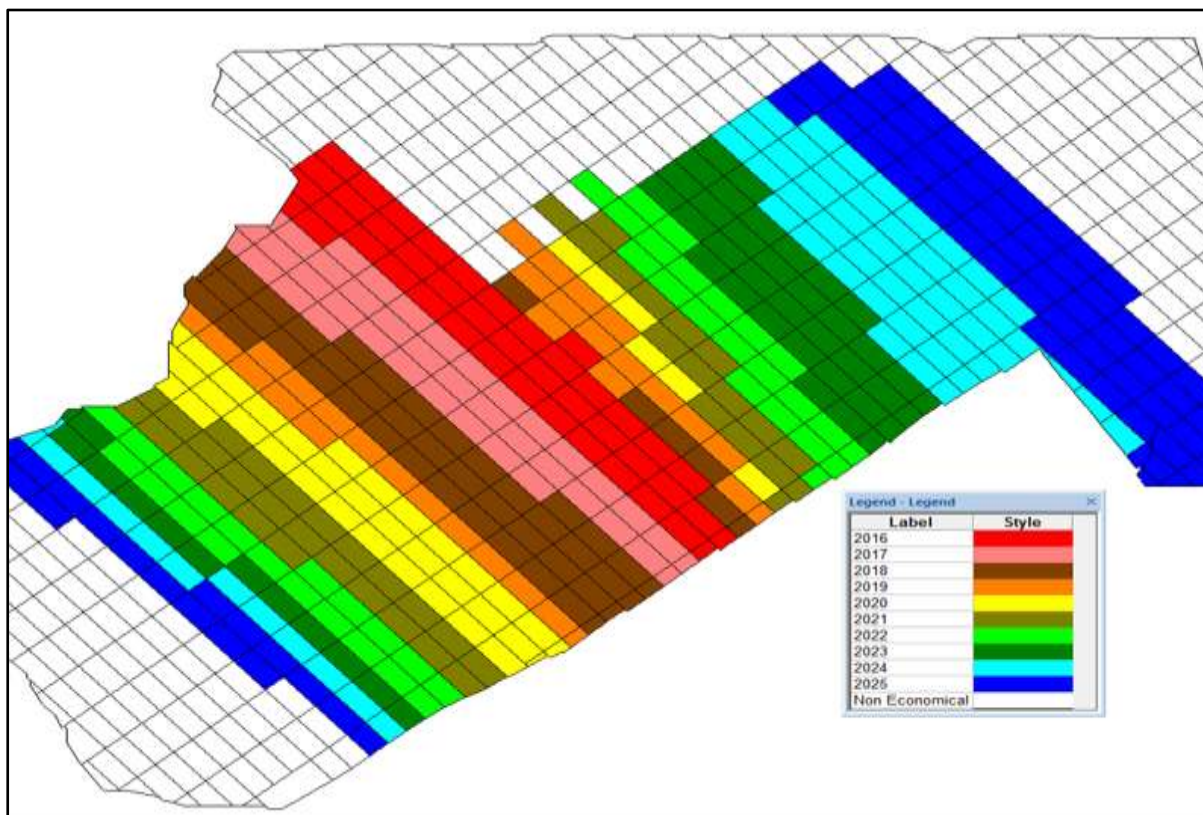


Figure 4-5: Showing Mining Sequence for the first 10 years


4.6. ORE PROCESSING FACILITIES

The proposed metallurgical plant will be located on site within a 240m by 290m area, including raw water storage. The plant complex will include infrastructure and equipment allowing for ore storage (stockpile), flotation, thickening and water storage, reagent make-up and storage, concentrate storage (closed silo or shed). It will further comprise a concentrate thickener and pressure filter to dewater the concentrate, and a silo and truck loading facility for final storage ahead of ship loading.

The total water storage at the mine site will be less than 50,000m³.

The plant stores, workshops, offices, training centre, laboratory, lay-down areas and security' will be accommodated on the mine buildings footprint covering an area of 12.75ha located adjacent to the beneficiation plant. Existing buildings on site such as the unused lodge will be used as administrative offices for mine personnel.

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4.7. SOFTS STOCKPILES (WASTE ROCK)

The mined overburden will be split into two different stockpile types, namely top soil which will cover an area of 13.9 ha reaching a height of 5m and softs (waste rock).covering 14.9ha at a height of 38m. Once the first year of strip mining has been completed, i.e. after about 33 months a steady state condition will be obtained, after which current arisings will be returned to the pit.

Topsoil stockpiles will be limited to 5m in height, above the original topography, and will be seeded with suitable indigenous plant species to prevent wind and water erosion. The topsoil will be used as a final covering to other stockpiles to assist the growth of plants and grasses. The softs (waste rock) stockpile will be covered with a layer of topsoil \pm 20cm thick and seeded with suitable indigenous plant species to prevent wind and water erosion.

If necessary, a clay lining will be placed at the base of the softs stockpile (SS). Clay linings will function as engineered hydraulic barriers to the movement of water and leachate from the softs stockpile into the surrounding environment. Based on the current understanding of the chemistry of the ore, a lining will not be required.

Based on the requirements of the rehabilitation programme, the plant tailings will be combined with the overburden from the pit, on the softs stockpile. The optimisation of the proposed layout has required the disposal of a single stream. This also results in the smallest possible footprint.

Classification of Soft Stockpile

The SS is it to be progressively developed increasing in footprint area, height and storage volume over a 33 month period, from Jan 2016 to Jul 2019 and shall ultimately cover an area of approximately 14.9 Ha, reaching a maximum elevation of 108 mamsl (38m maximum height), containing 25.3 million m³ or 37.9 million tonnes of dry material at an average dry placement density of 1.5 tonne/m³. From the total tonnes stored, 31 million tonnes comprises overburden material, with the remainder being tailings. After 33 months, the tailings and overburden material shall be used to systematically backfill sections of the open pit that has already been mined out.

Development of the Soft Stockpile

The SS material is to be disposed of in relatively dry state of 6-8% moisture content (water over dry mass) onto a dry soft stockpile. The development of the SS is to commence with the construction of a 1:12 starter ramp constructed using the overburden material and trucks. Upon completion of the starter ramp, a conveyor shall be assembled which is to be used to convey the overburden material and tailings to the SS. The figure below illustrates the concept of the conveyor on the starter ramp.

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Figure 4-6: Example of a starter ramp and conveyor

The concentrator tailings conveyor shall discharge onto the SS conveyor, and is approximately 100m in length. The SS and concentrator conveyor belts are 900mm wide giving a conveyor structure that is 1.5m wide.

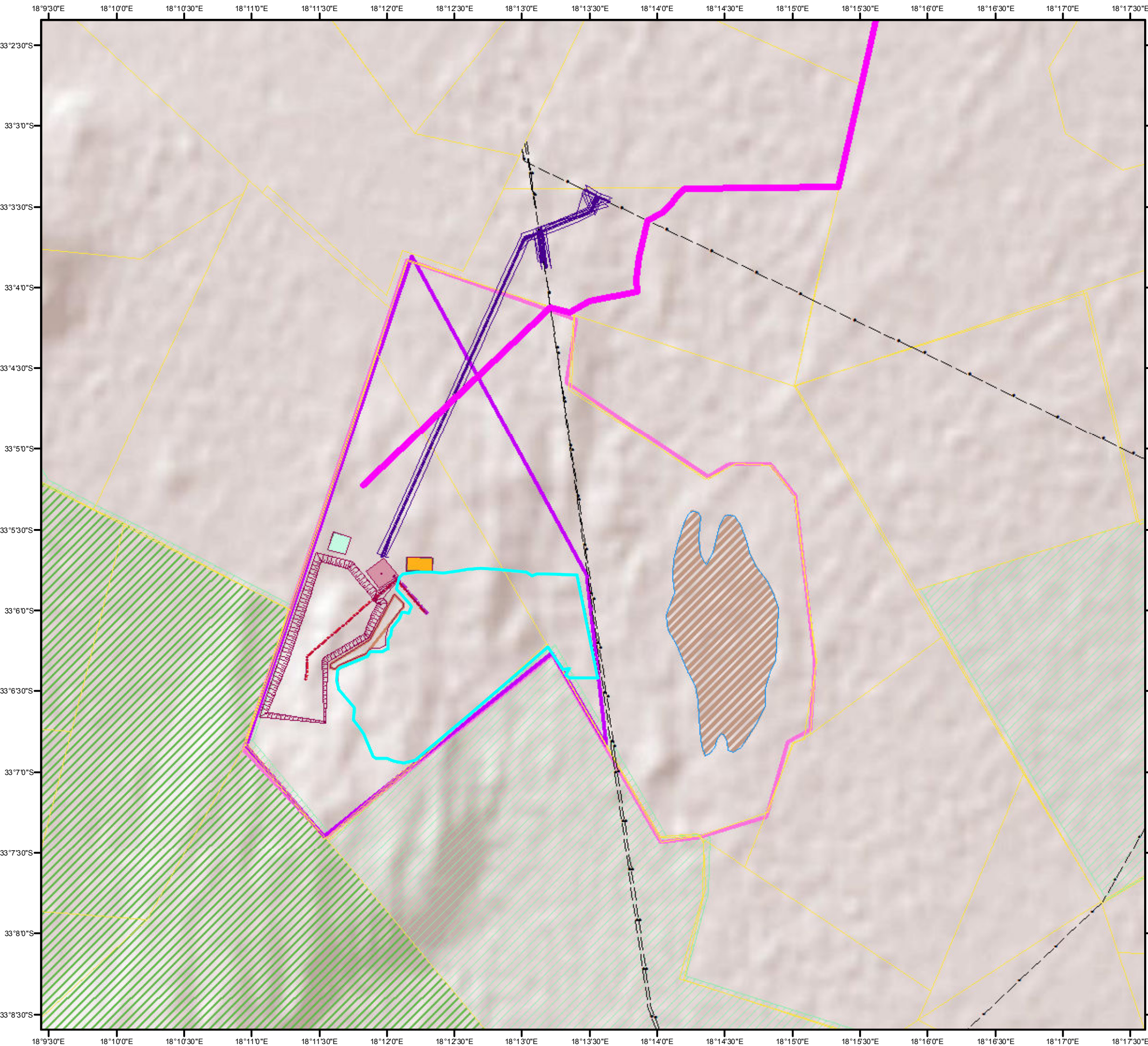
Construction of a platform starting at the edge of the ramp shall commence upon start up using the overburden material and dewatered tailings. The platform is to be maintained at an elevation of 108mamsl and a minimum width of 190m. The total length of the platform upon completion would be approximately 1300m from the edge of the ramp.

The length of the conveyor shall progressively increase as the platform advances. A radial stacker boom of approximately 70m is utilised to tip/stockpile material at the end of the conveyor. Bulldozers shall push the material out in front of the boom towards the advancing face as shown in the figure below.



Figure 4-7: Bulldozer pushing material at the end of the conveyor stockpile

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Legend

- Elandsfontein Land Parcels
- Mine Area
- Mine Pit
- Mine Buildings
- Concentrator
- Conveyor (ROM)
- Topsoil Stockpile
- Softs Stockpile
- Conveyor SS
- Stormwater Dam
- Powerlines
- Servitude Line
- Main Access Road

SCALE:
0 0.45 0.9 1.8 2.7 3.6 km

PROJECT: Elandsfontein Phosphate Mine

Figure 4-8: General Layout Plan


CLIENT:

Project No: 10043		Rev No. 1.0
Scale: 1:50 000	A3	
Drawn:	06/06/2014	OB
Checked:	06/06/2014	RR
Approved:	06/06/2014	GA

P O Box 692
Kuil's River
7579
Tel: 0860 111382
Fax: 0866587676
Email: info@braafsa.com

N

Projection: Geographic, Datum: WGS 1984
Source: Enpat (2001),
Demarcation Board (Dec 2005)
Inset ESRI Data and Maps

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The stacker is to be advanced once the distance of the face becomes impractical for the plant to doze the material. The feed conveyor is able to accommodate some advancement before a splice is required; this is in the order of 30m. Further advancement requires installing a new belt splice and can be undertaken in less than 1 working shift.

After completion of the platform, deposition shall progressively advance over the entire SS footprint area by means of conveyors, spreaders and dozing of side slopes. Realignment of the conveyor and radial stacker shall be required to reduce the distance toward the advancing face.



Figure 4-9: Development of a stockpile similar to the SS

During the operational phase of the SS the side slopes of the dump are to be initially established at the material's natural angle of repose ± 35 degrees (1V:1.4H) upon being dumped and then systematically dozed to a final side slope of 18 degrees (1V:3H) when the material approaches the edge of the footprint. The figure below shows the conceptual layout of the SS at closure.

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Figure 4-10: Conceptual Layout of Soft Stockpile

As the material is disposed in a dry state and no water is to be stored on the dump, an elevated phreatic surface within the dump is not possible. The side slope of 18 degrees (1V:3H) proposed during the closure phase of the SS is therefore considered stable.

Seepage arising from the SS is expected to be minimal due to the dry state of the dump and is only likely to arise following heavy rainfall event in the form of toe seepage and very limited ground water seepage.

The state of the seepage and slope stabilities is to be undertaken as part of the DFS to verify the above side slope profiles and seepage regime.

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4.8. OVERVIEW OF PROCESSING METHOD

The concentrate plant will cover an area of 6500m². The ROM conveyor from the pit to the plant is 590m long. The softs conveyor length will increase as the stockpile is developed. The final length is estimated at 1845 m. The concentrator tails conveyor will discharge onto the softs conveyor and will be 100m in length. All these belts will be 900 mm wide resulting in a conveyor structure that is 1.5 m wide.

Run of Mine (ROM) material from the mine will be conveyed to a stockpile located adjacent to the pit, which will decouple the mining and metallurgical processing facilities. The sand will be screened to remove any oversized material.

The sand will be conveyed a short distance to an agitated pulping tank. Dilution water will be added into the pulping tank, to obtain a suitable density, before the material is pumped to the flotation section of the plant.

Concentrate will be collected as final concentrate, before being collected in a thickener, ahead of a filter. The filtered product will then be stored in a closed shed. It will be loaded onto trucks for haulage to the quay, for final shipping.

The tailings stream will be dewatered using stacker cyclones and conveyed to the softs stockpile, for ultimate co-disposal into the pit. The plant tailings will contain approximately 15 – 20% moisture with 6-8% moisture content (water over dry mass) for disposed tailings, and will constitute 18% of the total softs stockpile and backfill into the pit. Assuming dry softs from the pit contain a moisture content of 2%, the overall moisture content of the stockpile will be approximately 5.6% (excluding any precipitation and evaporation). The water from the processing facility is not expected to be detrimental to any water resource.

It is further estimated that the high evaporation rate (>2,000mm/annum) in comparison with the very low precipitation (<300mm/annum) will further contribute to the low moisture content in the softs stockpile and backfill material.


Thickener overflow and clarified filtrate will be recycled back to the processing water tank to be recycled through the process, thus reducing the overall process water demand.

Dirty water from the pit will be used as process water where possible. Process water will be stored in a large process water tank, integrated with the stormwater dam. Thickener overflows from the feed, tailings and concentrate thickeners will gravitate to the process water tank in recycle streams, allowing up to 70% of the water to be recycled. Water losses will occur through evaporation, remaining water in filtered product, and in the tailings stream.

4.8.1. CHEMICALS USED

The latest test work results indicate that only two reagents, tall oil and sodium silicate, are required for the upgrade of the phosphate rock from the in-situ grade to the final product specification grade. A third reagent,

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a flocculant, will be required to facilitate in the solid-water separation in the tailings and concentrate thickeners, to improve water recovery of the circuit.

Tall Oil

Tall oil is a type of fatty acid, and distilled from renewable crop sources. In the process, it selectively coats the phosphate particles in the flotation cells, rendering them hydrophobic. As a result of the hydrophobicity of the phosphate particles, they attached to the fine bubbles that are introduced to the flotation cells (through compressed air). The phosphate particles are then recovered in the froth phase.

Tall oil is added to the flotation feed at a dosage rate of 600g/t (600g reagent per tonne of phosphate, also equal to 600ppm). As a result of the interactions with the phosphate particles, tall oil is collected in the concentrate stream, which is exported off the property. Concentration levels in the tailings stream is negligible.


Tall oil is a stable, inflammable liquid, which is not considered to be a harmful chemical, and the MSDS (are attached as Appendix F), are provided regarding first aid and accidental release measures.

Tall oil will be delivered to site in bulk and transferred to the dedicated storage tank by pump. Monthly consumption will be close to 300 tonnes (roughly one truck every three days).



Figure 4-11: Elandsfontein sample showing silica sand interspersed with phosphate grains

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Sodium Silicate

Sodium silicate is made from quartz sand, water and caustic soda. It is generally used as a dispersant, i.e. to separate the quartz grains from the phosphate grains, to allow the effective interaction of the phosphate with the tail oil. The mechanism of the interaction between sodium silicate and mineral surfaces is still not well understood, but it is commonly used in the mining industry.

Sodium silicate will be added to the flotation circuit at a dosage of 200g/t (equating to roughly 100g/t). It will be delivered to site in a bulk liquid form (40% silicate, 60% water), and again, will be transferred from the tanker directly to the dedicated storage tank. All safe handling procedures are included in the MSDS (see attached as Appendix F).

Flocculant

Flocculants are widely used to improve solid liquid separation, to assist in the recovery of water from final concentrate and tailings streams. Flocculant is a non-hazardous substance and non-toxic substance, also used in the water treatment process.

Flocculant will be delivered to site as a solid, in bulk (500kg) bags, and mixed with water on site. The required dosage is small, with only 50g/t (or 25 tonnes per month) required to optimise the water recovery.

4.9. SUPPORT SERVICES

4.9.1. WASTE FACILITIES


4.9.1.1. SEWAGE TREATMENT FACILITIES

A sewage treatment facility shall be established at the proposed mine site which will be based on the sequential batch principle which is ideally suited for smaller applications (up to 350 people per day). The plant will be manufactured from standard low density polyethylene tanks. Operation of the plant is largely automatic by means of a PLC to control the various time sequences.

The plant consists of the following items:

- Coarse screen for incoming
- Primary receiving tank – 5 000 liter
- Transfer pump - duty / standby
- Raw sewage buffer tank – 20 000 liter x 2
- Raw sewage transfer pump – duty / standby
- Reaction tank – 20 000 liter x 3
- Air blower x 2
- Floating decant x 3
- Flocculant dosing x 3

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- Chlorine dosing x 2
- Clarified sewage batch tank x 3

The operational sequence of the plant will consist of collecting raw sewage, transfer to the reacting tank, primary aeration for 4 to 6 hours for digestion of organic matter, stagnation to create anoxic conditions for nitrification, secondary aeration, flocculant dosing and settling for 60 minutes, decanting with chlorination, reaction time for chlorine and finally discharge to the process water tank.

Sludge is removed according to a sequence controlled by the PLC. Sludge will be collected in drying beds consisting of sand beds in shallow concrete beds or earthen containments. Dried sludge will be removed and disposed of, and the sand is replenished.

The following parameters will be monitored:

- Incoming pH
- Incoming conductivity
- Incoming COD
- Outgoing pH
- Outgoing conductivity
- Outgoing COD
- Final chlorine
- Final nitrogen and final phosphate

Expected Treated effluent quality (final effluent) is shown in the table below.

Sample	Discharge (Final Effluent)
COD	40
Conductivity	90
E.Coli (cfu.100mL)	0
Faecal Coliforms (cfu/100mL)	0
Ortho Phosphate (mg/L)	5
Total Nitrogen (mg/l as N)	10


4.9.1.2. GENERAL AND HAZARDOUS WASTE FACILITIES

4.9.1.2.1. GENERAL WASTE

Domestic wastes are considered to be those that are generated by offices and domestic installations. Domestic and general wastes will include food waste, food packaging, drinking containers, metal cans, paper, cardboard, plastics, general packaging materials, light bulbs and fluorescent tubes.

Domestic waste will be accumulated within the canteen and other infrastructure. The waste stream will be domestic waste, and business and commercial waste, which are all non-hazardous. The Council for Scientific

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and Industrial Research's Human Settlement Planning and Design (2000) and the Department of Water Affairs' Minimum Requirements for Waste by Landfill (1998) were used to calculate the volume of waste and subsequent disposal or conveyance of the waste.

The conventional hierarchy of waste reduction and management will be employed at the mine:

- Reduce: Modify processes to reduce the amount of waste going into the waste stream and/or reduce the amount of packaging that will eventually enter the waste stream;
- Reuse: Wash and reuse bottles to eliminate them from the waste stream;
- Recycle: Remove recyclable materials from the waste stream, preferably by source separation;
- Treat: Compost organic material separated from the waste stream, preferably by source separation; and
- Landfill: Final disposal of materials, which cannot be economically or technically removed from the waste stream.

The aim of this approach is to minimise the amount of waste generated by applying waste reduction strategies, and then to maximise alternative uses of waste so as to minimise the amount of waste requiring final disposal to landfill.

The initial rate of deposition per capita per day is assumed to be 2kg (range 0.5- 3.5kg/capita/day). For 400 personnel the initial rate of deposition is assumed to be 0.8t/day. If the waste density is assumed to be 0.5t/m³, the total waste requiring handling is 1.6m³/day. The total storage area required is 50m³. It is suggested that on site storage be used in the form of 11m³ load luggers which would be stored on the foundations provided or within waste skips which are to be placed on surfaced foundations.

A waste collection contractor will be employed to collect and dispose domestic wastes.


Domestic wastes:

- Paper and plastics will be recycled;
- Disposed of at a registered landfill facility –Existing landfill facility at Vredenburg/ Langebaan will be used;
- Industrial waste include steel, packaging material and material off-cuts.

4.9.1.3. HAZARDOUS WASTE FACILITY

Hazardous wastes are those wastes, which can, even in low concentrations, have a significant adverse effect on public health and / or the environment. Based on the current mine design, the main source of hazardous wastes will be empty reagent storage containers (IBC and bulk bags from sodium silicate and flocculant) and grease. Hazardous wastes and greases accumulated at the proposed site shall be handled in a similar manner to domestic waste, namely, stored on-site in suitable containers located on areas built in accordance with requirements from the recognised authority, that will include linings, bunds, roofing. Hazardous waste will be temporarily stored on site prior to disposal in a storage area (building) with a footprint of 100m² and have a maximum height of two meters, with a total storage capacity of 200m³.

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All hazardous waste collected will be transferred to either the Cape Town Municipality's Vissershok or EnviroServ's Vissershok hazardous waste disposal facility. Hazardous waste generated by the mine shall be collected by a waste contractor and disposed of at appropriately licensed waste facility, such as Vissershok Waste Facility. Hazardous waste will be classified, handled, treated and disposed according to the SANS 10234 and the Regulations and Standards being developed by the Department of Environmental Affairs. EEM has submitted a waste license application to the Department of Environmental Affairs.

4.9.2. WATER MANAGEMENT

4.9.2.1. WATER BALANCE

A water balance has been completed for the whole mining operation, to confirm the water requirements and losses associated with the potential operation. The balance was completed by EEM, with technical inputs provided by Epoch Resources (responsible for the design of the softs stockpile), DRA International (responsible for the mine and plant design), and Julian Conrad (the specialist geohydrologist).

The balance was completed on an annual basis, as well as wet (May to September) and dry (October to April) periods of the year. For each of the rainfall periods, the water balance was further interrogated for the first 33 months of proposed operation, i.e. the period prior to the backfill of the pit, while material is being deposited on the softs stockpile, and then for the steady state Life of Mine (LOM), i.e. from Month 33 until mine closure.


4.9.2.2. PROCESS WATER SOURCE

The water required for the beneficiation process and dust suppression in and around the operations will be provided by the Saldanha Bay Municipality. EEM has entered into an agreement with the municipality, to be provided with treated effluent water from the Vredenburg Waste Water Treatment Works (WWTP). The effluent water will be re-processed at the WWTP, to ensure that water of a suitable quality supplied to the mine.

The supply of treated effluent to industry is part of a larger phase approach to deal with the current issues of sewage effluent discharge into clean water sources. A long term solution is being developed between local government and industry, to allow development without impacting on the fresh water supplies to the area.

A potable water treatment plant will further purify the water for human consumption. A small volume of water will be bled to the potable water storage tank, from the water storage tank. A filter feed pump will pump the water from the storage tank through dual media filters. Flocculant and pH correction will be dosed into the pump discharge line. The chemically charged raw water will then pass through the inline static mixers where the chemicals are flash mixed prior to feed into the retention lines. The filtered discharge water will then feed through the carbon columns at a flow rate of approximately 10m³/h. The fully treated water will be dosed with chlorine and discharge into the treated water storage tank.

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4.9.2.3. CLIMATE

The evaporation and precipitation rates used in the water balance are shown below.

Mean annual precipitation (MAP)	261	mm
Mean annual evaporation (MAE) S-Pan	2202	mm


The monthly figures used were as follows, based on historical averages for Hopefield and Langebaanweg.

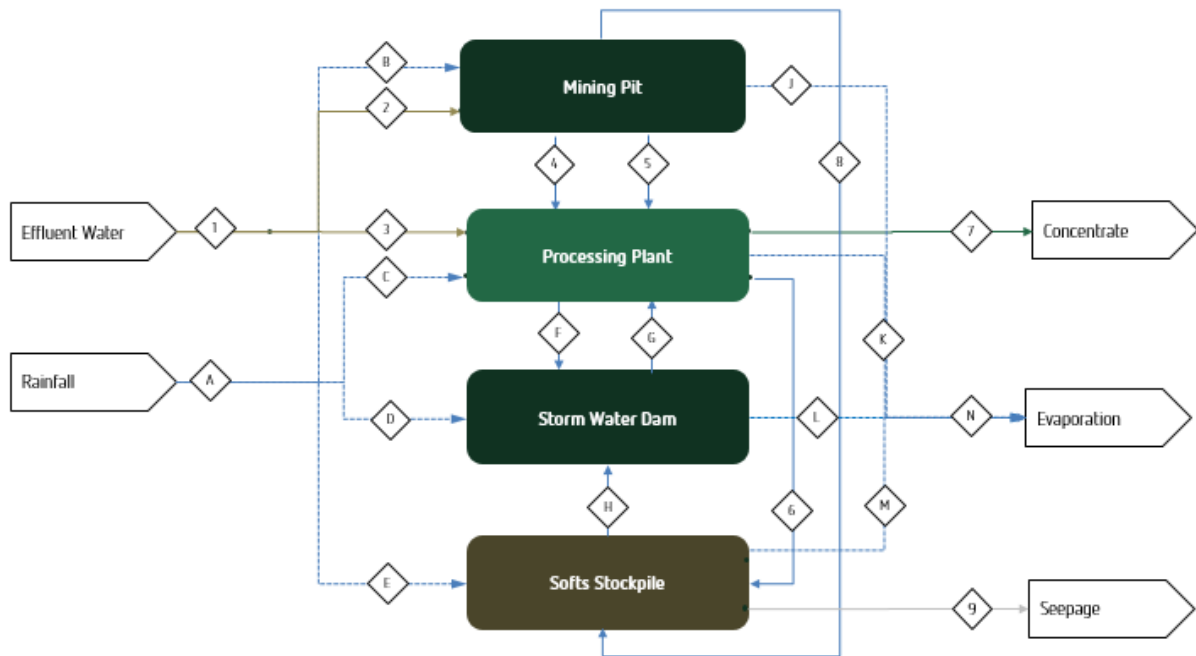
	Site rainfall*	S-Pan evaporation**
UNITS	mm	mm
JAN	4.9	310.0
FEB	4.8	267.0
MAR	4.8	240.0
APR	15.3	155.0
MAY	38.9	102.0
JUN	44.5	72.0
JUL	43.8	65.0
AUG	46.6	76.0
SEP	24.4	125.0
OCT	12.0	190.0

4.9.2.4. EARLY WATER BALANCE

The block flow diagram for the first 33 months of operation is shown below.

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The main source of water lost is through evaporation from water storage facilities, tanks and thickeners, and the softs stockpile. The moisture in the concentrate stream, which will be removed from the property, is the second most significant loss of water.

A summary of the water balance, showing the initial demand of the mining operation is shown below. For the first 3 years of the operation, an average consumption of 2.8ML/day will be required to satisfy the process demand, with a seasonal fluctuation between 2.5 and 3.4ML/day. This demand can be satisfied by the Vredenburg Wastewater Treatment Works.

Summary (ML)	Annual	Wet Season	Dry Season
Demand			
Daily	2.8	2.5	3.4
Monthly	75	67	89
Annual	897	805	1 072
Water Loss in Concentrate			
Daily	0.6	0.6	0.6
Monthly	17	17	17
Annual	199	199	199
Seepage			
Daily	0.1	0.4	0.0
Monthly	1.7	12	0
Annual	21	140	0

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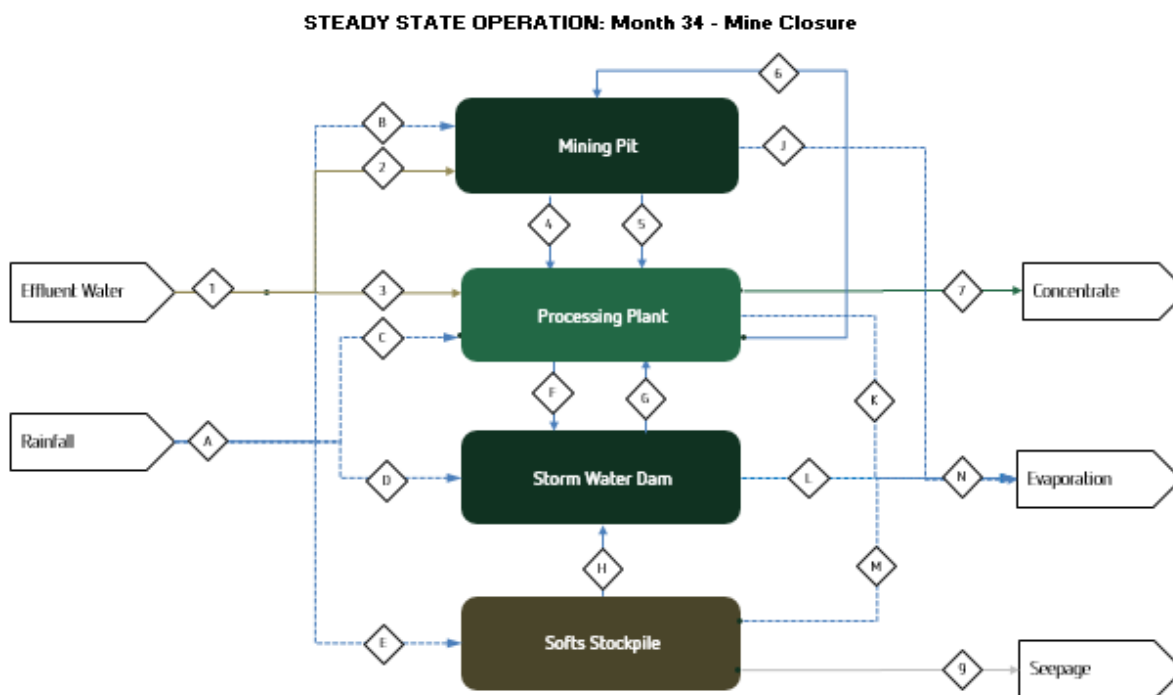
The potential loss of water to the environment is shown in the table above. Seepage arising from the softs stockpile is expected to be minimal due to the dry state of the dump and is only likely to arise following heavy rainfall event in the form of toe seepage and very limited ground water seepage.

All storm water will be contained in storm water catchment dams, and described in Section 5.4.1.4.

The each section in the process plant will be closed in a dedicated concrete bund area, so that all plant spillage can be managed. The bund areas are designed to cater for 1.5 times the total volume of the designated area.


4.9.2.5. STEADY STATE WATER BALANCE

The schematic diagram for the steady state water balance is shown below.



A summary of the water balance, showing the steady state demand of the mining operation is shown below. For the balance of the operation, an average consumption of 1.4ML/day will be required to satisfy the process demand, with a seasonal fluctuation between 0.6 and 2.4ML/day. This demand can be satisfied by the Vredenburg WWTP. The reduced demand of the process, at steady state, would integrate well with the long term regional industrial water plan.

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Summary (ML)	Annual	Wet Season	Dry Season
Demand			
Daily	1.4	0.6	2.4
Monthly	36	16	64
Annual	429	197	762
Water Loss in Concentrate			
Daily	0.6	0.6	0.6
Monthly	17	17	17
Annual	199	199	199
Seepage			
Daily	0.0	0.4	0.0
Monthly	1.2	10	-0.5
Annual	14	122	-5.9

The potential loss of water to the environment is shown in the table above. Seepage arising from the softs stockpile is again expected to be minimal due to the dry state of the dump and is only likely to arise following heavy rainfall event in the form of toe seepage and very limited ground water seepage.

All storm water will be contained in storm water catchment dams, and described in Section 5.4.1.4.

The each section in the process plant will be closed in a dedicated concrete bund area, so that all plant spillage can be managed. The bund areas are designed to cater for 1.5 times the total volume of the designated area.

4.9.2.6. GROUNDWATER


Dewatering and Boreholes

The proposed opencast pit will be dewatered with a series of boreholes on either side of the pit. The position of the boreholes will be determined by the strip being mined. A number of boreholes have been installed on the property for water monitoring, together with the DWA authorities. Once the pump tests have been conducted, and the final volumetric flow rates of the aquifers have been confirmed, the number, size and positioning of pumps will be confirmed.

It is currently proposed that the pumped water will be piped downstream of the mining operation. The aquifer water will immediately be reintroduced to the aquifer through a series of covered horizontal trenches ($\pm 4\text{m}$ deep), via a sealed water distribution hub, minimising the exposure of water to atmospheric conditions. Borehole dewatering of mining operations has been successfully employed at a number of mining operations both in South Africa and abroad.

The artificial recharge of the aquifers will form part of the WULA, and is being discussed and designed with the assistance of the DWA's and SANParks ground water specialists.

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Examples of similar case studies where the successful discharge and downstream recharge of aquifers has been implemented for the dewatering of open cast mining operations include:

- Finsch Diamond Mine, South Africa
- Lethlakane Diamond Mine, South Africa
- iGrootgeluk Coal Mine, South Africa
- Kolwezi and Kamoto Copper Mines, DRC
- Robinson Copper, Molybdenum, Gold Mine, United States
- Premier Coal Mine, Australia

4.9.2.7. GROUND WATER MANAGEMENT

The information obtained from previous studies and site investigations allow for a conceptual groundwater model to be developed. A multiple aquifer system is present at the proposed Mine Site, which can be summarised as:

- An upper aquifer in the overburden / mineralised material zones;
- A lower aquifer below the mineralised material zone.

Bore holes will be sited and maintained along the pit edge to draw down the upper aquifer and prevent clean water from flowing into the pit and thus becoming contaminated. This water will be piped to a down-stream location where it will be used to recharge the aquifer.

4.9.2.8. IN-PIT PUMPING

In pit sumps will be required to:

- Provide lowest drainage points within the pit to collect residual groundwater seepage;
- Direct and contain pit slope seepages and precipitation run-off; and
- House the in-pit sump pumps.


If possible mobile sumps should be provided, as this will provide buffer storage and allow for sufficient pumping capacity.

Drainage channels will be required within the pit to transport the water from all areas of the pit to the sumps, and to keep the working areas as free from surface water as possible. The volume and location of the sumps should be finalised during the detailed design stage. The sumps will be re-located with each new strip that is mined.

4.9.2.9. SURFACE WATER

Cut-off trenches, culverts and berms will be established around the pit, roads, overburden dumps and other infrastructure to prevent the inflow of surface water into these areas and ensure that such water does not become contaminated. Any water that ends up within these bermed-off areas will be regarded as contaminated and used in the beneficiation processes or to suppress dust on roads.

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All excess water and precipitation which accumulates within the pit and other areas on the mine will be pumped or gravitated along concrete channels (to mitigate any infiltration) directly into the Stormwater Dam (SWD).

The process plant area

All waste water within the processing plant will be pumped or gravitated along concrete channels (to mitigate any infiltration) directly into the SWD. This water will not require any further treatment, as by volume it will be diluted within the raw water, which will be supplied by the chosen water source.

The plant will be the main consumer of water on the mine, with an expected total water demand estimated at 3,260m³/day. As much as 80% of the process water will be recycled.

Following discussions with the Saldanha Bay Municipality (SBM), Elandsfontein has been granted the rights to source treated effluent from the sewage treatment plant at Vredenburg. Initial discussions have been held with SBM, and final pumping and pipeline arrangements will be developed. It is planned that the pipe route will use existing servitudes and run along servitudes already negotiated with private land owners.

The water supply line will be approximately 250mm diameter, and will be buried below ground level. The water will be upgraded by Elandsfontein's own treatment plant (not on the main mine site), such that cleaned water is piped to the mine site.

The total water to be used for dust suppression in the mine and irrigation of the rehabilitated rock dumps will be determined by specialist civil engineers appointed to the project. Raw process water will be primarily supplied from within the pit. Additional water will be supplied by the Saldanha Bay Municipality as treated sewage water which will be upgraded prior to piping to the mine site.

All roads within the catchment area:


All run-off water along the roads will be gravitated along concrete channels or safety berms directly into the SWD. The concrete channels dedicated to convey the dirty storm-water will be sized accordingly and necessary silt traps will be placed consequently. All other run off which falls within the proposed catchment area will be deemed as clean storm-water. This water will be allowed to infiltrate and gravitate towards its natural watercourse. Some of it may however gravitate towards the SWD and allowances will be made for this potential in-flow.

Stormwater dam

The run-off from the SS is classified as "dirty" water and shall be intercepted by storm water collection channels along the perimeter of the SS. A second diversion channel along the upstream sections of the SS perimeter shall divert clean storm water runoff around and away from the SS.

All storm water diversion channels are be sized to accommodate the 1 in 50 storm event using an average run-off coefficient of 0.5 as calculated using the South African National Road Agency's Road Drainage Manual. Energy dissipaters built from gabion baskets shall be constructed downstream of all the clean storm water

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diversion channels. Dirty water channeled from the SS shall feed into a concrete lined energy dissipater and silt trap before it flows into a storm water dam. All channels shall be unlined.

An unlined storm water dam (SWD) positioned downstream of the SS is sized to accommodate the 1 in 100, 7 day storm event run-off from the plant area and SS. An average run-off coefficient of 0.7 has been used for the SS and 1.0 for the plant area.

The stormwater dam will have a total storage capacity of approximately 1 150 000m³, covering an area of 3 ha. The dam will have a wall height of 5m above ground, the remaining infrastructure excavated below ground level.

As part of the integrated water management, a Storm Water Management Plan (based on the Best Practice Guidelines G1 (DWAF, 2006)) will be developed by EEM. The mentioned plan will describe the water flow over and around the proposed site, and provides strategies for optimizing the separation of clean and affected runoff water. The following sections however make reference to mechanisms that will be implemented to manage stormwater runoff.

Stormwater management – Softs Stockpiles

The run-off from the SS is classified as “dirty” water and shall be intercepted by storm water collection channels along the perimeter of the SS. A second diversion channel along the upstream sections of the SS perimeter shall divert clean storm water runoff around and away from the SS.


All storm water diversion channels are be sized to accommodate the 1 in 50 storm event using an average run-off coefficient of 0.5 as calculated using the South African National Road Agency’s Road Drainage Manual. Energy dissipaters built from gabion baskets shall be constructed downstream of all the clean storm water diversion channels. Dirty water channeled from the SS shall feed into a concrete lined energy dissipater and silt trap before it flows into a storm water dam. All channels shall be unlined.

An unlined storm water dam (SWD) positioned downstream of the SS is sized to accommodate the 1 in 100, 7 day storm event run-off from the plant area and SS. The SWD capacity is in the order of ±1 150 000m³.

The preparatory works associated with the SS comprise the following:

- Progressively stripping and stockpiling of the top 300mm of topsoil as the SS footprint develops;
- A 1m deep and 1m high collection trench and bund wall around the perimeter of the SS footprint area. This demarcates the extent of the SS footprint and collects any runoff water and shallow subsurface seepage arising from the dump;
- A 1m deep storm water trench along the upstream ends of the SS to divert any clean storm water runoff around and away from the dump;
- silt trap, energy dissipater and a SWD downstream of the SS into which the dirty water collection trenches discharge. The SWD is unlined with an earth embankment constructed out of borrow material sourced from within the dam basin area.

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Dirty storm water and spilled water from the concentrator plant area and softs stockpile will reticulate to a SWD. The SWD will be positioned down gradient of the plant and designed to accommodate the 1:100 year flood rain fall over the surface area of the softs stockpile and the concreted surface of the plant. Storm water from the softs stockpile will be pumped to the plant facility.

It is the responsibility of EEM to ensure that storm water control measures are designed and constructed to be capable of withstanding the maximum design flood. It should be taken into consideration that the potential for erosion increases where the surface runoff is concentrated and will be addressed within the designs. Designs will incorporate gradual drainage to avoid siltation of storm water infrastructure.

Storm water management measures discussed will be prioritized to prevent damage or failures during flood events. After implementation of the storm water management plan, regular inspections and maintenance should be conducted to ensure that all infrastructures are functioning according to design capabilities. Effective management of surface water runoff and clean/affected water separation at the Elandsfontein Phosphate ore project will contribute to conservation of downstream clean water resources and groundwater resources.

Plant, overburden- and discard dump and haul roads

The plant, overburden dump and discard dump will be located less than 400m west of the pit area. These are largely contained in the lower lying areas on the site (valley) and hence the surface runoff will gravitate toward the stormwater dam where the water will be used in the process.

Pit area, haul roads and Softs Stockpile


Mining of phosphate ore will take place in the south-western section of the Elandsfontein property. The size of the pit and the Softs Stockpile is 388ha and 14.9ha, respectively. There is one non-perennial drainage line which originates from the higher- lying hills toward the fossil area which is within the mine area (refer to the Freshwater Assessment – Appendix C).

Erosion berms should be installed to prevent gully formation and run off. The following points will serve to guide the placement of erosion berms:

- Where the track has slope of less than 2%, berms every 50m should be installed
- Where the track slopes between 2% and 10%, berms every 25m should be installed
- Where the track slopes between 10%-15%, berms every 20m should be installed
- Where the track has slope greater than 15%, berms every 10m should be installed.

There are no significant dams or open water within the project area. As a consequence of the area's limited rainfall, the sandy nature of the soil and generally flat topography, very little water accumulates on surface, even in the rainy season. It was thought that drainage from sections of the proposed project area may be expected to be towards the Langebaan lagoon, however results from the geohydrological study indicates that freshwater inflow into the southern end of the Langebaan Lagoon is groundwater derived coming in from the due east and not the Elandsfontein area (refer to Geohydrological Study – Appendix C).

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The design concept is to recover all dirty storm water and return water from the Plant, Pit and Softs Stockpile into the Plant operations, there should be no material impact on the aquifer system. Groundwater is ecologically significant in the area and flows out at a number of springs in the area (many farm names in the area relate to springs).

Ground water management measures that are proposed for the site include:

- Separate clean and dirty water through sound storm water management principles. This will include a sufficiently sized cut-off trench and berm to be constructed up gradient of the proposed plant and mine sites and softs stockpile to capture and divert clean surface runoff around the site;
- Contain dirty water in adequately sized storm water dams to avoid spillage and overflow into the catchment;
- Compaction of the base of the proposed softs stockpile site to reduce infiltration to the ground water regime. It was assumed that the hydraulic conductivity of the compacted base at the softs stockpile will be significantly reduced during this process.
- Continuation and expansion of the current ground water monitoring programme;
- Monitoring of piezometric head within the softs stockpile to ensure that there are no stability concerns; and
- Continuation of the ground water monitoring programme and implementation of the proposed amendments;
- Ground water management measures for the Closure Phase include:
 - Sloping, top soiling and re-vegetation of the top and side slopes of the proposed softs stockpile, to reduce ingress of rainfall;
 - Containing dirty water and seepage from the proposed softs stockpile to prevent spillage into the catchment.

4.9.2.10. POTABLE WATER

Analysis of the aquifer water show that dissolved solid levels are all within the prescribed limits of SANS 241:2005 Class 1 Drinking Water Specification. As a result, treatment by flocculation, filtration and chlorination will suffice.


A small volume of water (less than 10m³/h) will be bled to the potable water storage tank, from the aquifer discharge pumps. A filter feed pump will pump the water from the storage tank through dual media filters. Flocculant and pH correction will be dosed into the pump discharge line. The chemically charged raw water will then pass through the inline static mixers where the chemicals are flash mixed prior to feed into the retention lines. The filtered discharge water will then feed through the carbon.

The fully treated water will be dosed with chlorine and discharge into the treated water storage tank.

Domestic water demand

The estimated areas for the offices and other occupied buildings on site are shown below. For each building, the assumed daily water demand per 100m² floor area, based upon the recommendations of the "Guidelines for human settlement planning and design" is used, to determine the total daily domestic water demand. The

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daily demand of 23,076 litres translates into 76.9 litres per person per day. The bulk of this water, estimated at 80%, could be captured and recycled via the sewer treatment plant, reducing the amount of water that needs to be extracted from the boreholes. No water required for processing will be abstracted from the aquifer, as the plant will use treated effluent water. This means that the only water to be abstracted from the groundwater source (borehole as is currently the practice at the farm) will be for drinking water.

Table 4-3: Daily domestic water demand

Buildings	Water demand (kl/100m ²)	Water demand (kl/day)
Weighbridge	0.6	0.396
General waste	0.6	1.2
Hazardous waste	0.6	0.6
Equipment and Engineering Workshops	0.6	6
Salvage yard	0.6	6
Material Laydown and Storage Area	0.6	6
Administrative Office Block	0.6	0.72
Control Room	0.6	0.12
Clinic	0.6	0.48
Laboratory	0.6	0.96
Security buildings	0.6	0.24
Induction and training area	0.6	0.36
TOTAL		23.076

Domestic water supply

Indications are that boreholes would be able to supply sufficient water for domestic use.


4.9.2.11. TRANSPORT AND CONVEYANCE

4.9.2.11.1. INBOUND LOGISTICS

Employees

Personnel employed for the purpose of mining, ore beneficiation and maintenance and all other related activities on the project, will be transported to their respective work areas via three alternatives; bus and minibus, company vehicle or private vehicle. Entry to the site for all three modes of transport will be controlled at the main gate. The access control system will be designed for personnel access control and efficient flow of personnel, especially at shift changes. Deliveries not associated with weight based validation, as well as visitors to the mine, will also gain access through this access control point and will be managed in such a way that where possible it does not coincide with shift changes.

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SUV's and Company Vehicles

There will be 36 cars/SUVs arriving and departing from the mine each weekday morning and afternoon, used by management, skilled and administrative staff and it is assumed that they will travel from Saldanha/Langebaan/Vredenburg on TR21/2.

It is estimated that management and skilled staff will generate 36 inbound car/SUV vehicle trips inbound in the morning (06h30 – 07h30) and the same number of trips outbound in the afternoon (15h00 – 16h00) per weekday.

Minibus Transportation

Employees will be sourced from the local labour sending areas in close proximity to the site such as Hopefield and other areas within the Saldanha Bay Municipal Area. Potential labour sending communities are located to the west and east of the project in Hopefield, Langebaan, Saldanha and Vredenburg approximately 14-20km from site.

Personnel will be collected from the various informal and formal settlement locations in the labour sending communities by minibus, operated by a bussing enterprise. These minibuses will travel mainly on the R45 from Hopefield to the mine and from the R45 from Saldanha, Vredenburg, Langebaan via surfaced roads to the site and deliver personnel to the security and access control point.

- Operations staff will be transported by 10 minibuses each day.
- The day shift will start at 07h00 and end at 15h00, the afternoon/evening shift will be from 15h00 to 23h00 and the night shift will be from 23h00 to 07h00;
- Minibuses will off-load staff to start a shift and will wait and load up with staff that is ending a shift before travelling back to their homes.

Operation vehicles

It is envisaged that a logistic contractor will be identified through a tendering process. It is estimated that there will be 3 bulk tankers delivering consumables to the mine each weekday and 4 trucks bringing in solid reagents, maintenance materials and parts each weekday. It is assumed that these tankers and trucks will travel to the site along TR21/2 from the east (N7) and return in that direction after delivering to the mine.


Roads and parking areas

Haul roads

The mine site currently has no formal access road from TR21/2, only an informal farm track. A nine km long access road is proposed to connect the mine to TR21/2. The access road and intersection on TR21/2 will have to be designed for 30 heavy vehicles per direction per day turning in and out of the access for the first 3 months of the construction period and 10 heavy vehicles per direction per day during the remaining 9 months of construction. There will also be additional light vehicles turning in and out of the access during the morning and afternoon peak hours. Haul trucks will travel down to the process area and return along the same route, empty.

There are a number of existing unsurfaced roads on the mine property. Where possible the intention is to make use of these existing roads as haul roads.

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Plant internal roads

It is estimated that the length of internal plant roads will be 4km of the total plant area with widths varying between 6m and 12m depending on function. It is assumed that the bulk of the material required for the construction of the roads will be sourced from the site as well as from the mining discard.

Parking areas

A total area of 500m² has been set aside to provide for:

- minibuses to collect and drop-off staff and park whilst waiting for staff during shifts; and
- staff parking outside the main office block for permanent employee's using their private vehicles;
- visitor parking.

4.9.2.11.2. OUTBOUND LOGISTICS

Security and Weighbridge

The validation and control of saleable ore products will be weight based and will therefore be transported from the final concentrate silo over a single lane weighbridge, with an upgrade to a double lane weighbridge planned during the life of the project. Loading flasks will be fitted with load cells to streamline the process. This will further assist in reducing dust impacts related to loading of the final product.

Product Logistics

All saleable ore will be road hauled from the mine after beneficiation via containerized trucks to the Saldanha Bay Port for ship loading.

Final Product


The upgraded phosphate will be sorted in a covered silo, which is approximately 30m in height and 23m in diameter with a capacity of 75 000 tonnes. Containerized trucks will be loaded from the silo via a covered rapid load out facility from where the product will be transported via road to the port.

Road Haul

The proposed mine is located on the farms Elandsfontein 349/2 and 349/4, Malmesbury RD in the Western Cape. The farms are not directly bordered by any major thoroughfares but are accessed from the R27 via proclaimed roads over SANParks property. As there is no direct access to the mine, an access from R45 (TR21/2) is proposed, via a nine km long access road which will largely follow existing servitudes/farm road tracks. The access road from the R45, which is a dedicated freight route, will open up the town of Hopefield as the main source of labour and property upgrades.

The table below indicated the areas to be affected by the proposed access road from the R45.

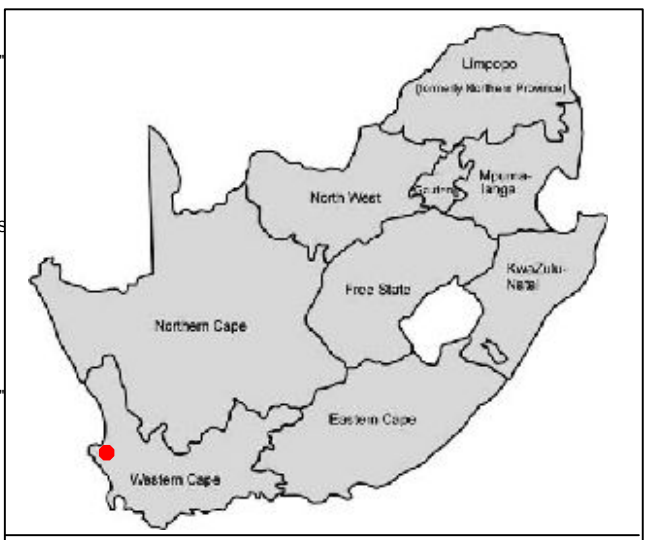
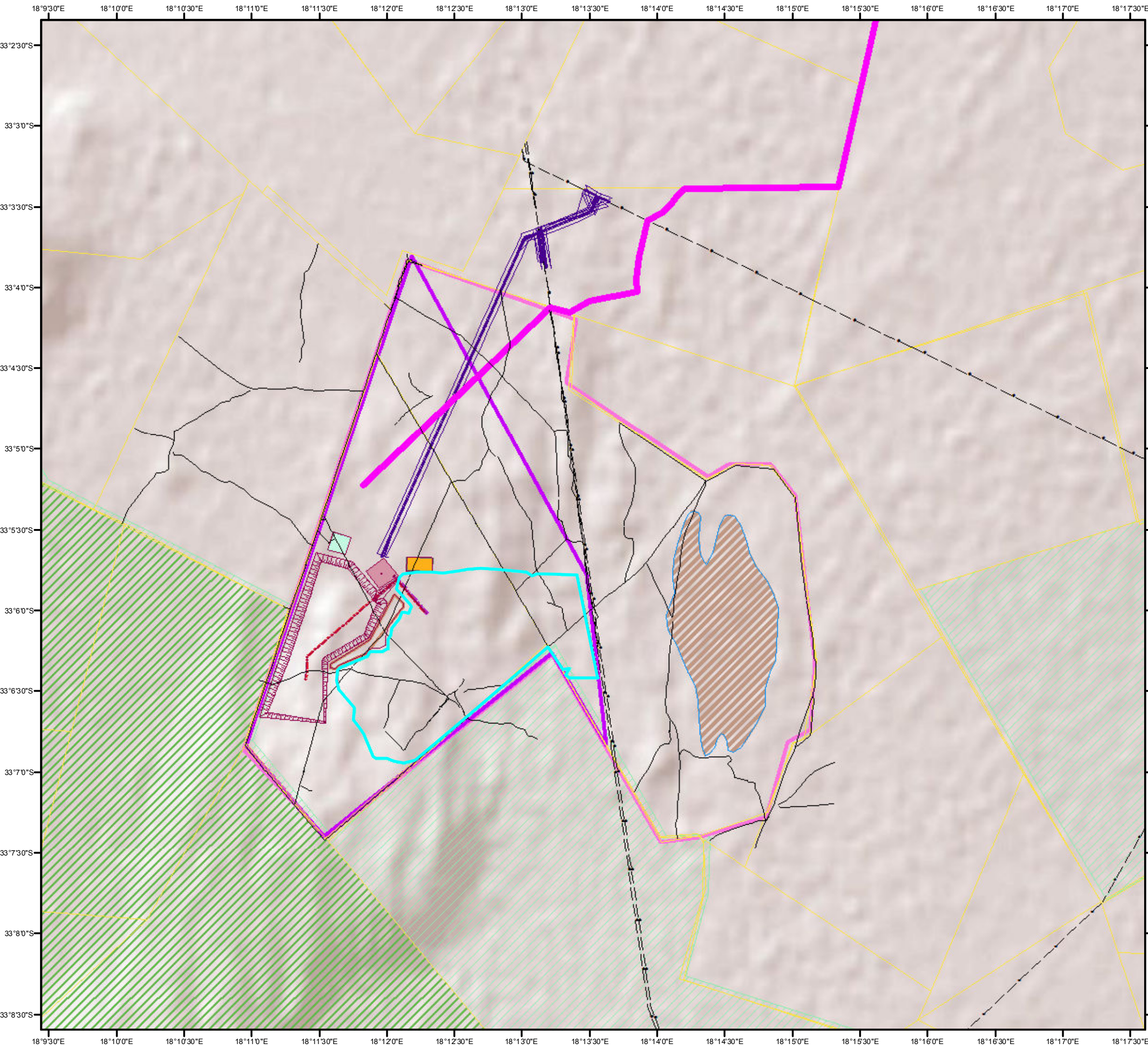
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Properties to be affected by proposed access road

Portion	Relevant infrastructure	Owner	Servitude
304 portion 7	Main access road from R45	Saldanha Bay Municipality	Servitude right of way over western boundary of farm. Serves dominant farm – 12.59 meters.
178 RE	Main access road from R45	HORSESHOE INV 0025 CC	Dominant farm 178/6 has servitude over farm 178RE Servitude described in title deeds 38263/08 and 14829/10 Servitude road 12.59m wide. Landowner 178/6 responsible for maintenance and repairs of road.

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Legend

- Existing Roads
- Elandsfontein Land Parcels
- Mine Area
- Mine Pit
- Mine Buildings
- Concentrator
- Conveyor (ROM)
- Topsoil Stockpile
- Softs Stockpile
- Conveyor SS
- Stormwater Dam
- Powerlines
- Servitude Line
- Main Access Road

SCALE:
0 0.45 0.9 1.8 2.7 3.6 km


PROJECT: Elandsfontein Phosphate Mine

Figure 4-12: Existing Roads


CLIENT: 

Project No: 10043		Rev No. 1.0
Scale: 1:50 000	A3	
Drawn:	06/06/2014	OB
Checked:	06/06/2014	RR
Approved:	06/06/2014	GA

P O Box 692
Kuil's River
7579
Tel: 0860 111382
Fax: 0866587676
Email: info@braafsa.com



Projection: Geographic, Datum: WGS 1984
Source: Enpat (2001),
Demarcation Board (Dec 2005)
Inset ESRI Data and Maps

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Routes from access point to TR21/2 to Port

Three alternative routes were investigated that could be used by trucks to transport the mined phosphate to Saldanha Bay harbour, until such time as the Department of Transport and Public Work's planned link road between TR21/2 and TR85/1 is constructed, which will provide a more direct route than the existing three alternative routes that are shown in . These alternative routes were each inspected to determine their suitability for use by 22m long interlink truck-trailers carrying a load of 48 tonnes. The travel distance along each route and the advantages and disadvantages of their use as a haul route, until such time as the new freight road link is constructed between TR21/2 and TR85/1, is summarized in Table 4-4.


On evaluation of these three alternative routes it was found that Route B is the preferred route, but that it requires a left-turn deceleration lane on TR21/1 at the OP07643 intersection and the reduction of the speed limit on TR85/1 westbound from 120km/hr to 100km/hr from the rail bridge to the OP07643 intersection where the shoulder sight distance from OP07643 to the crest of the rail bridge is insufficient for trucks. Also, the haul road south from TR85/1 to OP07645 requires improvement to accommodate 22m interlink trucks.

The advantages and disadvantages to the three routes are tabled below:

Table 4-4: Advantages and disadvantages of using the alternative routes to haul material from the mine to the harbour

Route A	
Roads used	TR21/2, MR233, MR559, OP07645
Total length (km)	37,0
Advantages	Disadvantages
Least existing traffic volume of the 3 alternatives	<ul style="list-style-type: none"> Road widening required at the TR21/MR233 intersection to enable separate left-turn and right-turn deceleration lanes on the approaches to the intersection Longest route of the 3 alternatives Crossing of TR77/1 which is a tourist route Widening and surfacing required on the off-ramp from MR559 to OP07645 The section of road on the MR559 in the vicinity of the Curro School is considered to be a high accident zone.
Route B	
Roads used	TR21/2, OP07643, Haul Road, OP07645
Total length (km)	32,5
Advantages	Disadvantages
Shortest route length of the 3 alternatives	<ul style="list-style-type: none"> Highest existing traffic volume of the 3 alternatives Road widening required at the TR21/OP07643 intersection to provide a left-turn deceleration lane on the approach on TR21/2 Required shoulder sight distance from OP07643 eastwards

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	<p>on TR85/1 to rail bridge is not achieved for 120km/hr speed limit.</p> <p>It is recommended that the speed limit on TR85/1 be reduced from rail bridge to OP07643 to 100km/hr to meet the minimum SSD.</p> <ul style="list-style-type: none"> Haul road south of TR85/1 in the vicinity of the adjacent rail bridge is currently not suitable to accommodate the 22m interlink trucks.
Route C	
Roads used	TR21/2, MR233, TR77/1, TR85/1, Haul Road, OP07645
Total length (km)	34,0
Advantages	Disadvantages
Shorter than Route A	<ul style="list-style-type: none"> TR77/1 is a popular tourist route and the trucks would be travelling on the section of the route between MR233 and TR85/1 for a distance of 5,6 km which has a speed limit of 120km/h. The slow moving heavy trucks would inconvenience tourist traffic and can be regarded as increasing the accident potential due to more overtaking attempts. The activities at the weigh bridge located on the southern side of the TR85/1 west of the TR77/1 intersection will increase the travel time of trucks that are required to stop here. Minimum shoulder sight distance on the haul road for returning trucks to turn onto TR85/1 in the easterly direction is not achieved for 120km/hr speed limit. It is recommended that the speed limit on TR85/1 in the westbound direction be reduced to 100km/hr from the rail bridge to the OP07643/Haul Road junction to meet the minimum SSD. The Haul Road south of TR85/1 in the vicinity of the rail bridge is currently not suitable to accommodate the 22m interlink trucks.

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Figure 4-13: Alternative Route Selection

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4.9.2.12. POWER SUPPLY

Royal Haskoning DHV has been employed to secure bulk power supply the mine site. The power supply option will be constructed in accordance with Eskom's HV self-build procedure.

The initial power requirements are 12MVA in the Eskom application. Load will only be determined once the mechanical equipment list is finalised. The operating cost estimate has been based on 8kWh/tonne processed, which equates to 3000MWh per month.

Power supply to the mine will be from the existing Aurora-Moorreesburg 132kV overhead line, which runs approximately 2km to the north of Portion 2 of the farm Elandsfontyn 349. Eskom's Network Planning Department has provisionally approved a loop in – loop out arrangement, in which a 2km length of double circuit 132kV overhead line will connect to a new Eskom substation, located on the mine property near the concentrator plant. The substation will consist of two 132kV line bays, two 132kV transformer bays and two 132kV step down transformers to supply to the mine's MV board. The substation will cover a total area of 600m² and reach a total height of 15m.

132 kV distribution lines

The connecting distribution lines will extend for 5km and require 20 pylons, with a span length of 250m each. The distribution lines will cover a total distance of 5km and total footprint of 1.5 Ha.

The overhead line corridors shown are based on minimising the number of line deviations (which reduces the costs). The preferred alternative is based on the latest road planning along the western boundary of Farm 6/178. The mine access road will not cross beneath the 132 kV preferred option (but will cross-beneath the existing lines). A number of options were initially considered for the mine power supply. The options are discussed in alternatives section.

4.9.2.13. CHEMICAL AND HAZARDOUS SUBSTANCES FACILITIES

4.9.2.13.1. DIESEL AND LUBRICATION STORAGE FACILITY

Provision will be made for an on-site diesel and lubrication oil storage facility. The facility will be constructed to the requirements of the chosen fuel supply company. Bulk supply of fuel and lubricants would be by road from the bulk storage facilities in the area. The 50m² facility will house approximately 30m³ of diesel and accommodate 2 re-fueling bays. A storage area of 80m² will accommodate 100 litres of lubricant.

4.9.2.14. MAINTENANCE FACILITIES


The following maintenance facilities are proposed:

- Equipment and Engineering Workshop 1000m².

4.9.2.15. ADMINISTRATION AND OTHER BUILDINGS

The buildings will be divided into prefabricated structures for administrative use, whilst cladged, steel structures with concrete flooring will normally be constructed for workshops and similar applications.

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The estimated building requirements are summarised in Table 4-5: Estimated building requirements below.

Table 4-5: Estimated building requirements

Structure	Area (m2)
Weighbridge	66
General waste	200
Hazardous waste	100
Equipment and Engineering Workshops	1000
Salvage yard	1000
Material Laydown and Storage Area	1000
Administrative Office Block	120
Control Room	20
Clinic	80
Laboratory	160
Security buildings	40
Induction and training area	60
Total	±3846

4.9.2.16. HOUSING, RECREATION AND OTHER EMPLOYEE FACILITIES

There are 300 employees including senior management required for a proposed 1.5 Mtpa open pit production scenario. Key skills required are management, technical and operational skills and it is planned to recruit these during the construction phase. Skilled and semi-skilled labour recruitment will primarily focus on the local communities and will focus on Historically Disadvantaged South Africans (“HDSA”) and Women in Mining (“WIM”). It is planned that the requirements of the Mining Charter, with staffing for HDSA at 40% and 30% WIM (target is 10%).

No permanent accommodation will be constructed on site as workers will be recruited from the nearby local communities.

4.9.2.17. SECURITY AND LIGHTING


Project area

Farm 349/2 and 349/4 is currently fenced and access controlled. Further security on site includes an allowance has been made for 3,000m of fencing around the mining site. The fencing will be 2.4m section diamond mesh fencing. This will prevent wildlife (existing game on farm etc) from entering the mine area and prevent access to no-go areas such as the fossil area.

Security building

Plant security will consist of a permanent gatehouse with boom gates, a 2.4m high diamond mesh (or equivalent) security perimeter fence, four card operated double turnstiles and several in- plant vehicle and

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pedestrian gates to control access in and around the plant. From here the security will control trucks and visitors both entering and leaving the building. Access control and a time attendance system have been allowed for.

4.10. CONSTRUCTION PHASE

The construction of the mine, beneficiation plant and associated infrastructure will be outsourced to an engineering contractor.

Key activities that will be undertaken during the construction phase of the Project include the following:

- Construction of the main mine access road from the R45;
- earth-moving, levelling, grading and excavations;
- site clearance;
- pre-stripping;
- installation of equipment;
- construction of temporary construction camp;
- construction of all mine infrastructures and facilities; and
- construction of bulk services facilities (i.e. power infrastructure, waste facilities and water supply system and sewerage treatment plant).

This section focuses on the construction phase of the project and describes the following:

- Job creation during the construction phase;
- Construction camp infrastructure (office, workshop, temporary storage of fuels and wastes);
- Non-mineral waste management;
- Storm water management; and
- Concentrator plant.


4.10.1. JOB CREATION DURING THE CONSTRUCTION PHASE

The construction phase of the Project will result in between approximately 800 construction phase jobs. The estimated direct temporary employment during the peak construction period will be up to 800 people on site. The breakdown of people employed in terms of low skilled, semi-skilled and skilled are estimated at 40:40:20. Direct household income impacts would flow from all wages, estimated at USD10 – 15 million (including manufacturing labour) paid during construction. Approximately R80 million of this total would probably accrue to workers currently resident in Hopefield.

4.10.2. CONSTRUCTION CAMP INFRASTRUCTURE (OFFICE, WORKSHOP, TEMPORARY STORAGE OF FUELS AND WASTES)

A construction camp will be established during the construction phase of the Project, which will cover a total area of approximately 0.8 to 1.2 hectares. It is proposed to locate the construction camp within the existing disturbed area on site, which currently accommodates existing stores and outbuildings and borehole. The following areas will be needed for the construction camp:

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- an office complex;
- workshops;
- servicing areas;
- temporary storage of materials;
- bulk fuel storage (100 m³);
- bulk lubricant storage (20 m³); and
- truck yard and vehicle parking.

It is expected that the following variety of large equipment will be required during the construction phase:

- cranes;
- dump trucks;
- front end loaders;
- shovels;
- concrete batch plant;
- excavators;
- boom placers; and
- road rollers.

4.10.3. BULK SERVICE REQUIREMENTS FOR THE CONSTRUCTION CAMP

Water

Elandsfontein Farm currently obtains water via the existing borehole on the site. According to current estimations, the water requirement for the construction phase is approximately 75m³/day and will be sourced from the existing borehole on the farm.

Should the existing borehole not be able to supply the needed volumes, the water requirement will be transported to site via road tankers.


4.10.4. POWER

Each contractor will be required to bring their own generators to supply power where required.

4.10.5. FUEL AND LUBRICANTS

The expected bulk fuel requirements for all on-site equipment during the construction phase will be approximately 30 m³ per day, without exceeding more than two days of storage at any one time. The fuel will be stored in a bunded area of 25 m² within the construction camp. In addition to this, approximately 5 m³ of lubricants and oils will be stored in the contractor's camp site, for the duration of construction. The lubricant and oil containers will also be stored within a bunded area of approximately 15 m².

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4.10.6. SEWAGE

In order to manage the sewage generated during the construction period, all contractors will provide portable chemical toilets for workers. A waste contractor will be appointed to manage the portable toilets to ensure that they are emptied regularly and the waste disposed of at a licensed waste disposal facility.

4.10.7. ACCESS ROADS

Access to the mine, will be facilitated via the proposed 9km access road linking the site to the R45 (refer to Figure 4-13). The proposed road will follow existing disturbed tracks and servitudes to minimise the overall impact on the environment. This road will serve as the main mine access road and will be used by various construction vehicles (eg cranes, dump trucks, front end loaders, shovels, excavators etc.) to prepare the open pit for operation.

4.10.8. NON-MINERAL WASTE MANAGEMENT

Domestic waste from the contractor's camp and the construction operations will be separated. Paper and plastics will be recycled, with the remaining domestic wastes and disposed of at the existing municipal landfill site. General industrial waste produced would include respectively. A total of 5-10 ton/month of domestic wastes are expected to be generated during construction. Domestic wastes will be stored within the contractor's camp site, covering a total area of half a hectare. All non-hazardous wastes will be disposed of at the municipal landfill site (which is a registered landfill site), as and when steel, packaging material and material off-cuts. The temporary waste disposal site will be divided between general/ domestic and hazardous wastes and cover a total area of 100 m² and 200m² required.

Hazardous waste will mainly include oil contaminated wastes, which will be collected and disposed of as and when required. Hazardous wastes will be temporarily stored within closed containers (possibly within covered skips) and removed, as and when needed (about every two weeks). The hazardous waste storage area within the contractors yard is expected to cover an area of approximately 50m². EEM will employ an authorised waste management contractor on site, who will be responsible for general and hazardous waste collection and removal. All hazardous wastes will be disposed of at the Vissershok hazardous waste facility/EnviroServ Facility.

Proof will be obtained from the contractor as to the final disposal location and volume of domestic and hazardous wastes.

4.11. PROJECT PHASES AND ACTIVITIES

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Table 4-6: Construction, operational and closure details


Construction - estimated to take 12 to 15 months and will provide approximately 800 jobs	
Infrastructure	Description
Access road and parking area	Construction of all access and service roads to infrastructure in terms of the proposed project including parking area for mini-buses; staff and visitors.
Internal Plant Roads (Haul Roads)	Construction of all service roads to infrastructure in terms of the proposed project. Where possible existing roads on the farm will be used as haul roads (see Figure 4-12).
Powerline and substations	The ESKOM self build option will be initiated and the preferred option implemented as described in Section 4.9.2.12.
Stormwater Dam	Preparation of the Stormwater Dam <ul style="list-style-type: none"> Site Clearing Stripping of topsoil and subsoil and stockpiling
Processing Plant	Construction and installation of processing plant infrastructure
Security infrastructure	Construction of gatehouse and access controlled infrastructure at the main gate from the R45.
Mine Administration Buildings, including laboratory, control room, medi-clinic, induction and training centre	Construction of mine related infrastructure.
Equipment	Equipment for construction will be brought onto site as required for the various phases of the project. This will consist of mainly diesel powered machines that are normally found on construction sites including trucks, loaders and scraper excavators. Diesel mobile cranes will be brought to site as and when required, to assist in the erection processes related to structural steel and equipment installation. It is likely that the contractor will also choose to erect electrically powered tower cranes strategically positioned to enable the placement of concrete and assist in erection. Ready mixed concrete will be used- it will be brought to site using road-going mixer trucks.
Offices and Contractors Laydown area	Establishment of Main Contractors Camp yard to ensure all necessary offices, ablution and storage facilities area adequate for project needs.
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Operational Phase- During the operational phase approximately 300 permanent job opportunities will be created in terms of the proposed project.


Surface area disturbed	<p>Mine Pit: The open pit will be mined through conventional truck and shovel mining techniques. The overburden will be stripped and dumped on the softs stockpile that will be established on over 14.9ha's with a maximum height of 38m on the northwestern side of the open pit</p> <p>The mining sequence in the open pit environment will be as follows:</p> <ul style="list-style-type: none"> • removal of topsoil, vegetation and overburden for open pit preparation and for construction of associated infrastructures. • The topsoil (seed bearing soil) will be stripped prior to mining and placed on a separate dump to the north of the pit away from the plant infrastructure and will be used during rehabilitation. The open pit will be started through creating an initial boxcut. The objective of the boxcut will be to expose sufficient ore reserves for the first production year, and will be positioned optimally to act as a future access ramp, and at a location in close proximity to the run of mine (ROM) location. • Conveying overburden to the SS or backfilling after ore extraction; • Loading and hauling of the Ore to ROM stockpile through the processing plant and haul to port. <p>Apart from the growth of the processing plant, SWD, and two stockpiles, no additional surface disturbance will take place during the operation phase of the project.</p>
Equipment	Equipment that will be brought on to the site will be for use in inspecting and maintaining all surface area infrastructures.
Plant residue disposal	Tailings will be deposited in a relatively dry state to the SS where it will be mixed with the overburden and once a steady state has been reached it will be used in the rehabilitation process of the pit.
Closure phase	
SS and SWD	<ul style="list-style-type: none"> • The complete removal of all operational infrastructures including the dam and stockpile footprint will be undertaken during the post operational phase of the mine.

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Roads:	<ul style="list-style-type: none"> Roads not needed for closure and post-closure uses at the site will be closed by ripping compacted surfaces, re-grading as needed to promote proper surface drainage, covered with growth media where needed and re-vegetated. Site roads constructed using the cut-only or fill-only method of construction. Cut-only roads will have cover placed on the road surface to control runoff and facilitate soil placement and re-vegetation. Fill-only road segments will be ripped to loosen compacted surfaces. Any roads constructed using cut-to-fill methods will be reshaped using fill material. All closed roads will be covered with soil and re-vegetated.
Demolition of Infrastructure	<ul style="list-style-type: none"> All power and water services to be disconnected and certified as safe prior to commencement of any demolition works. Salvageable equipment will be removed and transported offsite prior to the commencement of demolition. All above ground electrical, water and other service infrastructure and equipment to be removed and at designated salvage yards. Electrical, water and other services that are more than 500 mm below ground surface will remain. All pipes and structures deeper than 500 mm need to be sealed to prevent possible ingress and ponding of water. Concrete slabs and footings will be removed to a depth of 500 mm below ground surface. This concrete (and metal) will be broken up and disposed of in the designated landfill. All concrete below 500 mm depth will remain underground with the invert of all structures broken/sealed to prevent possible ingress and ponding of water. Establish appropriate vegetation as per the Vegetation Management Plan.
Contaminated Soils:	<ul style="list-style-type: none"> Undertake soil investigations to characterize the nature of possible contaminants and design a site specific soil remediation strategy. Identify appropriate risk based guideline levels against which to assess contamination. As a point of departure the guidelines given in the Draft National Framework for Soil Contamination (DEA, 2010) will be used

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	<ul style="list-style-type: none"> • If contamination is primarily hydrocarbon, with soil concentrations exceeding an appropriate risk based guideline, the following will be undertaken. <ul style="list-style-type: none"> ○ Volumes less than 100 m³ – On site bioremediation will be undertaken by collecting the affected soils and transporting them to a dedicated bioremediation facility. ○ Volumes greater than 100 m³ – Disposal at hazardous waste • If contamination is primarily inorganic a risk based approach will be adopted in determining final soil remediation technology adopted. • Where risk based assessment indicates that residual contamination is unlikely to present an unacceptable human or ecological risk, contaminated soils to be covered with a soils suitable as a plant growth media and vegetation established. These areas to be clearly demarcated as areas not for use by local communities.
Groundwater:	<ul style="list-style-type: none"> • With the cessation of the deposition of slurry onto the Temporary Tailings Storage Facility and then SS, it is expected that the primary source of salts potentially seeping from the facility will be removed and it is expected that groundwater quality around either of the SS will improve. Furthermore, as groundwater at various locations around the mine may be impacted on by both mining and processing activities, a groundwater management plan will be developed for the entire operation based on a needs analysis within the entire mine lease area. Therefore, no detailed groundwater remediation requirements are included in the action plan relating to this specific project.
Pit	<p>The decommissioning phase will include the final backfilling of the pit, reshaping of the final void, rehabilitation of mine residue deposits, rehabilitation of final footprints including shaping, replacement of topsoil and re-vegetation. The final mining void will be infilled, it is estimated that the final levels will be approximately 2 metres or less lower than the current levels. The mine path will largely ignore the subtle variations in the current topography. It is however important to retain the diversity of structure in the landscape that ranges from sand dunes to exposed calcrete that supports the diversity of plant and animal life. It is therefore proposed that the different substrates be harvested judiciously and that the placement will be done with skill under guidance of an expert in field of landscape scale rehabilitation in order to re-create a post mining environment very similar to the pre-mining condition. The entire area will be revegetated for the</p>

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	<p>purposes of:</p> <ul style="list-style-type: none"> • Rehabilitating the mined area to allow the reestablishment of indigenous vegetation and return of animal species; • Minimise the visual scar on the landscape; • Prevent erosion of transformed areas.
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Table 4-7: Project Life-Cycle of Elandsfontein Phosphate Mine

STAGE 1 CONSTRUCTION & COMMISSIONING	STAGE 2 BUILD-UP	STAGE 3 OPERATIONAL	STAGE 4 DECOMMISSIONING & CLOSURE
2015 - 2016	2016-2019	2019-2036	2036-2039
No. of estimated workforce: 800	No. of estimated workforce: 300	No. of employees: 300 – 0	No. of employees: 300 – 0
Mining right obtained Initiate construction of access roads within existing servitude.	Build production levels up to optimum level of approx 1.5 million primary sales tons per annum	Maintain approx 1.5 million primary sales tons per annum . Continuous improvement monitoring, and evaluation.	Start to develop portable skills Scaling down of operations Rehabilitation Retrenchments

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5. PROJECT ALTERNATIVES

5.1. INTRODUCTION

The purpose of this Section is to present a detailed description of project alternatives considered in the EIA/EMP process. A detailed motivation for selecting specific alternatives, in line with the mitigation hierarchy of avoid, abate, mitigate and replace/compensate is presented. The assessment of alternatives is based on new information gathered during the present mining right application process (MPRDA).


5.2. MITIGATION HIERARCHY: AVOIDANCE, PREVENTION AND MINIMIZATION OF IMPACTS

The biodiversity sensitivity of the project area requires that the consideration of alternatives is closely aligned with the Mitigation Hierarchy. The priority in mitigation is to first avoid or reduce at source the magnitude of the impact from the associated Project activity through the design of the project i.e. avoid by siting or rerouting the activities away from sensitive areas. Once this is achieved, the resultant effect to the resource/receptor can be addressed via abatement at a site then the receptor level. Restoration or rehabilitation can then be undertaken and only once the above have been considered can compensatory measures or offsets be considered (i.e. to reduce the significance of the effect once all reasonably practicable mitigations have been applied to reduce the impact magnitude). In line with good practice, avoidance has been applied to help guide the location alternatives.

Table 5-1: Mitigation hierarchy

Avoid at Source/Reduce at Source	Avoiding or reducing at source through the design of the Project (e.g., avoiding by siting or re-routing activity away from sensitive areas or changing the time of the activity).
Decrease on Site	Add design controls to decrease the impact (e.g., pollution control equipment, traffic controls).
Abate at Receptor	if an impact cannot be minimise on-site then control measures can be implemented off-site (e.g. fencing to prevent animals straying onto the site).
Repair or Remedy	If unavoidable damage to a resource cannot be avoided (e.g. agricultural /conservation land due to creating access, ore extraction or materials storage areas) and these impacts can be addressed through repair, restoration or reinstatement measures.
Compensate in Kind; Compensate Through Other Means:	Where other mitigation approaches outlined above are not possible or fully effective, then compensation for loss, damage and disturbance might be appropriate (e.g., planting to replace damaged vegetation, financial compensation for damaged crops or recreation and amenity space or compensation with biodiversity rich land where biophysical loss is unavoidable).

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5.3. ANALYSIS OF OPEN PIT AND UNDERGROUND MINING TECHNIQUES

EEM's base case for this project included the open pit mining option. However, it was broadly understood that open pit mining would result in a greater impact on the biodiversity resources than an Underground mining option. As a result, and to adhere to the mitigation hierarchy of firstly avoiding the impacts, EEM was requested to consider the potential to adopt an underground mining technique as per Department of Mineral Resources (DMR) request.

EEM appointed DRA Engineers to consider the technical and commercial viability of undertaking underground and open pit mining at the Elandsfontein Phosphate Mine.

5.3.1. OPEN PIT VS UNDERGROUND MINING

The Elandsfontein Phosphate deposit is confined to a sedimentary deposit located in the Varswater formation in the Western Cape.

Due to the fact that the overburden material is of a sandy nature (no in-situ hard rock), underground mining would not be an option. The soft overburden has a zero rock mass rating and as such any attempt to go underground would result in a total collapse. The maximum competent slope angle in the deposit is 35 degrees. Underground mining is not a viable or safe mining method.

For this reason open pit mining, and more specifically, strip mining was selected as the preferred mining technique to allow continuous rehabilitation of the area, that would commence 33 months after mining has commenced.

Refer to Appendix E for DRA's Mining Technique Analysis.


5.3.2. ALTERNATIVES CONSIDERED FOR SURFACE MINING (OPEN PIT)

Four surface mining methods have been considered and part of the option study for the project.

5.3.2.1. DREDGING

Due to the sandy nature of the ore body, and the presence of a shallow water (in the Elandsfontyn upper aquifer), dredge mining was initially considered as a low cost mining solution. The top soil and overburden above the water table would have been removed using conventional excavation methods, until the water table was intersected. The ore would then have been dredged using long suction hoses, connected to large pumps resting on barges.

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Following initial meetings with the Department of Water Affairs, it was noted that large volumes of open water would not be favoured, so the option of dredge mining was closed.

5.3.2.2. HYDRAULIC MINING (OR SLUICING)

The second mining option investigated was the hydraulic mining or sluicing method, often employed for the re-mining of historical tailings dumps. As for the dredging option, the top soil and over burden would be removed through conventional excavation methods, and deposited on large stockpiles adjacent to the final planned pit limits. The pit would have been dewatered around the perimeter.

High pressure water, produced by a monitor gun, would then be used for the excavation of the deposit. The pulped ore would have flowed via a sluice, to a central collection point for pumping to the plant. The water extracted from the water table would have been used for the hydraulic mining process.

After further consultation with the Department of Water Affairs, the client was advised to consider a dry mining method that would not result in large water consumption and possible environmental considerations. For these reasons conventional open cast and strip mining was then considered, with strip mining being the preferred option.

5.3.2.3. CONVENTIONAL OPEN CAST MINING

Conventional open cast mining was also considered. In the process of conventional open cast mining, as with the previous mining methods discussed above, a single large pit is created, until the mineral resource is exhausted. Waste rock, extracted over the life of mine, is piled up at the surface, near the final expected limit of the open pit. Rehabilitation of the pit can only commence once mining is complete, i.e. after the full 20 year mining period.

5.3.2.4. STRIP MINING (PREFERRED)


In an attempt to mitigate the environmental impacts of the mine, strip mining was investigated. The strip mining will take place in a number of discrete phases, which will reduce the overall mining, foot print:

- topsoil is removed and stockpiled;
- overburden layer is stripped and stockpiled;
- phosphate ore is mined; then
- the strip is backfilled with the overburden and slimes from the plant; and
- the topsoil returned to the strip and rehabilitated.

Initial design was based on large strips, of approximately 250m in width, but further optimisation of the process has indicated that smaller strips, of as little as 50m, can still be feasible. Strip mining has been selected as the preferred mining method, to allow continuous rehabilitation of the area, that would commence 33 months after mining has commenced.

5.3.3. LOCATION ALTERNATIVES FOR MINE INFRASTRUCTURE

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The original layout plan identified the potential location or location alternatives for all major infrastructure required for the project. The original layout plan is presented in Figure 5-1 below. This included the following project components:

5.3.3.1. LOCATION OF ALL INFRASTRUCTURE ON MINE AREA

The original layout plan identified the potential location or location alternatives for all major infrastructure required for the project.

This included the following project components:

- Stockpile (Topsoil and waste rock);
- A tailings dam;
- A pollution control dam;
- Open pit;
- Plant;
- Contractor area; and
- Access alternatives (road or conveyor belt).

Locations were identified for the open pit, and plant based on discussions between the environmental and engineering teams. The locations were finalised primarily based on avoidance of sensitive habitats and previous assessment undertaken as part of the prospecting application.

Discussions were initiated with the applicant's technical team regarding the potential relocation of these specific infrastructure components, based on the presence of sensitivities. It was agreed that the plant area and concentrate transport option could be –changed. This resulted in the second layout alternative – i.e. the inland port site where a portion of the mine infrastructure and plant would be located.

However, due to the location and dimensions of the ore body, the location of the open pit could not be relocated, as it would result in the sterilisation of parts of the ore body.

In adopting a conservative approach, all estimations of footprints were based on worst case scenarios. It is understood that as detailed design is complete, the expected footprints of the development will be refined.

5.3.3.2. INLAND PORT SITE

The original layout plan was then updated to exclude the processing plant on the main mine site. It was decided that to minimise the overall footprint on the mining area, a portion of the processing plant would be moved to the Inland Port Site.

The proposed metallurgical plant will be located on site within a 240m by 290m area, including raw water storage and pollution control dams. The plant complex will include infrastructure and equipment allowing for ore storage, flotation, thickening and water storage, reagent make- up and storage, concentrate storage, plant

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stores, engineering workshops, lay-down area and security. In order to limit the extent of development on the Elandsfontein site, the mine administrative office, training and induction centres and laboratory will be located off site, at the inland port facility, near Saldanha. The inland port facility will contain a concentrate thickener and pressure filter to dewater the concentrate, and a silo and truck loading facility for final storage ahead of ship loading. The administrative offices, laboratories, clinic and training and induction centre will be located at the inland port site.

5.4. PLANNING AND DESIGN

Previous investigations undertaken as part of the prospecting application for Elandsfontein Phosphate Mine identified a number of sensitive receptors within the area of influence. Taking cognisance of these receptors, the baseline specialist studies were undertaken as part of the initial scoping exercise via site visits, collation of existing information in order to update existing baseline information and produce a variety of sensitivity mapping. In line with the mitigation hierarchy, the sensitivity mapping was used to guide the layout of the mine based on the sensitivities present.

EEM developed a conceptual layout plan (refer to Figure 4-8) and associated alternatives based on technical feasibility and input from specialist consultants and issues raised through the mining right process by key stakeholders and interested and affected parties, where feasible. However, as the layout plan is based on conceptual design and the suggested locations and footprints will be subject to further refinement in the detailed design phase. The conceptual layout plan was presented to the ESIA specialist team for consideration. Based on the inputs from the various specialists the mine layout plan and alternatives has been updated.


The layout plan assessed by specialists as part of this EIA/EMP which is the preferred option is presented as Figure 4-8. It will comprise the location of all mine infrastructure and processing plant on the application area on Elandsfontein Farm.

It will include:

- Softs Stockpile (overburden and tailings);
- Topsoil Stockpile;
- A stormwater dam;
- Open pit;
- Plant;
- Mine Buildings;
- Access road.

Throughout the planning and design phase, mine closure objectives have been developed to inform the post mining land use and rehabilitation process. The mine closure objectives will be informed through the mining charter and requirements set out by the Department of Mineral Resources. Furthermore, consideration of post-mining land use and associated rehabilitation efforts was addressed as part of the specialist investigations.

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These two layout options identified in sections 5.3.3.1 and 5.3.3.2 (see Figure 5-1 for the original layout plan) were provided to the specialist team to assess as part of the Scoping Study. This yielded a number of sensitivity maps which were used to inform the current layout plan.

The following sensitivity maps were presented to commence with the first mitigation hierarchy measure (i.e. Avoidance):

- 1 Habitat Sensitivity Map.
- 2 Archaeological and Heritage Sensitivity Map.
3. Visual Sensitivity Map.
4. Noise Sensitivity Map.

Note that hydrological sensitivities were derived from satellite imagery and topographical surveys undertaken. In addition, the visual specialist provided preliminary feedback on the initial layout options, which are contained below.

Upon receipt of these specialist sensitivity maps and feedback on hydrological and visual sensitivities, the proposed location alternatives were reviewed in light of the specialist mapping and amended whenever feasible to avoid or prevent significant impacts/ conflict areas.

Although archaeological, visual, hydrological and noise sensitivities were considered and incorporated into the layout planning, the primary driver for avoidance was that of the habitat sensitivity map. A copy of the initial specialist sensitivity maps are presented below.

5.4.1.1. HABITAT SENSITIVITIES


In order to manage the impacts associated with the habitats and species of special concern, the botanical specialist has mapped areas of sensitivity. The habitat sensitivity map helped with delineating areas of conservation importance and thereby guided the location of Project related infrastructure.

Biodiversity “features of conservation concern” were identified based on quantifiable criteria such as their uniqueness to the site (i.e. local endemic); rarity; threatened status (i.e. risk of going extinct); cultural value; or, sensitivity to disturbance. Three categories of features of conservation can be defined, i.e. species, habitats and sites. In line with these categories of features, a flexibility map was developed to define constraints within the affected environment. A botanical sensitivity map was produced indicating area of high, medium and low sensitivity (refer to Figure 5-2).

5.4.1.2. ARCHAEOLOGICAL/ HERITAGE SENSITIVITIES

The archaeological study has indicated that the Saldanha Bay region is of very high archaeological and palaeontological importance, particularly with regard to Pleistocene fossil fauna (bone) and associated archaeology. Elandsfontyn Farm 349, for example, has produced Middle (MSA) and Early Stone Age (ESA) tools with associated fauna more than 200 000 years old, while the ‘Saldanha Man’ skull from the fossil site (nearly 3 kms east of the proposed mining area), is the oldest known human in the Cape, with a date between 700 000 and 400 000 years ago. Archaeological and palaeontological research started at Elandsfontein more than 60 years ago, and has seen the production of more than 20 scientific reports dedicated to the site. Internationally,

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it is one of the most recognised Pleistocene archaeological sites in South Africa. Refer to Figure 5-3 for the archaeological sensitivity map.

5.4.1.3. NOISE SENSITIVITIES

The Elandsfontein Farm is located in an area that is sparsely populated, with limited sensitive noise receptors in the immediate area (Figure 5-4). Sensitive receptors in the area include the town of Hopefield, neighbouring farm and wildlife and road users (R27 and R45). The proposed Elandsfontein mine will result in the generation of noise through the use of diesel equipment, concentrating and activity of mining such as drilling and hauling of concentrate.

Presently, there are no major noise sources in the areas surrounding the mine site. The main activities in the area are animal farming, nature conservation, subsistence agricultural farming and related operations, which serve the local communities. The general area around the site is rural, and noise levels are expected to be in the range of between 45 dBA and 35 dBA during daytime and night-time respectively. The only areas with higher noise levels are expected to be in the immediate vicinity of the existing main roads of R27 and R45.

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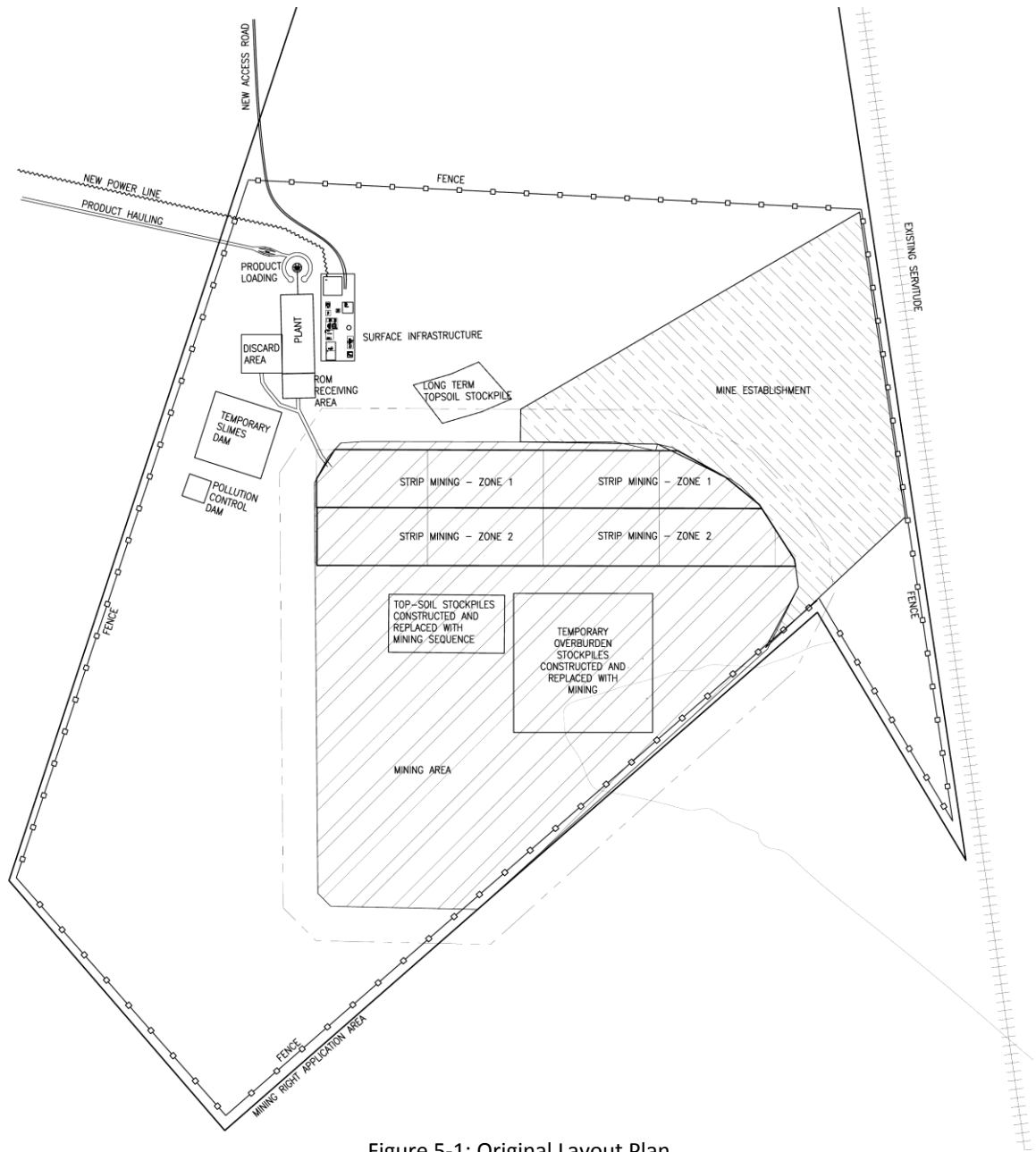
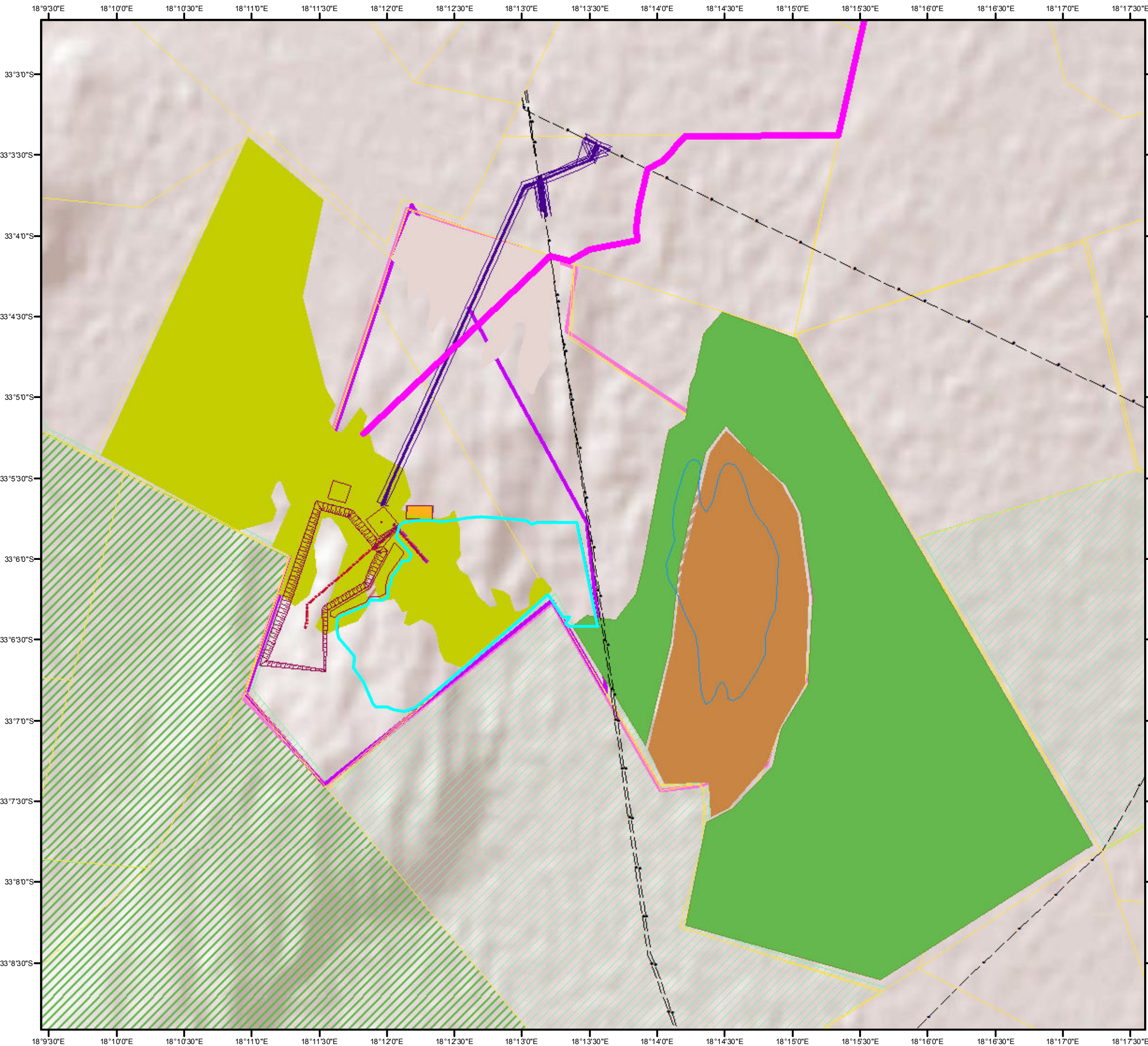
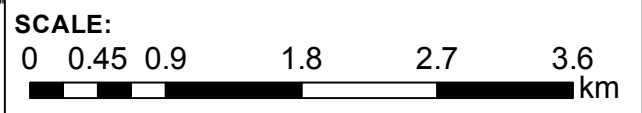


Figure 5-1: Original Layout Plan



Legend

- Elandsfontein Land Parcels
- Mine Area
- Powerlines
- Main Access Road
- Dune Field
- Hopefield Sand Fynbos
- Langebaan Dune & Saldanha Limestone
- Saldanha Flats Strandveld



PROJECT: Elandsfontein Phosphate Mine

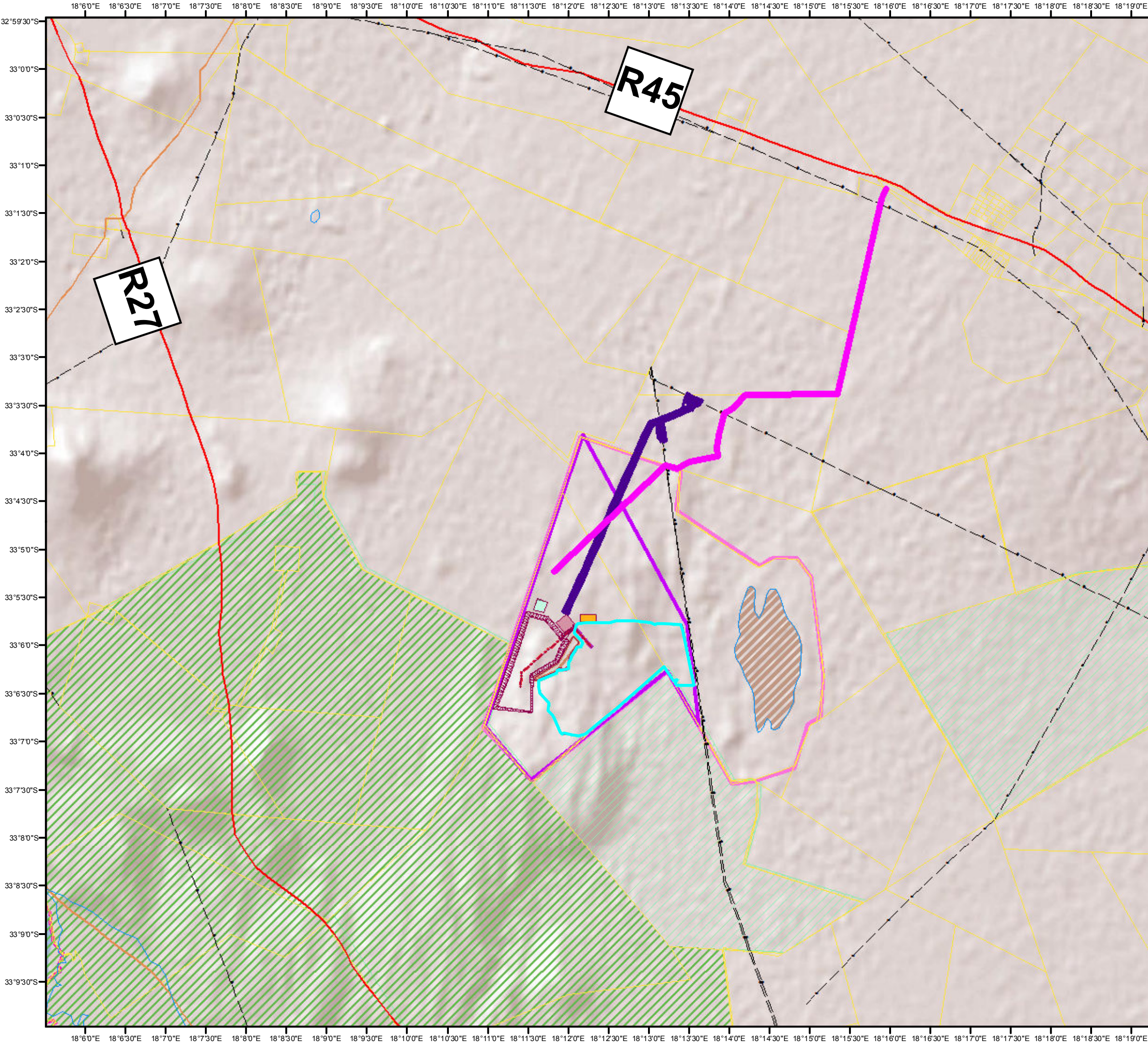
Figure 5-2: Habitat Sensitivity



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Scale: 1:50 000		A3
Drawn:	06/06/2014	OB
Checked:	06/06/2014	RR
Approved:	06/06/2014	GA

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Projection: Geographic, Datum: WGS 1984
Source: Enpat (2001),
Demarcation Board (Dec 2005)
Inset: ESRI Data and Maps




Legend

- Elandsfontein Land Parcels
- Mine Area
- Mine Pit
- Stormwater Dam
- Conveyor SS
- Conveyor (ROM)
- Topsoil Stockpile
- Concentrator
- Mine Buildings
- Main Access Road
- Powerlines
- Main Road
- Secondary Road
- Railway Line
- Fossil Area

SCALE:
0 0.5 1 2 3 4 km


PROJECT: Elandsfontein Phosphate Mine

Figure 5-3: Archaeological Sensitivity

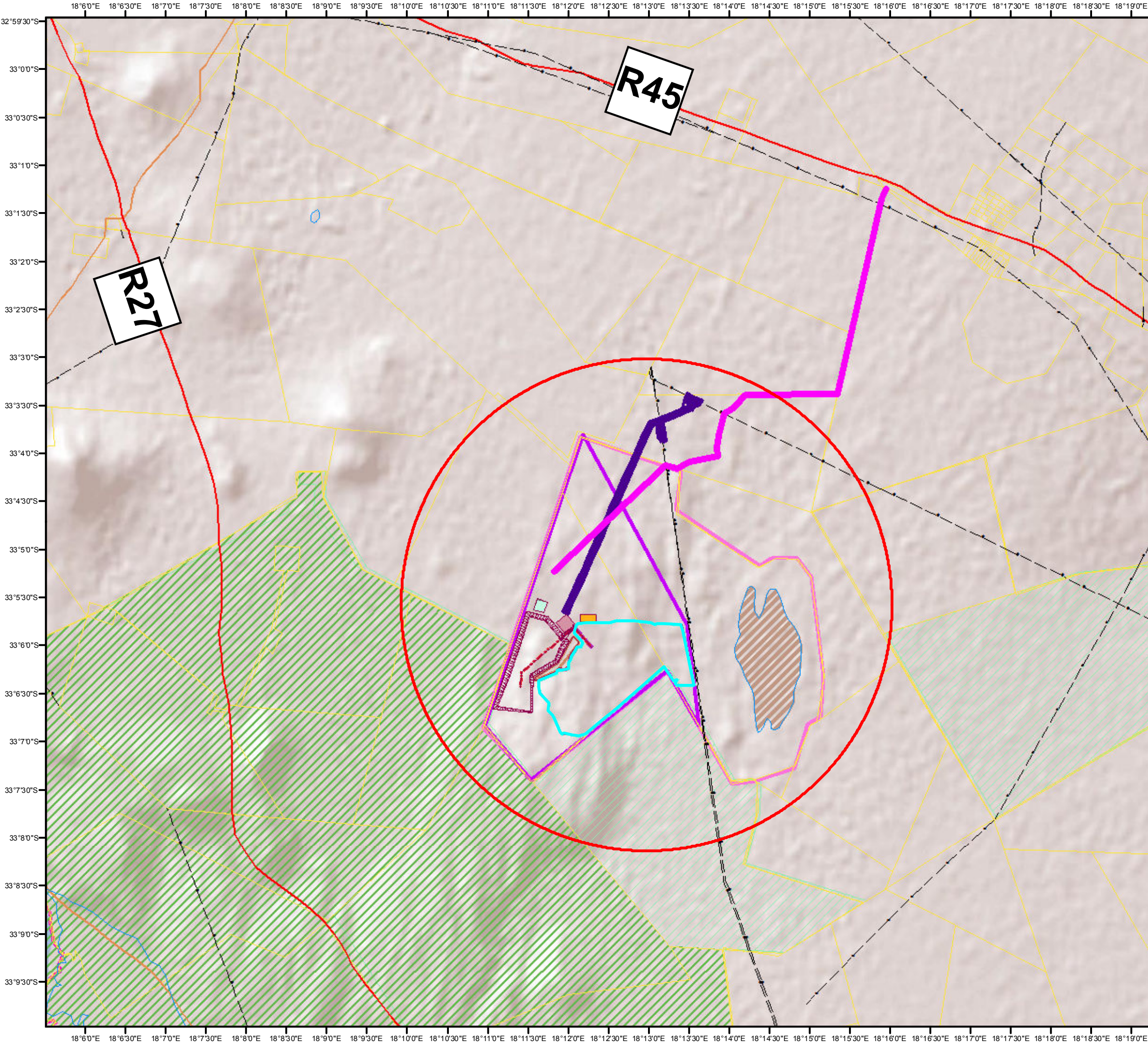
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Project No: 10043		Rev No. 1.0
Scale: 1:84 000	A3	
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Checked:	06/06/2014	RR
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Inset ESRI Data and Maps




Legend

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- Conveyor (ROM)
- Topsoil Stockpile
- Concentrator
- Mine Buildings
- Main Access Road
- Powerlines
- Main Road
- Secondary Road
- Railway Line
- Fossil Area

SCALE:
0 0.5 1 2 3 4 km


PROJECT: Elandsfontein Phosphate Mine

Figure 5-4: Noise sensitivity


CLIENT: 

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Scale: 1:84 000	A3	
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Inset ESRI Data and Maps

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5.4.1.4. VISUAL SENSITIVITIES

The visual specialist was requested to consider the initial design and provide feedback in terms of key sensitivities. The specialist was of the opinion that the Project will have a visual impact but that infrastructure with height should be located within the lower lying portions of the mine area to minimise the overall impact on sensitive receptors. The relative scale and physical presence of project components, in essentially a 'green fields' location, make it difficult to mitigate. The specialist suggested that the location of facilities must try to be 'consolidated' into the smallest 'footprint' possible and preferably within the valley area on the site to maximise the visual absorption capacity of the impacted landscape.

5.4.1.5. HYDROLOGICAL SENSITIVITIES

As outlined above, the hydrological sensitivities identified were based on satellite imagery, topographical surveys and the freshwater assessment.

The main aquatic features within the wider study area consist of the Salt River System, a tributary of the lower Berg River, to the east of the site and the Langebaan Lagoon to the west of the site. The site occurs approximately 2km west of the watershed between these two larger freshwater features. Thus the surface water drainage is to the south west, to the Langebaan Lagoon. There are no seasonal or permanent wetlands in the immediate study area, only a poorly defined drainage channel that is orientated towards the south and falls outside of the mine area. It is unlikely that there is any significant surface water flow in the channel and that the movement of water within the channel is relatively insignificant and is subsurface flow. There is no visible aquatic ecosystem associated with the channel.

The exploration site overlies two aquifers. The upper aquifer is low yielding and the lower aquifer is higher yielding. The groundwater quality is good and, due to the porous nature of the unconsolidated sand, the aquifer (particularly the Upper Aquifer Unit) is susceptible to contamination. For this reason mine design plays a vital role in eliminating and/or minimising the potential negative impacts which may occur as a result of the project on groundwater.

5.5. OUTCOMES OF AVOIDANCE


As previously indicated, the habitat sensitivities were used as the primary driver to determine locations of project infrastructure. The aforementioned sensitivity maps were overlaid onto the original layout plan and subsequently used by the engineering team to shift infrastructure to avoid areas of high sensitivity as much as possible.

5.5.1. SOFTS STOCKPILES

Habitat

The habitat sensitivity map identified sensitive habitats within various sections of the Elandsfontein Farm. Based on the conceptual softs stockpiles plan all options are located within an area identified as medium sensitivity and hence that this factor did not make a difference.

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Archaeological/ Heritage

The archaeologist has noted that the Elandsfontein Farm does contain fossils associated to fauna. This is largely concentrated to the dune field on Portion 2 which falls outside of the mine area, but it is possible that heritage material may be intercepted within the affected area. Strict controls will be put in place during excavation to ensure that no fossil resources are impacted.

Noise

Neither of the softs stockpile options was considered to impact sensitive noise receptors in the surrounding region. The noise specialist has not identified any preference with regard to the softs stockpile options.

Hydrogeology

The softs stockpile will be located on the site which overlies two aquifers. From a geohydrological perspective, at this stage of the project, the plans in place indicate both the upper and lower aquifer systems will not be impacted significantly and there will be no long term impacts.

Visual

Based on softs stockpile options, the final option in brown indicates an area that would be the “easiest” to partially absorb the visual impact of this huge feature, as it would be 'enclosed' by the natural koppie to its west and partially as it will be located within a lower lying area, although a portion is on a high lying area. The final option would ensure the provision of an area which is large enough to contain the overburden and tailings.

Based on habitat sensitivities identified around the final option for the softs stockpile, due consideration was given to both the visual and ecological sensitivities.


Technical assessment

A Site Selection process was undertaken during the pre-feasibility phase of the project, to assess options for a new surface SS at Elandsfontein Mine. Six sites were identified in, and around, the Elandsfontein Mine, as possible softs stockpile areas at a desktop level, on the basis of space available to accommodate a softs stockpile with sufficient capacity required for the Elandsfontein tailings. A further high level site selection assessment was undertaken by the tailings engineer for each of the sites as a means of ranking them in terms of suitability as tailings disposal facilities.

The following criteria were used to evaluate each SS site alternative:

Environmental Criteria	<ul style="list-style-type: none"> • Interference of potential land use • Loss of previously undisturbed land • Risk to surface water catchment regimes • Risk of changing visual characteristics • Risk of airborne releases • Proximity to farm homesteads/developed areas in terms of dust • Road and Air Safety
Public acceptance criteria	<ul style="list-style-type: none"> • Displacement of local inhabitants

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Economic and engineering criteria

- Visibility of site to surrounding community
- Wind direction in relation to sensitive receptors.
- Distance to nearest residential areas
- Landownership
- Required capacity and footprint area;
- Method of deposition;
- Structural geology, hydrogeological and geotechnical constraints;
- The proximity to the plant;; and
- Potential expansion if the life of the mine is extended or the tailings production rate is increased.

To determine a possible preferred site for the softs stockpile, the following components were taken into account:

- The location of the open pits, process plant and open pit mine waste dumps;
- The required storage capacity of the necessary tailings/water volumes;
- The configuration of the mine lease area and terrain; and
- The location of sensitive areas in the surrounding environment.

Summary of Preferred Option

Based on the aforementioned inputs, softs stockpile final option was selected to be the preferred choice, with specific refinements required to avoid irreplaceable ecological habitat located to the north.

Six possible SS sites were considered; refer to Figure 5-5.

- Reduced environmental impact (all mine activities are contained in the southern portion of the property.
- Proximity to plant and pit (reduced pipeline and future conveyor lengths).
- Lower crest height, i.e. reduced visual impact on surrounding areas.

5.5.2. OPEN PIT


Habitat

The sensitivity mapping within the footprint of the pit is indicated as medium with a small portion overlapping into the high sensitivity area. The expected footprint of the open pit is based on the dimensions of the ore body as well as technical requirements to access the reserve. Due to the technical limitations of the proposed open pit the extent of the area to be mined was not extended any further into the high sensitive so as to avoid further impact on the resources. This technical limitation would reduce the financial viability of the Project and was therefore screened out. However, the design engineers have explored the potential to limit the extent of the proposed open pit so as to avoid the further impact on a area of high sensitivity as far as reasonable possible.

Archaeological/Heritage


The archaeological specialist has identified specific areas of concern with regard to the location of the proposed open pit which includes the fossil dune field to the northeast and hence the footprint has been

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restricted to terminated on the southern side of the Eskom Powerline servitude about 2km's form the sensitive area.

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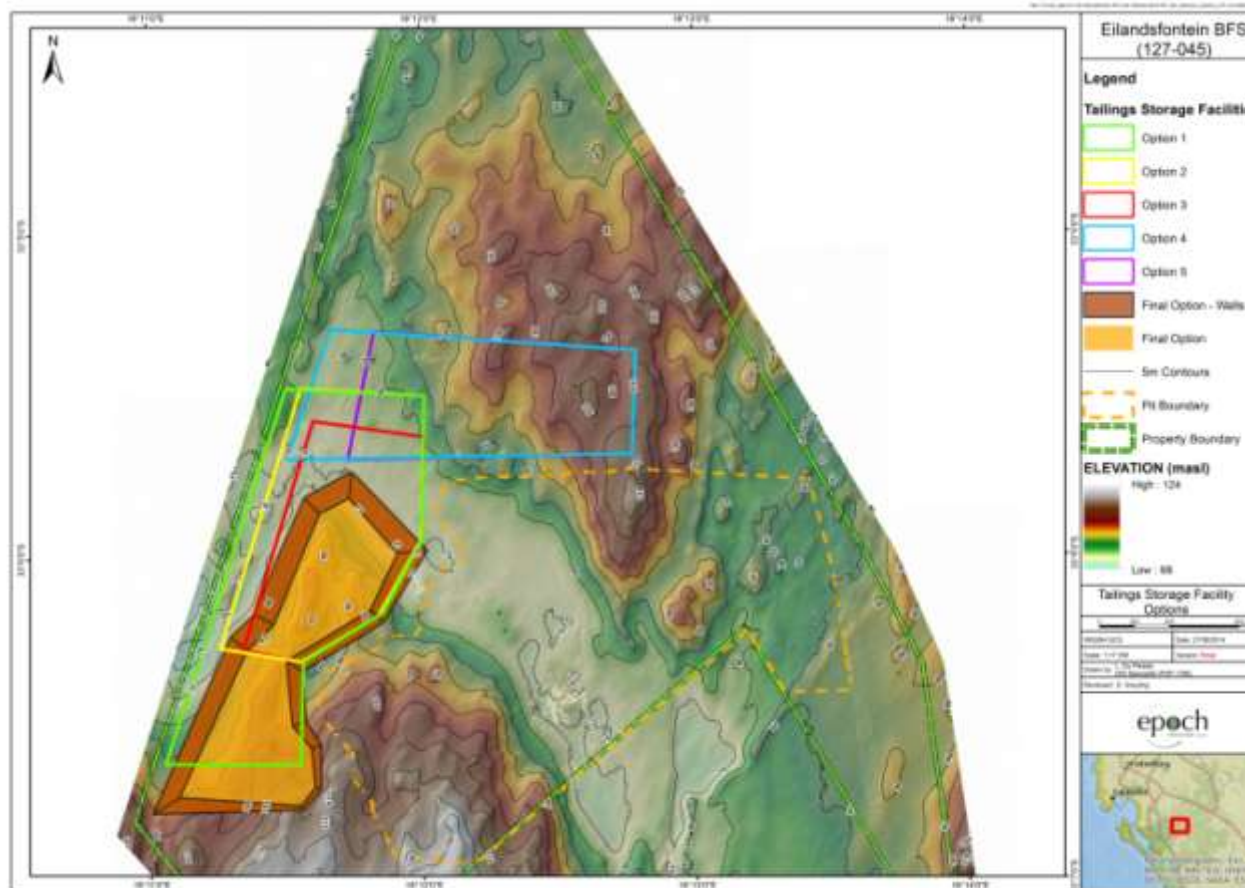



Figure 5-5: Soft Stockpile location alternatives

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Hydrology

There is a poorly defined drainage channel that is orientated towards the south of the mine area within the pit. It is unlikely that there is any significant surface water flow in the channel and that the movement of water within the channel is relatively insignificant and is as subsurface flow. As there is no visible aquatic ecosystem associated with the channel, no freshwater mitigation measures would be required on site.

Geohydrology

The mine will be located on top of two aquifers, one the Upper (unconfined) and the Lower (confined) Aquifer Unit. The stormwater management measures and waste management mitigation measures for reducing in pit pollution and subsequent impact on groundwater resources. Design measures must take cognisance of the groundwater aspects.

Visual

The proposed open pit would be located within the valley and would therefore not be visible from the R27/R45 but will be visible from the adjacent WCNP along the southern boundary of the pit. A suitable buffer must be implemented between the boundary of 5m high berm with vegetation removed during clearing of the mine pit at angle of repose (about 35degrees), along the southeastern around the pit where it borders adjacent properties.

Summary of Preferred Options

In light of the aforementioned comments, together with the technical limitations to the dimensions of the open pit, the location of the pit will not be moved. However, to minimise the potential visual impact on the surrounds (i.e. adjacent neighbours) a vegetated berm will be established on the boundary of the pit along the southern end while maintaining a technically safe slope angle.

5.6. SUMMARY OF ALTERNATIVES

During the mining right application process, a suite of project alternatives were considered, such as:

- Location alternatives for various major infrastructure components
- Product handling and Transport Alternatives
- Access alternatives
- Mine Power Route Alternatives
- Pit Dewatering Alternatives
- Process Water Alternatives

The final list of alternatives that were considered is tabulated below. A tabulated summary of the various alternatives considered during the Scoping process together with the reasons why these have been screened out is presented in Table 5-2 below as well as the preferred alternatives considered and taken forward for detailed impact assessment refer to Final Layout Plan included in Figure 4-8

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Table 5-2: Summary of alternatives screened out and preferred options (highlighted in blue) taken to detailed impact assessment


Alternative Type	Alternative	Motivation as to why alternative was screened out or is now preferred
Location Alternatives		
Inland Port Site	Site 1: Location of a portion of the processing plant at an Inland Port Site - The inland port facility will contain a concentrate thickener and pressure filter to dewater the concentrate, and a silo and truck loading facility for final storage ahead of ship loading. The administrative offices, laboratories, clinic and training and induction centre will be located at the inland port site.	Subsequent investigations has shown that pumping the ore concentrate in a pipeline extending 18.5 km through properties held by 5 different land owners and crossing below the R27 and R45 was no longer favoured as it would generate the same number of trucks as the product being trucked directly from the mine to the port. The direct trucking option is a more feasible option for EEM.
Locate all infrastructure on mine application area (Elandsfontein Farm)	Site 2: Locate all mine infrastructure, processing plant and buildings on Portions 4 and 2 of Farm 349, Elandsfontein Farm	The specialist studies have indicated that discretionary infrastructure (buildings, stockpiles, stores, roads, etc.), should be concentrated in the Low and Medium Sensitivity, and should be as close to the mine area as possible, and occupy as small an area as possible. For this reason the current mine layout has concentrated infrastructure around the main area of impact to minimise the overall footprint.
Mine Access Alternatives		
The Elandsfontein mine site can be accessed by three proclaimed public roads:	Route 1: OP05544 (via Hopefield) – 19km In considering main access to the site, the shortest, most direct route has desired. In addition, it has been repeatedly requested that the mine access opens up an employment opportunity for the residents of Hopefield..	Therefore, despite a number of public roads being available, the preferred route currently runs directly north of the property, joining the R45 near Hopefield, with an approximate distance of 9 km

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Alternative Type	Alternative	Motivation as to why alternative was screened out or is now preferred
	Route 2: OP05545 (via the R45 near Langebaanweg) – 12km	
	Route 3: OP05546 (via the R27) – 9.5km. Currently, being used for access to the farm.	This route runs from the R27 through SANParks property and is therefore not an option to pursue as an access road.
	Route 4: The fourth access proposal investigated is the construction of a nine km long access road which largely follows existing servitudes over three farms to the north of the mine connecting to TR21/2 (R45), at a point about 13km from Hopefield.	Reasons' making this option preferred is the fact that it provides a link from the mine to Hopefield, a request from the SBM and secondly, unlike the option OP05546, which runs from the R27 through SANParks property to the mine property, the proposed access route largely follows existing servitudes.
Concentrate Transport Alternatives		
Rail Transport	Route 1: Mine Site to Hopefield The first rail option considered the construction of a rail line connecting the mine site to the existing Spoornet rail way line in Hopefield, for transfer to the port site.	The routing of the new rail way line needed to cross SANParks land however, and an immediate alternative was considered. In addition, there was a possibility that the rail line may have to cross the Sout River en route to Hopefield. This option was therefore excluded due to its potential negative impacts.
	Route 2: The construction of a new railway line from the mine site to Saldanha was then considered, and traded off against a similar routing for a haul road, to be used by trucks or road trains.	The available routes would cross through agricultural land, causing negative impacts for the landowners, including increased noise and dust, and undesirable visual impacts. The haul roads or rail lines would also need to cross several provincial roads.

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Alternative Type	Alternative	Motivation as to why alternative was screened out or is now preferred
Conveyor transport	DRA International (Pty) Ltd was then commissioned to investigate further alternatives, with a primary objective of reducing overall environmental impact. In this study, a number of conveyor technologies (conventional belt, rope conveyor and pipe conveyor) were considered, and compared to the option of pumping a slurry from the mine site to the inland port. Although the conveyor belts offered a number of significant advantages over the haul road and rail options, the pipe line was recommended. The pipe line alternative requires a narrow servitude between the mine and port site, simpler road crossings, and reduced noise, dust and visual impacts. The pipeline would comprise a 250NB HDPE pipeline will be suitable for slurry transport. The slurry will be pumped using a series of six high pressure centrifugal pumps, located at the mine. A 200NB return water pipeline would be required for returning the thickener overflow and filtrate to the plant process.	<p>Some of the benefits of the direct trucking route are highlighted below:</p> <ul style="list-style-type: none"> • The pipeline length was 18.5km from mine site to the inland port. The route crossed through properties held by 5 different land owners. The pipe line would need to be accessed by a service road which would need to run parallel to the pipeline for the entire distance. The pipeline also needed to be jacked under three provincial roads (the R27, Langebaanweg Road and TR45). The direct trucking route would make use of the mine access road, which would have been constructed in the pumping solution. • For the pumping option the concentrate would be transported to an inland port facility for dewatering and storage. From the inland port storage facility, the concentrate would be trucked 8.5km to the multi-purpose terminal. In the direct trucking option the distance travelled will be 30km from the intersection from the mine access road and the R45, to port. • The number of trucks required for both options will remain unchanged • The direct trucking option can save the project the capital expenditure associated with the pipeline and the inland
Road Transport	Elandsfontein Exploration and Mining have investigated a number of concentrate transport options. The most recent trade off study showed that the pumping of the concentrate to an inland port site had a lower environmental impact and was more cost effective than any of the previous methods investigated.	

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	Following the receipt of some new information, another option was investigated. This involved the loading of trucks (containerized trucks) at the mine site for transportation of the concentrate directly to the port.	port, to the order of R270 million.
Alternative Type	Alternative	Motivation as to why alternative was screened out or is now preferred
Power Supply Alternatives	<p>Four power supply alternatives were considered by Elandsfontein.</p> <p>Each option was evaluated against four criteria:</p> <ul style="list-style-type: none"> Line length, space on existing servitudes or corridors, environmental foot print Stability of power supply Expected delivery date of power supply Cost of power supply to mine <p>Option 1: A 66kV supply from Blouwater Substation (20km line length)</p> <p>Option 2: A 132kV supply from Aurora Substation (10km line length)</p> <p>Option 3: 66kV line from Hopefield Substation (13 km line length)</p> <p>Option 4: Loop In – Loop Out from 132kV Aurora Moorreesburg line (4km line length)</p>	<p>The loop in – loop out option has been selected as the preferred alternative, scoring the highest on all four evaluation criteria.</p> <p>In addition, two alternatives were investigated regarding the location of the substation. The first option was to locate the substation nearer to the loop in loop out connection. Further investigation has now indicated that to minimise the overall footprint outside of the direct area which will be affected by mining it is preferred that the substation be located as close to the plant and pit. In this way the mine footprint will be restricted to the mine application area in close proximity to the area to be directly affected by mining activities.</p>
Pit Dewatering Alternatives		

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Alternative Type	Alternative	Motivation as to why alternative was screened out or is now preferred
Recharging Through Pumps	The initial pit dewatering proposal included the establishment of a series of boreholes on either side of the pit. The water abstracted from the aquifer would then be pumped downstream of the mining operation and recharged into the aquifer by pumps.	Through further discussion and investigation with the DWA Steering Committee it was found that this option is not preferred and that the water should instead be allowed to naturally drain into the soil.
Trench Percolation	As the mining activities intersect the upper Elandsfontyn aquifer and any open bodies of water are prohibited, continuous perimeter borehole pumping will be required to remove the excess water from the mining strips. It is currently proposed that the pumped water will be piped downstream of the mining operation. The aquifer water will immediately be reintroduced to the aquifer through a series of covered horizontal trenches (±4m deep), via a sealed water distribution hub, minimising the exposure of water to atmospheric conditions. In this option water would naturally percolate into the soil.	Preferred option as it is a closed system minimise the potential impact of exposure to atmospheric conditions and allow water to naturally seep into the soil.
Process Water Alternatives		
Aquifer Abstraction	It was initially proposed that a portion of the pumped aquifer water would be used for processing activities on site.	This option was excluded due to the potential groundwater impact.
Treated Municipal Grey Water	The current option includes the treatment of effluent water from the Vredenburg Wastewater Treatment Works prior to piping to the mine site for use in the processing plant.	This is the preferred option as it will minimise any additional interaction or exposure of aquifer water and thereby minimise potential impacts to the groundwater. By implementing this option the pit dewatering process becomes a closed process and
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		minimises exposure of the aquifer water to atmospheric conditions prior to recharging.
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5.7. MODIFICATION OF PROJECT DESIGN AND LAYOUT

Based on the aforementioned screening process, a project layout was developed and distributed to the specialist team. The specialists undertook their impact assessments based on the initial layout plan (refer to Figure 5-1). Based on the initial findings of the specialist studies, the following changes as indicated by specialists, consultation with stakeholders and best practice design and technological requirements were made:

- Concentrate mine infrastructure and ancillary services close to the mine area as possible and on low to medium sensitivity areas;
- Locate components with height in lower lying areas/depressions;
- Decrease in size of the softs stockpile from 61 hectares to 14.9 hectares.

Note that each specialist has been requested to confirm the aforementioned refinements to the project design, in relation to their specialist impact assessment. It was confirmed that all specialist findings and impact ratings were not going to change, as compared to the impacts assessed against the initial layout plan.

The final layout plan, which reflects the concentration of the plant and stockpiles around the pit and increase in footprint of the softs stockpile was compiled, in which Report is based on is included as Figure 4-8..

5.8. COMPARATIVE ANALYSIS OF ALTERNATIVES FROM THE MINING RIGHT APPLICATION PHASE (SCOPING TO EIA/EMP)


Based on a review of the alternatives considered during the application process, the proposed location of the following infrastructure is consistent (i.e. on the main mine site) as presented to date:

- Open pit;
- Softs Stockpile;
- Mine Buildings;
- Powerline;
- Portion of Processing Plant; and
- Stormwater Dam.

There have been a number of changes from the original design to the final design plan which is now being assessed. The original design included, a pollution control dam and a tailings dam, which no longer form part of the mine infrastructure.

In light of the design changes the overall location of the mine infrastructure and plant is still contained within the 942 ha application area but have been moved further southward. Based on the design changes the biodiversity sensitivities (botanical sensitivity), and topographical characteristics have been taken into consideration when siting the components with height, such as the softs stockpile. All elements of the mine with height have been located on areas with medium sensitivity and on the lower lying areas. The new mine

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infrastructural components and the plant is consistent with the technical requirement to locate these elements within close proximity to each other for optimization purposes and to minimise the overall footprint.


5.9. NO PROJECT ALTERNATIVE

In terms of the No-Go option, the current status land use Farm 349/4 and Farm 349/2 will remain agricultural and the landowner may look to develop commercial farming. Although the farm was previously operated as a private nature reserve with tourism facilities (a lodge) it is no longer operational. The No-Go option could also potentially mean that the large area currently under investigation for off sets (up to 4,000ha) would be lost for conservation.

It must however be noted that current activities on the land includes prospecting which was awarded to Elandsfontein Exploration and Mining (Pty) Ltd in 2013 by the DMR. The land was also re-zoned in accordance with the Saldanha Bay Municipality.

The no-go alternative will also be considered, in which the status quo for the area will remain. The economic and social impacts of mining on the current and future conservation activities will also be considered.

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6. DESCRIPTION OF THE BASELINE ENVIRONMENT

6.1. BIOPHYSICAL ENVIRONMENT

6.1.1. CLIMATE

The Western Cape has a semi-arid Mediterranean climate, which is strongly influenced by the cold Benguela Current and coastal winds. The Saldanha area is characterised by dry warm summer months (October to April) and wetter cool winter months (from May to September).

The project area receives more than 80% of the precipitation occurring between April and September, and very little in the summer months. The rainfall is variable and less than 300mm per annum is the norm. The area is classified as arid. Standard rain-gauge measurements for the area do not record any precipitation from the fog, particularly in autumn and they therefore give a misleading indication of the total precipitation.

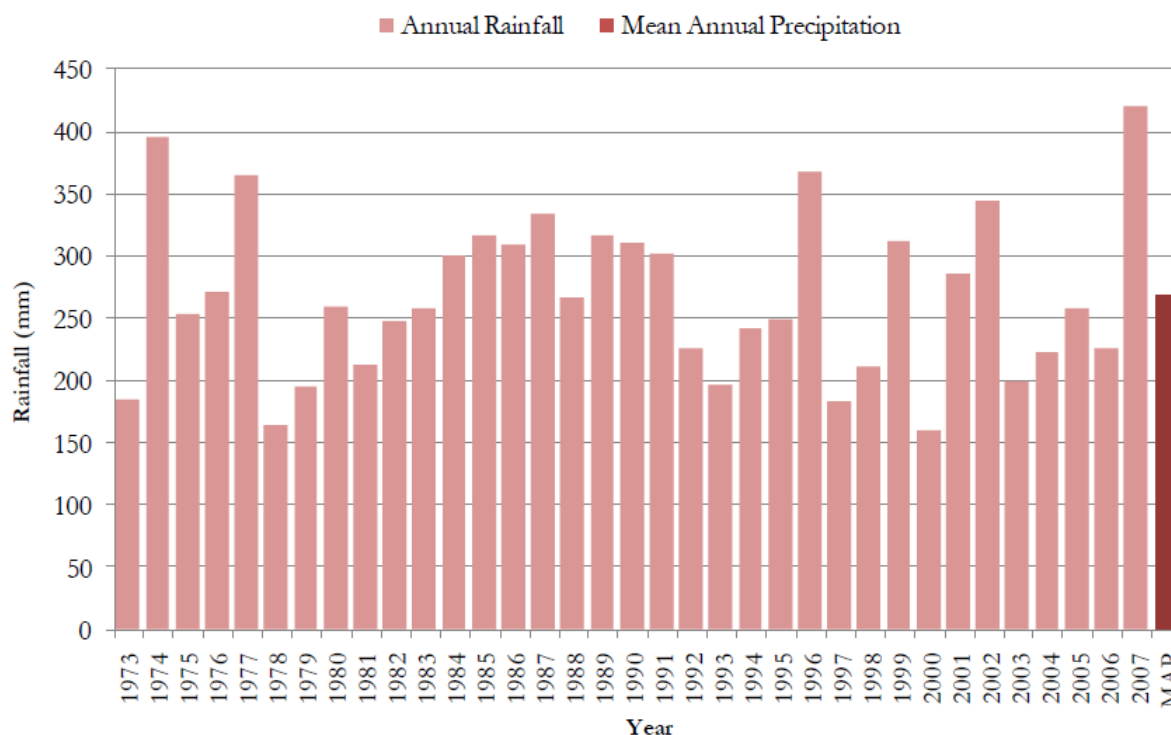



Figure 6-1: Annual Rainfall for Rainfall Station Langebaan Road 185-1R

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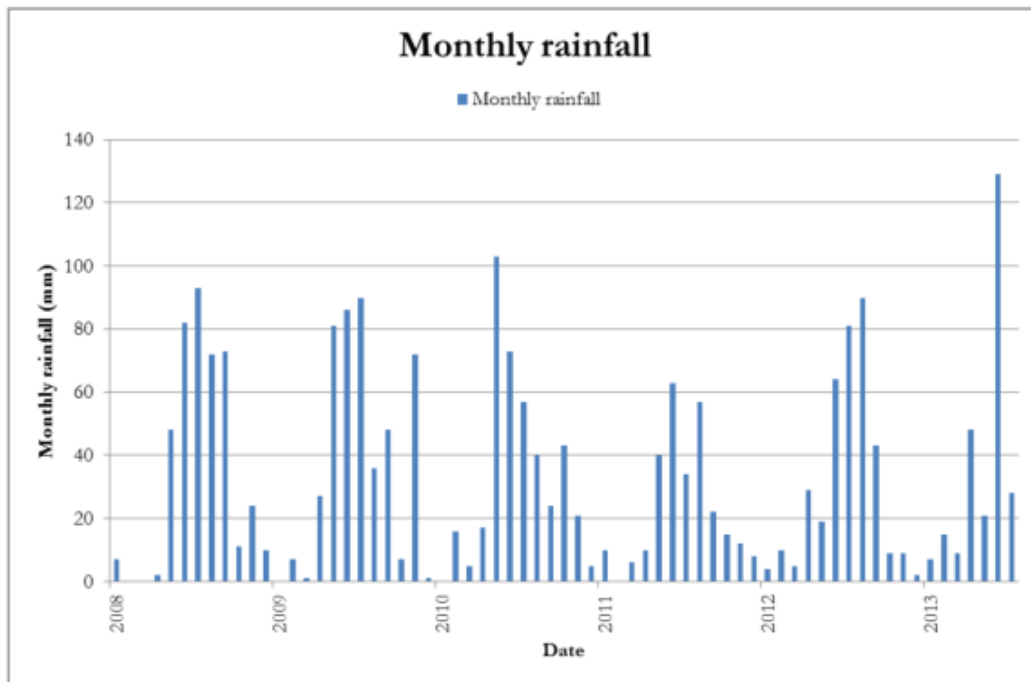


Figure 6-2: Monthly Rainfall Data obtained for Rainfall Station: BG00074 (source: GEOSS.2014)

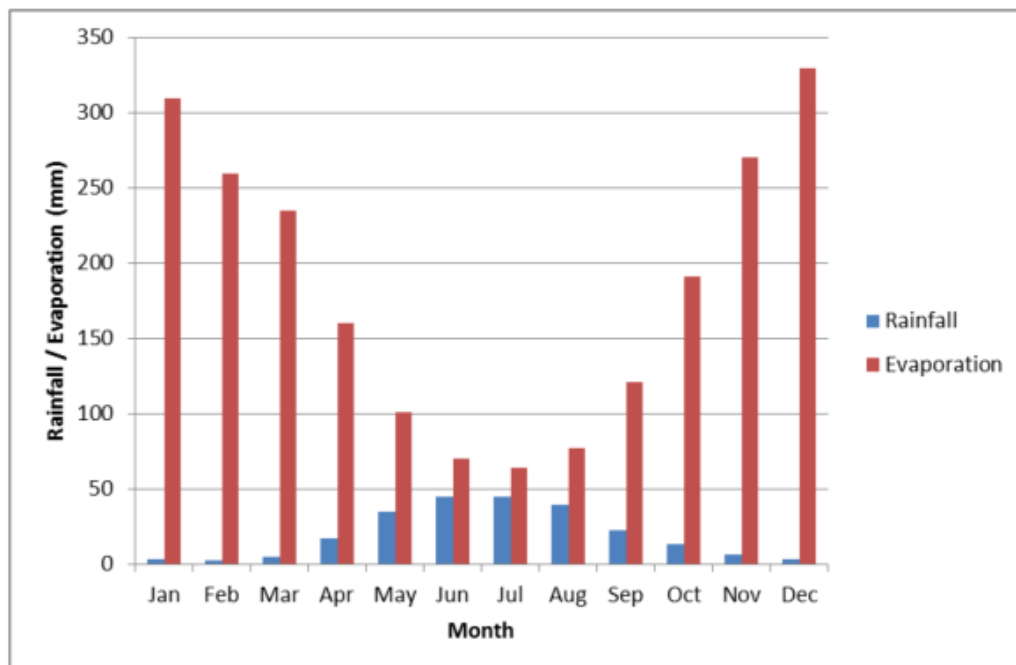



Figure 6-3: Long Term Monthly Rainfall and Evaporation Data for the Area (GEOSS, 2014)

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Temperatures range between -6 and 35 °C. The highest temperatures occur from December to March and the lowest between June and August. During summer, temperatures increase to reach maximum in the afternoon and decreases to reach a minimum just before sunrise. During winter, temperatures increase to reach maximum in the afternoon and decreases to reach a minimum in the morning.

The predominant wind direction in the area is from the south-east, followed by winds from the south. Winds with speeds of between 3.6 m/s and 5.7 m/s occur approximately half the time in the area.

The winter rainfall occurs when evaporation is at its lowest and winter will be the time when the greatest volume of groundwater recharge occurs. Figure 6-4 shows the long term monthly evaporation and rainfall data for the area (Schulze et al, 2008).

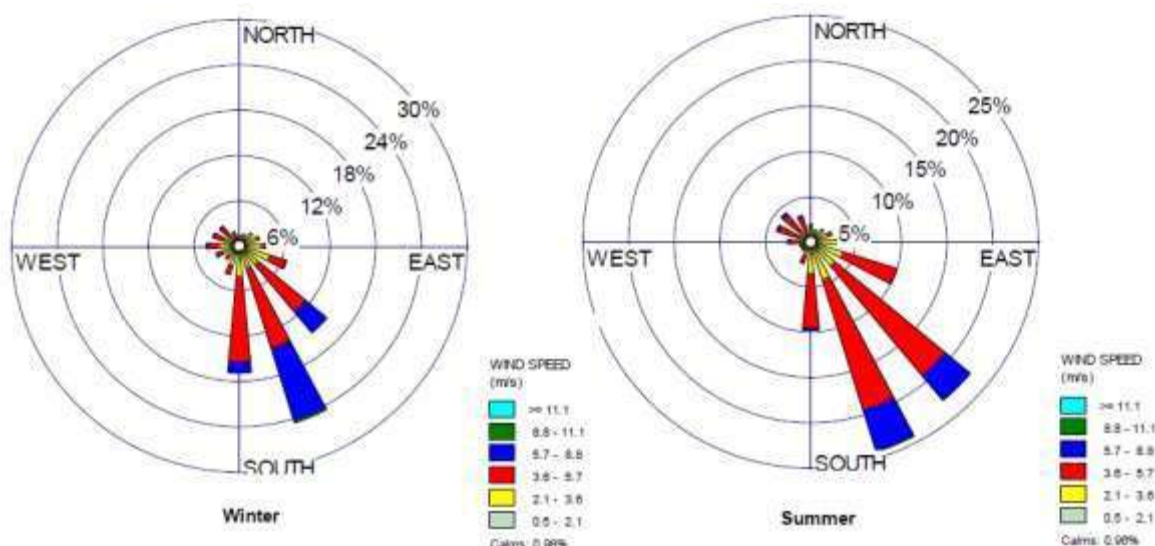


Figure 6-4: Windroses for Area (Source: DDA)


6.1.2. TOPOGRAPHY

Between the farm and the coast, (both north and south), the land is very undulating with many small koppies; whereas, to the east, the land is more open, with gentler slopes.

The mining right site is characterised by a valley lying north-west – south-east between 77 and 78masl. The land to the immediate south-west rises to Staankop, 136m, and to the north-east to Stinkkruidkop at 114m. The valley is the original route of the Berg River, which now flows north to Velddrif.

The land to the south and west is occupied by a range of low hills in a north south grouping; the R27 is shielded from the site by these hills as is the lagoon, Langebaan town and Saldanha Bay. To the east of the site is a gentle north-

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south ridge to 105masl, beyond which, further east, is Hopefield. Hopefield lies in the Soutrivier valley at 20 to 60m elevation.

6.1.3. GEOLOGY

The Elandsfontein phosphate deposit occurs in the known mineralised Varswater Formation that is present along the west coast of South Africa between Cape Hangklip in the southeast to Elands Bay in the northeast. Phosphate mineralisation was initially identified by Samancor in 1985. The company drilled 28 RC boreholes which were analysed for P_2O_5 and described. The average thickness of P_2O_5 mineralisation varies between 6.0m and 26.0m.

6.1.3.1. REGIONAL GEOLOGY

The regional geology is marked by the presence of numerous outcrops of Cambrian/Neoproterozoic granites of the Cape Suite, and Tertiary/Quaternary sediments consisting of calcareous aeolian sands, calcretes and phoscretes. Regionally extensive outcrops of the Malmesbury Group occur to the west near Saldanha and granites of the Darling pluton in the south. The area immediately surrounding the property is however covered by calcrete ridges and aeolian sand with a surface expression of a relatively flat relief. The Elandsfontein property represents a palaeo-basin setting that has been filled up with a sequence of sedimentary units. Historical drilling indicated the presence of marine and fluvial sequences represented by the Elandsfontein and Varswater Formations. More recent sediments are represented by the Pliocene Langebaan Formation and Quaternary Witzand Formation, which represent the current surface geology.

The phosphate deposits of the South African continental margin and coastal terrace were described in detail by Birch (1961), who indicated that diagenetic phosphorites are ubiquitous in the western and southern margins of South Africa. According to Birch (1961), authigenic phosphorites form in shallow estuaries or embayments, in environments of intense, wind-generated upwelling and high biological productivity. In such conditions, phosphate-rich sediments deposit into the sea floor by decay of siliceous phytoplankton, which facilitates the interstitial precipitation of apatite to form phosphatic packstones and oolitic pellets at the water-sediment inter-phase.


6.1.3.2. LOCAL GEOLOGY

The lithostratigraphic units in the Elandsfontein region are combined as the Sandveld Group, which is present from Cape Hangklip in the southeast to Elands Bay in the northwest. This sedimentary group overlies the pre-Mesozoic basement rocks of the Malmesbury Group and the Cape Granite Suite.

The naming of the Formations and Member units has been changed in recent years, in accordance with Roberts (2006), whom applied the Member names for sub-units as previously defined by Tankard (1974). Three Formations are present at Elandsfontein:

- Elandsfontyn Formation (oldest)
- Varswater Formation

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- Langebaan Formation and
- Witzand Formation (youngest).

The Varswater Formation has in turn been divided into four sub-units namely,

- the Langeenheid Clay Member;
- the Konings Vlei Clay Member;
- the Langeberg Quartzose Sand Member ;and
- the Muishond Fontein.

Figure 6-5 presents a stylised stratigraphic succession for the proposed Project area, with specific detail of the Elandsfontein ore body that is targeted in this Project.

The following section describes the formations and members of the Varswater Formation.

6.1.3.3. WITZAND FORMATION

The Witzand Formation is the youngest formation present at Elandsfontein. It is made up of unconsolidated aeolian material and is part of the same depositional system which led to the deposition of the underlying Langebaan Member of the Sandveld Group. Mass movement of beach sand is thought to have periodically occurred during regression. The prevailing southerly winds transported the beach sand inland as dunes. However, the most recent transport event is thought to have occurred during a mid-Holocene high sea-level stand, when sand eroded from previously stabilised dunes. The base of the Witzand Formation is in contact with the Langebaan Formation.

6.1.3.4. LANGEBAAN FORMATION

The calcarenites of the Langebaan Formation, of Pliocene age, are found from sea level to altitudes exceeding 200m amsl. It forms extensive areas of undulating topography which rises inland to a broad sandy plain that extends towards Hopefield. The Langebaan Formation rests on the Varswater Formation and is in turn, locally overlain by the Witzand Formation. Sediments of the Formation accumulated during the last glacial lowering of the sea-level when large tracks of un-vegetated land were exposed on exposed sea floor.

The Langebaan Formation is generally medium grained and slightly greyish to cream coloured with quartz grains and shell fragments clearly visible. It can be coarse or gritty to extremely fine grained and the degree of sedimentation and hardness of the rock is variable. Outcrops along the Langebaan Lagoon display large-scale cross-bedding. Prevailing southerly palaeowinds are clearly indicated by the cross-bedding and consensus exists that most of the Langebaan Formation accumulated during the last lowering of the sea level when the sand was exposed to the southerly winds. The absence of marine shells in most outcrops point to a coastline that was located considerably further to the south.

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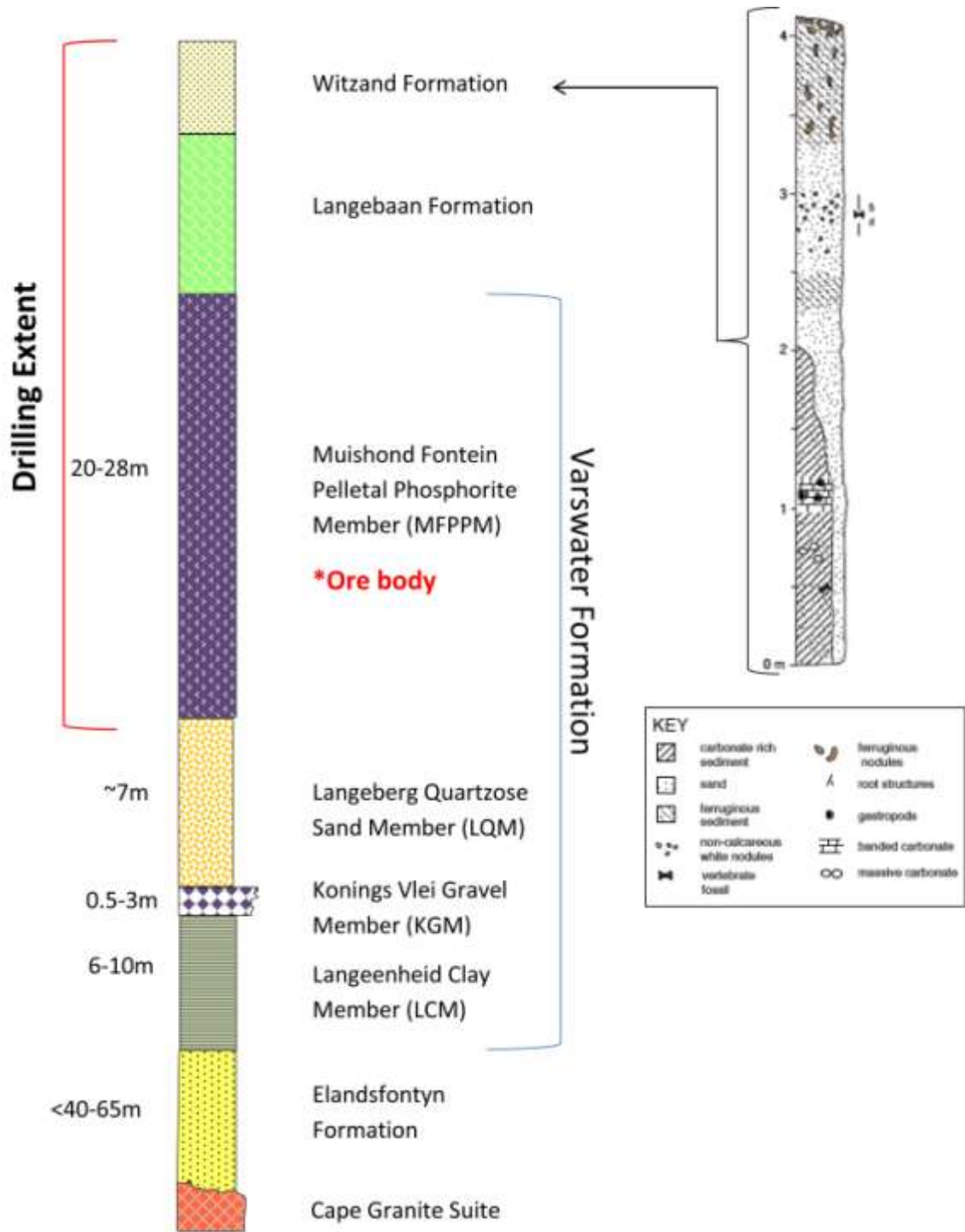

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Figure 6-5: Stratigraphic Column at Elandsfontein Farm



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6.1.3.5. MUISHOND FONTEIN PELLATAL PHOSPHATE MEMBER (MFPPM) -VARSWATER FORMATION

The MFPPM, which in places rest directly on the KGM or on the Elandsfontyn Formation, was deposited during an Early Pliocene transgression. Cold temperatures prevailed during this period.

The unit consists of very fine to medium grained quartz sand which is characterized by rounded and polished grains and includes up to 20% P₂O₅. The apatite (phosphate minerals) pellets are rounded or elliptical and have both concentric and erosional features. The phosphates indicate marine, littoral and fluvial depositional environments for the Member. This member is expected to be the primary target for the phosphate exploration drilling.

6.1.3.6. LANGEBOEG QUARTZOSE MEMBER (LQM) – VARSWATER FORMATION

These deposits were laid down during an early stage in the Early Pliocene transgression (5 Ma). The unit is approximately is thin at Elandsfontein and consist of fine to coarse grained, non-phosphatic sand.

At the time of LQM deposition a channel formed to the north that linked Saldanha Bay with St Helena Bay, with the high ground in the Saldanha-Vredenburg area forming a series of islands which sheltered the mainland from the sea. The paleo Berg River met this channel from the east where the river's estuary was separated from the channel by a sand bar. Subsequent deposits formed an estuarine complex consisting of flood plain salt marshes and tidal flat deposits which include quartzose sands, peats and clays.

6.1.3.7. KONINGS VLEI GRAVEL MEMBER (KGM) – VARSWATER FORMATION

This conglomeratic phosphorite was first described from occurrences in a mining quarry at Langebaanweg. Sediments consist of a 0.5m – 3m conglomerate which includes abraded primary and secondary phosphatic material and a semi-consolidated sand matrix. This member is poorly developed at Elandsfontein.


The deposition of the KGM reflects a marine transgression in the Middle Miocene which succeeded the fluvial deposits of the Elandsfontyn Formation. Fossils present in the Member indicate warmer water conditions, when compared to present conditions, and indicates an age dating to the Miocene-Pliocene.

6.1.3.8. LANGEENHEID CLAY MEMBER (LCM) – VARSWATER FORMATION

This member forms the lowermost unit of the Varswater Formation and consists mostly of clayey sands. The LCM has only recently been classified as a Member and seems to be absent on the Elandsfontein Property. An age of Middle to Late Miocene can be assumed for this unit.

Regionally, sediments consist of inter-tidal kaolinitic clays and clayey sands with a combined thickness of approximately 6m to 10m. The LCM was deposited after the Elandsfontyn Formation and represents a

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transition from fluvial to estuarine conditions. The presence of this layer usually marks the base of the economically important phosphates.

6.1.3.9. MINERALISATION

The core drilling program provided detailed information of the sub-surface geology at Elandsfontein. The Witzand and Langebaan Formations consist of well-rounded, fine grained quartz grains with a lime matrix prevailing in the Langebaan Formation. These formations constitute overburden material for the Elandsfontein Project.

Phosphate mineralisation is limited to the underlying Varswater Formation. A number of mineralised units, limited to this Formation, were indicated identified and described during the drilling program. A short description of the mineralised units can be summarised as follows:-

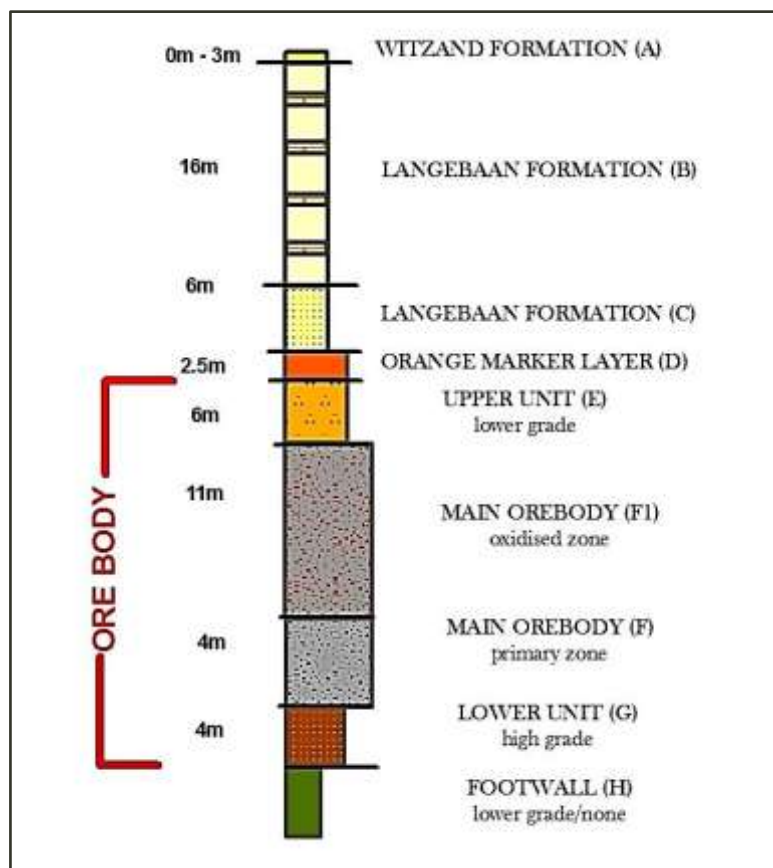




Figure 6-6: Description of Main Ore Body for the Elandsfontein Project

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- Unit A:** The unit represents the Witzand Formation consisting of a thin layer of loose, unconsolidated aeolian sand, varying in thickness from 0.0m to 3.5m. A gradational contact is present with the top unit of the Langebaan Formation. Thicker sequences are present within valley features and absent on calcrete outcropping areas. This unit will represent topsoil and overburden material during a mining operation.
- Unit B:** Represents the upper sequences of the Langebaan Formation, consisting of fine grained, well-rounded quartz grains with a lime matrix. Frequent consolidated calcrete layers (0.5m to 3.0m) are present within the sequence. Unit B represents a relative competent overburden sequence.
- Unit C:** The unit represents the lower sequences of the Langebaan Formation, characterised by the absence of calcrete layers. The contacts between Units B and C are gradational and not specific. It is essentially a loose, cream coloured sand unit, fine grained and well-rounded with a lime matrix. The unit causes difficult drilling conditions and forms part of an unconsolidated, loose sand overburden material.
- Unit D:** Unit D forms a clear marker horizon between the overlying Formations and the underlying, mineralised Varswater Formation. The layer has a strong orange colour, consisting of very well rounded, medium grained, orange coloured quartz grains. No phosphate mineralisation or lime matrix is present. The unit will form a clearly defined marker at the base of overburden material.
- Unit E:** Unit E has the first phosphate mineralisation of the Varswater Formation and therefore represents the top of the Varswater Formation. Shell fragments and phosphatic pellets are present in loose, unconsolidated white sand. The unit is generally less mineralised.
- Unit F1:** The unit represents the upper sequence of the main ore body, indicated by a greenish-grey sand unit with prominent shell fragments and yellow to orange phosphate pellets. The unit is mineralised throughout and represents an oxidised sequence in the depositional basin. Quarts grains are prevalent, sub-rounded and less sorted than in the upper units. A silty matrix is present, which becomes more predominant in depth.
- Unit F2:** The unit is part of the main ore body, and very similar to the overlying F1 unit. Phosphate grains are brown to black, with a transitional contact from the overlying F1 unit represented by yellow and reddish phosphate pellets. The sequence represents a reducing environment with the silty matrix becoming more prominent.
- Unit G:** Unit G represents a brown coloured clayey and silty sequence, underlying the main F1 and F2 ore body. As a result of secondary mineralisation fairly high grade phosphate material can be present. The unit forms the base of the ore body.
- Unit H:** Unit H is represented by clay units, maroon or carbonaceous, which are normally un-mineralised.

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From a mining perspective the units can be grouped as follows:

- Units A-D (overburden)
- Units E – G (ore body)
- Unit H (footwall)

6.1.4. PROSPECTING ACTIVITIES

The EEM Exploration Program consisted of the drilling of 40 diamond core exploratory boreholes.

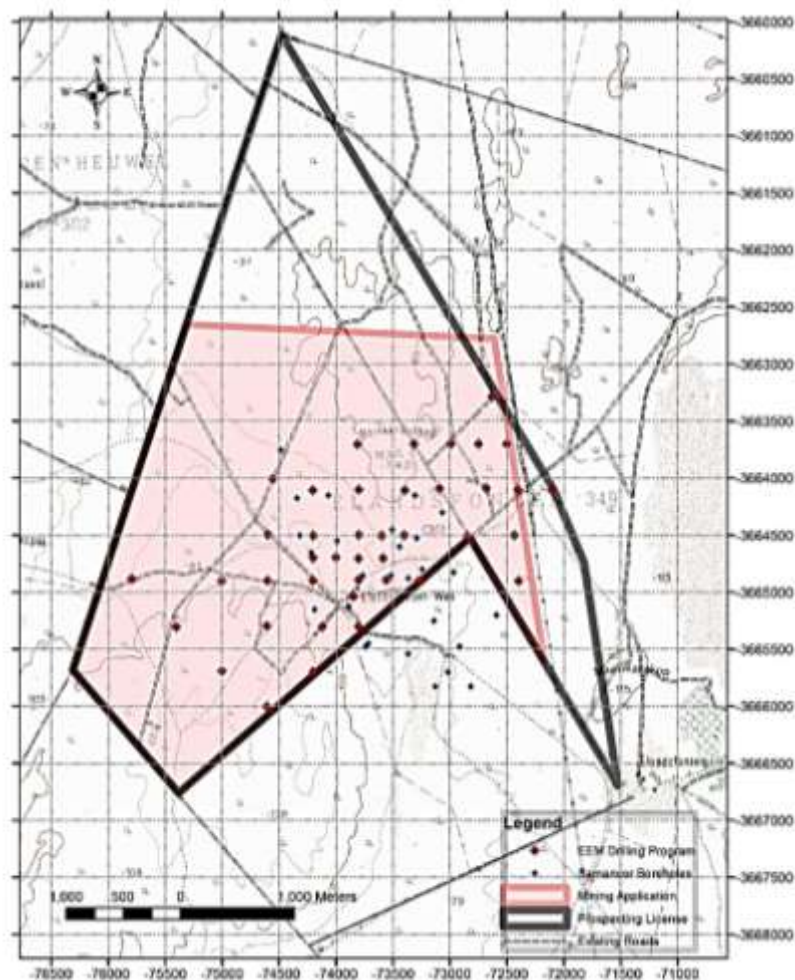



Figure 6-7: Exploratory borehole location on Elandsfontein

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From the detailed geological descriptions provided (based on exploration data on boreholes), the sedimentological sequence was subdivided into 9 sub-units as described in figure 7-1, Units “D” and “E” are mineralised at times, whilst units “F” and “G” constituted the main ore-body. The thickness distribution of unit “F”, the main ore zone is indicated in Figure 6-8.

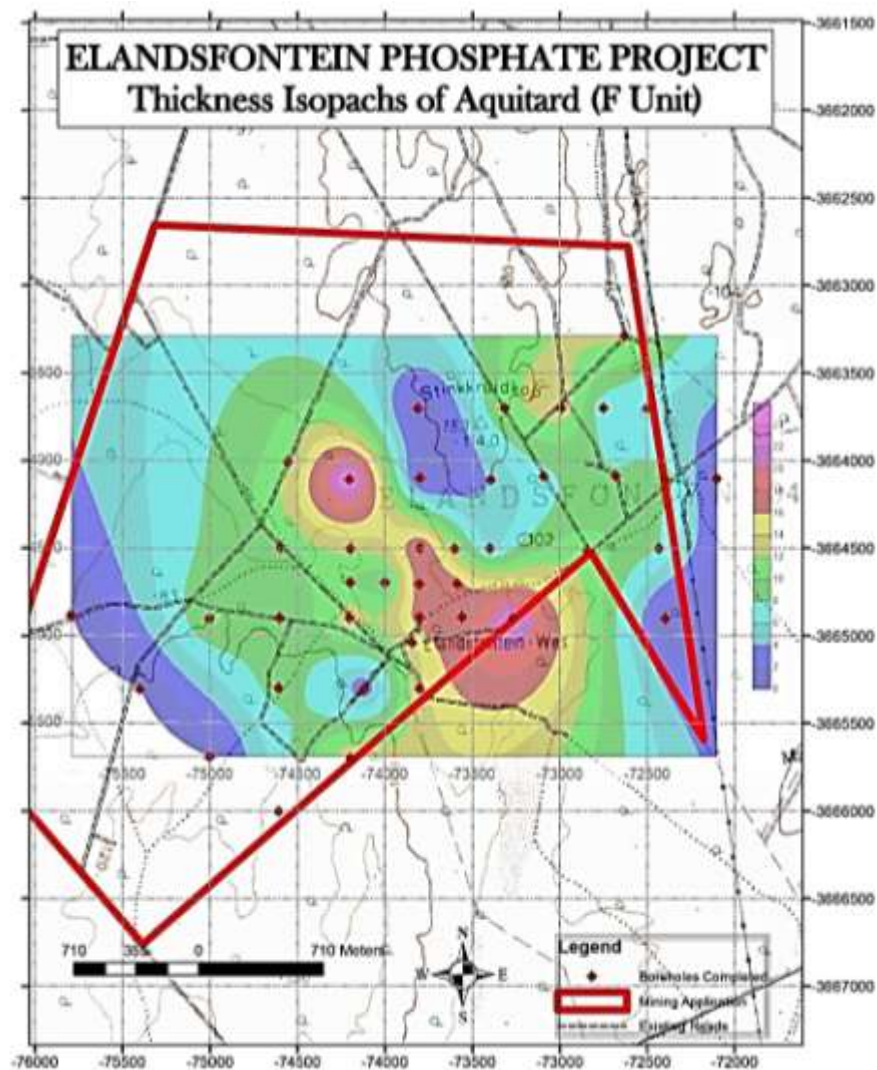



Figure 6-8: Thickness Distribution of Main Ore Zone (“F”)

Diamond core recovered from each borehole was sampled on a continuous basis over the mineralised zone (Units “D” to “G”). Sample lengths varied between 1.0m to 1.50m per meter. Samples were then composited in order to determine the mineable thickness and grade over the selected ore. The grade distribution and variations are indicated in Figure 6-9.

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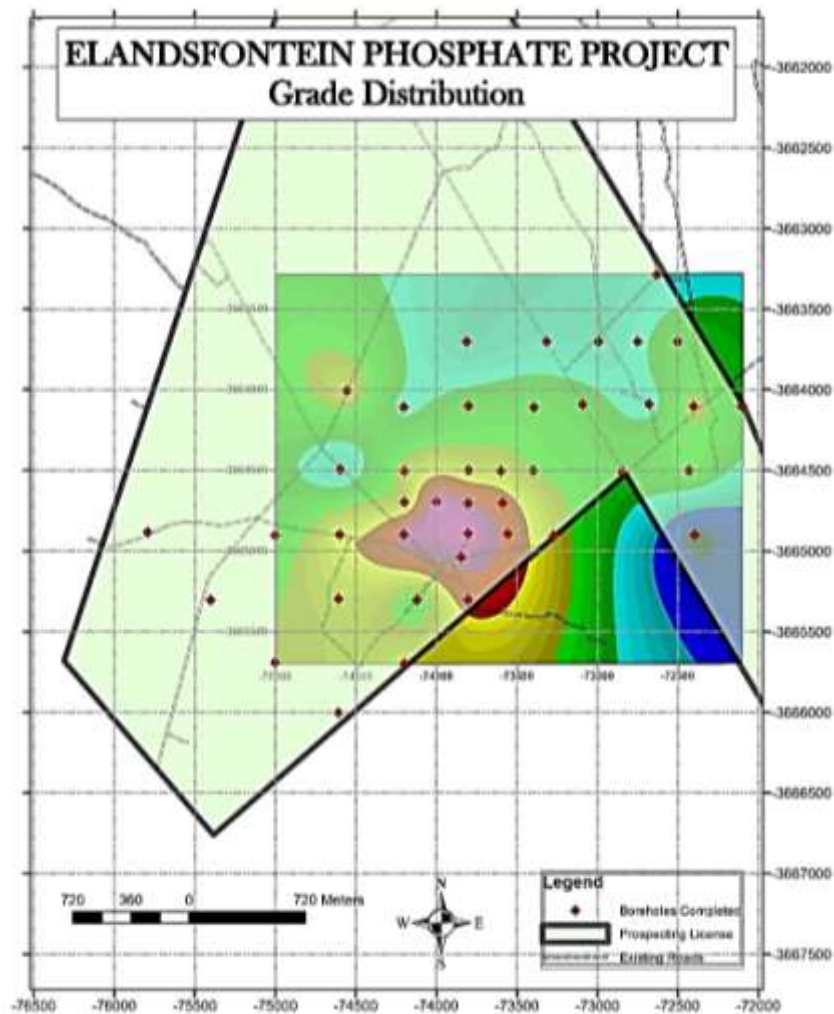


Figure 6-9: Phosphate Grade Variation within the Elandsfontein Ore Body

Exploration results have indicated that the top soil; overburden and ore body distribution across the area prospected which forms part of the mine area are at the depth distributions (in m) and widths (in m) shown in Figure 6-10.

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Table 6-1: Showing Stratigraphy of Top Sand, Overburden and Ore from EEM Exploration Boreholes


Hole	COORDINATES		TOP SAND			OVERBURDEN			ORE ZONE			
	X	Y	From	To	Width	From	To	Width	From	To	Width	P2O5
EM001	-73802.69	-3664891.28	0.00	2.90	2.90	2.90	29.82	26.92	29.82	52.10	22.28	14.94
EM002	-73802.62	-3665301.68	0.00	2.50	2.50	2.50	34.20	31.70	34.20	52.64	18.34	11.95
EM003	-73847.50	-3665039.95	0.00	2.50	2.50	2.50	36.65	34.15	36.65	54.20	17.55	13.99
EM004	-74201.06	-3664899.37	0.00	2.50	2.50	2.50	45.13	42.63	45.13	61.00	15.87	14.29
EM005	-73270.61	-3664899.86	0.00	2.50	2.50	2.50	22.72	20.22	22.72	47.95	25.23	9.30
EM006	-72844.67	-3664508.19	0.00	4.35	4.35	4.35	4.35	0.00	4.35	16.20	11.85	7.46
EM007	-74557.66	-3664006.76	0.00	2.50	2.50	2.50	44.50	42.00	44.50	46.00	1.50	9.84
EM008	-72680.13	-3664089.20	0.00	0.94	0.94	0.94	10.80	9.86	10.80	18.20	7.40	5.77
EM009	-72431.69	-3664502.73	0.00	0.64	0.64	0.64	8.50	7.86	8.50	14.10	5.60	8.39
EM010	-74597.01	-3664494.80	0.00	2.50	2.50	2.50	38.50	36.00	38.50	47.90	9.40	4.93
EM011	-72396.85	-3664900.93	0.00	2.10	2.10	2.10	3.05	0.95	3.05	4.50	1.45	2.00
EM012	-73091.16	-3664090.98	0.00	1.10	1.10	1.10	13.00	11.90	13.00	18.20	5.20	7.16
EM013	-74599.52	-3664896.69	0.00	2.50	2.50	2.50	42.25	39.75	42.25	61.85	19.60	10.85
EM014	-72402.59	-3664101.21	0.00	1.55	1.55	1.55	7.70	6.15	7.70	15.20	7.50	9.05
EM015	-72499.61	-3663701.90	0.00	1.90	1.90	1.90	6.90	5.00	6.90	11.50	4.60	7.37
EM016	-72748.98	-3663700.10	0.00	1.83	1.83	1.83	6.60	4.77	6.60	13.15	6.55	6.26
EM017	-74605.68	-3665296.97	0.00	2.50	2.50	2.50	74.40	71.90	74.40	80.85	6.45	9.35
EM018	-74199.52	-3664504.26	0.00	2.50	2.50	2.50	39.90	37.40	39.90	52.47	12.57	9.24
EM019	-72991.28	-3663698.98	0.00	1.23	1.23	1.23	9.90	8.67	9.90	12.60	2.70	5.30
EM020	-73315.39	-3663697.55	0.00	0.70	0.70	0.70	21.60	20.90	21.60	29.15	7.55	5.45
EM021	-73800.91	-3664502.14	0.00	2.50	2.50	2.50	25.89	23.39	25.89	49.02	23.13	9.56
EM022	-74119.77	-3665299.98	0.00	2.50	2.50	2.50	58.02	55.52	58.02	62.12	4.10	7.26
EM023	-73400.68	-3664501.43	0.00	2.50	2.50	2.50	13.69	11.19	13.69	22.60	8.91	8.39
EM024	-73799.79	-3664100.45	0.00	2.50	2.50	2.50	19.02	16.52	19.02	32.52	13.50	7.30
EM025	-73394.61	-3664107.46	0.00	2.50	2.50	2.50	20.40	17.90	20.40	32.23	11.83	7.79
EM026	-74201.42	-3664107.62	0.00	2.50	2.50	2.50	29.52	27.02	29.52	32.52	3.00	6.07
EM027	-72098.90	-3664096.37	0.00	4.30	4.30	4.30	15.40	11.10	15.40	18.25	2.85	6.84
EM028	-74199.20	-3665698.88	0.00	2.50	2.50	2.50	64.50	62.00	64.50	82.60	18.10	9.93
EM029	-73808.74	-3663704.44	0.00	3.70	3.70	3.70	29.90	26.20	29.90	36.00	6.10	4.80
EM030	-75002.12	-3664903.20	0.00	2.50	2.50	2.50	68.40	65.90	68.40	79.60	11.20	7.36
EM035	-72628.60	-3663284.13	0.00	1.45	1.45	1.45	7.80	6.35	7.80	13.40	5.60	5.69
EM036	-73557.43	-3664894.32	0.00	2.50	2.50	2.50	28.75	26.25	28.75	47.50	18.75	12.48
EM037	-73803.55	-3664704.96	0.00	2.50	2.50	2.50	34.10	31.60	34.10	51.75	17.65	13.33
EM038	-74000.34	-3664695.24	0.00	2.50	2.50	2.50	37.10	34.60	37.10	48.52	11.42	14.80
EM039	-73600.51	-3664703.00	0.00	2.50	2.50	2.50	29.89	27.39	29.89	47.10	17.21	12.16
EM041	-74199.25	-3664699.26	0.00	2.50	2.50	2.50	34.40	31.90	34.40	51.92	17.52	8.76

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The results of prospecting on Elandsfontein was used to inform the mining method and sequence (refer to Section 6.1.4).

6.1.5. GROUNDWATER

6.1.5.1. DESCRIPTION OF HYDROGEOLOGY

The geology of the area consists of basement Cape Granite and Malmesbury Group rocks that underlie the sediments of the Sandveld Group. The formations present, are the Elandsfontyn Formation (oldest); the Varswater Formation (characterised by quartz grains and ***the presence of phosphate***); the Langebaan Formation and the Witzand Formation (youngest). The Varswater Formation is composed of four sub-units which occur throughout the Saldanha region, namely the (in order of oldest to youngest):

- Langeenheid Clay Member (oldest),
- Konings Vlei Clay Member (previously the Gravel Member –GM),
- Langeberg Quartzose Sand Member (formerly the Quartzose Sand Member – QSM), and
- Muishond Fontein Pelletal Phosphorite Member (MFPP) (youngest).

Phosphate mineralisation is limited to the underlying Varswater Formation. A number of mineralized units limited to this formation were identified. The ore body is found within units E to G (see Figure 6-6).

Geological depositional environments control groundwater occurrences. Within the area two significant aquifers exist, namely the Langebaan Road Aquifer System (LRAS) (situated in the northern palaeo-channel) and the Elandsfontein Aquifer System (EAS) (situated in the southern palaeo-channel). The Elandsfontein Aquifer System underlies the exploration area. These aquifer systems follow the trends of palaeo-channels (Geoss, 2014).


The significant hydrogeological units within the Elandsfontein Aquifer System are:

- The Lower Aquifer Unit (LAU) and overlies the basement rocks.
- The variably consolidated sands and calcretes, with inter-bedded peat clay represent the Upper Aquifer Unit (UAU).

The clay layer that separates the Elandsfontyn Formation and the Varswater Formation creates (semi-) confined conditions in the basal sands and gravels. GEOSS (2014) indicates the clay sequence is 24 m thick and the alternating clay rich material extends over a thickness of 31 m. The clay sequence is considered to be part of the Elandsfontein Formation. GEOSS (2014) that the clay layer actually be termed an “aquiclude” most probably extends across the entire study area.

The confined Lower Aquifer Unit (LAU) is the most significant aquifer and is generally restricted to paleochannels which define the Langebaan Road Aquifer System (LRAS) and the Elandsfontein Aquifer System (EAS). Figure 6-10 depicts the approximate depth and subdivisions of the Lower Aquifer Unit (LAU) and the Upper Aquifer Unit (UAU). The LAU within the Elandsfontyn Aquifer system as semi-confined, and over a regional extent the UAU can generally be considered to be unconfined.

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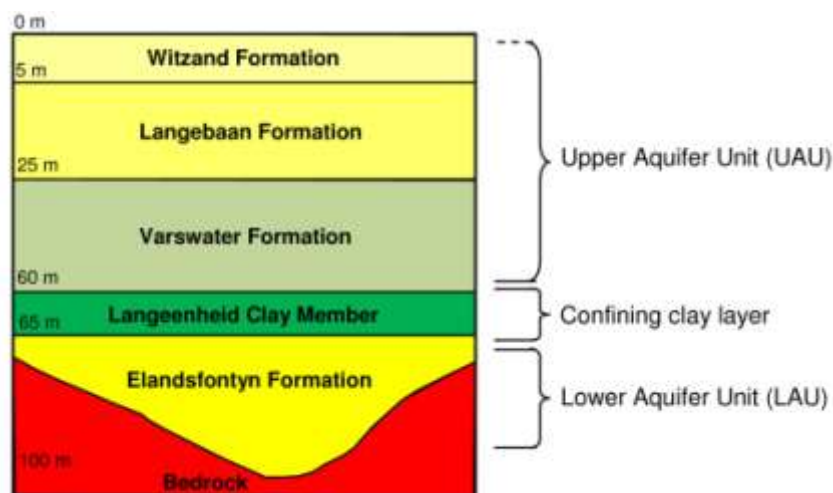


Figure 6-10: Subdivision of the Upper and Lower Aquifer Systems (UAS and LAS). The depths indicated are approximate

6.1.5.2. GROUNDWATER LEVELS AND FLOW

DWA groundwater level data (see Appendix C for the Geohydrological Study) shows groundwater levels range from approximately 2 m to 28 meters below ground level (mbgl) for the Elandsfontein area. From the water level data obtained and measured it is evident that the water level ranges from 2 to 27 mbgl regionally. Within the proposed mining area the groundwater level is mostly between 10 and 20 mbgl (GEOSS, 2014).


To characterise the flow of the upper aquifer two boreholes were drilled within the phosphate member and pumping tests were completed. The yield of the boreholes was approximately 2.5 ℓ/s and 0.8 ℓ/s respectively. During the pumping tests five exploration boreholes were monitored and they showed no response to the abstraction.

6.1.5.3. GROUNDWATER QUALITY

Groundwater sampling and analysis was undertaken by GEOSS. The Electrical Conductivity (EC) and pH levels were measures at locations within and around the Elandsfontein Mine Area. The groundwater is of good quality. The only parameter to be aware of is iron, however as the groundwater is to be abstracted and recharged without coming into contact with the atmosphere, there shouldn't be iron precipitation in the recharge process.

Field measurements of EC for a number of boreholes in the exploration area showed ECs ranging from 60 mS/m to 80 mS/m and based on this data the water quality for the exploration area is considered to be good.

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6.1.5.4. GROUNDWATER RECHARGE AND AQUIFER YIELD

The Langebaan Road and Elandsfontein Aquifer Systems share a common recharge area, namely the dune field to the west of Hopefield. These aquifer systems are defined by palaeo-channels that have been filled with gravels of the Elandsfontyn Formation and represent preferred groundwater flow paths. The Elandsfontein Aquifer System is also recharged by rain falling in the vicinity of Rietfontein to the south-east of the study area.

Groundwater recharge in the area is between 16 and 24 mm/a (in the order of 7 % of MAP) and although recharge possibly occurs further east this still gives an indication of the need to manage and conserve the groundwater resource appropriately. From the DWAF 1:500 000 hydrogeological map series the exploration area plots in an intergranular aquifer with a groundwater yield of 0.1 - 0.5 ℓ/s and is near an area with a mapped yield of 0.5 – 2.0 ℓ/s. DWA (DWAF, 2008) modelling of the Langebaan and Elandsfontyn aquifers which shows the major groundwater flow passes through the exploration area (see Appendix C for the Geohydrological Study).

6.1.5.5. GROUNDWATER AND ECOSYSTEMS

The high conservation status Langebaan lagoon is not fed by overland streams or rivers due to the porous nature of the sediments and the arid conditions, but it has been suggested that groundwater plays a significant role in sustaining the marsh ecosystem. Boreholes drilled around the edge of the lagoon as well as geophysical surveys have shown a significant inland hydraulic freshwater head intruding into the lagoon. Borehole information, yield tests and borehole construction information were collated so as to be able to determine the flow rates per geological formation. Results show high flow rates within the calcrete of the area, which are typically low yielding geological formation. Also of relevance are the very high flow rates of the shallow sands in close proximity to the lagoon edge.

There are a number of factors that result in the groundwater outflow in the Geelbek area. These are:


- The steep hydraulic gradient towards the lagoon from inland.
- The high flow rate (hydraulic conductivity of the calcrete) – permitting the flow of groundwater.
- The very high groundwater flow rate of the shallow sands in close proximity to the lagoon.
- The presence of the clay beneath the lagoon, which will force the deeper groundwater flow upwards towards the lagoon.

Studies have shown that groundwater abstraction and recharge at Elandsfontein Mine will not affect this flow of fresh groundwater into the Langebaan Lagoon (GEOSS, 2014). Assessment of the groundwater flow directions of the area indicates that the flow into the lagoon is directly from the east of the Geelbek area (and not from the north-east where the Elandsfontein site is) from the Upper Aquifer Unit (Geoss, 2014).

6.1.5.6. AQUIFER CLASSIFICATION/STRATEGIC VALUE

Due to the intergranular nature of the sands the vulnerability rating is “high” to “very high”. The Elandsfontyn Aquifer underlying the exploration area is classified as a “Special Aquifer System” and requires a “high” to “strictly non-degradation” level of groundwater protection in accordance with “A South African Aquifer System Management

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Classification, (1995).” This classification, along with the “high” to “very high” vulnerability classification (DWAF, 2005), means that the susceptibility of the aquifer to contamination from anthropogenic activities is high.

6.1.5.7. SOIL MOISTURE CONTENT

The soil moisture was monitored during the pumping tests. On average the water content of the soil between 600 and 1000 mm remain constant while that shallower than 500 mm tend to decrease during the measuring period (67 hours). This is mainly due to evaporation from the soil surface and water uptake off the fynbos. Extraction of water from the boreholes did not influence the soil water content of the soils surrounding the two boreholes. The changes in soil water content that did occur can be ascribed to redistribution of water, evaporation from the soil surface and water uptake by the plants (Geoss, 2014).

6.1.6. SURFACE WATER

The proposed mining site is located in the Berg River Catchment area which is subdivided into 12 quaternary catchments which has a surface size of 9000 km².

The key aquatic features in the area surrounding the proposed Elandsfontein Phosphate Mine are the Langebaan Lagoon (approximately 9km to the south-west, Quaternary catchment G10M), and the Groen/Sout River System (approximately 6km to the east, Quaternary catchment G10L). There are no seasonal or permanent wetlands in the immediate study area, only a poorly defined drainage channel that is orientated towards the south.

6.1.7. GEOCHEMISTRY

Key findings of a geochemical study of Elandsfontein mine waste materials conducted by Mintek are presented below.


Softs stockpiles

Mintek undertook a leaching study on simulated overburden material that would report to the softs stockpile. The test results indicate that the softs is a low risk to the environment with the exception of Sb (Antimony) in the borate leach. The results further indicate the presence of soluble salts because of the leachable calcium and possibly sulphate. Further detail is required as the salts could impact on the environment, this data is potentially important.

In addition, although volatile or semi-volatile organic compounds in the material are highly unlikely, at least one sample should be done to demonstrate this to the authorities.

Clearly, more information is required but the results seem to indicate that the softs will have a low impact on the environment provided it is managed correctly.

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Tailings

A head analysis of a sample of Run of Mine was provided by Elandsfontein Mine and Exploration. Many of the elements are non-toxic. As has a value >TCT0 but it is <TCT1. This would classify the tailings as low risk when disposed to land, although a more in-depth analysis is required to determine the actual risk.

Table 6-2: Composition of Elandsfontein Tailings (TC – Total Concentration)

Elements as Oxides	Average Value	Elemental Composition, mg/kg	TCT0	TCT1
SiO2%	64.65	295 200	NR	NR
Al2O3%	1.095	5 990	NR	NR
CaO%	17.15	122 570	NR	NR
MgO%	0.25	1507	NR	NR
Fe2O3%	1.005	7029	NR	NR
K2O%	0.365	3196	NR	NR
MnO%	0.04	309	1000	25000
Na2O%	0.2	1484	NR	NR
P2O5%	2.95	12873	NR	NR
TiO2%	0.08	480	No Value	No Value
Cr2O3%	<0.01	<68.4	46000	800000
V2O5%	<0.01	<67.97	150	2680
S%	0.075	750	No Value	No Value
LOI%	2.535	25350	NR	NR
As mg/kg	15.5	15.5	5.8	500
Cd mg/kg	0.965	0.965	7.5	260
Th mg/kg	1.9	1.9	No value	No value
U mg/kg	13.8	13.8	No value	No value

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As indicated previously, although the tailings may have a composition similar to the original ore body, the physical characteristics such as particle size, permeability and the pH in water may have changed. Thus, it is very important that a full characterisation is undertaken, e.g. of test samples and later in samples from the beneficiation plant to ensure that the environmental risks are the same.

6.1.8. SOIL AND LAND CAPABILITY

The land capability of the proposed site can be defined as relatively flat and undulating characterised largely by fynbos in the north, west and south, a fossil area to the northeast which is largely overgrown with invasive alien vegetation which continues further eastward. Portion 4 and 2 of the Farm Elandsfontein has been identified as a Critical Biodiversity Area by Saldanha Bay Municipality, separating the two eastern portions of the West Coast National Park (WCNP). It was previously a Private Nature Reserve and due to the nature of the vegetation on site can be seen to form the natural northern extension of the WCNP.

Sand and limestone substrates present in the area are largely recent to Tertiary deposits of marine origin overlying Malmesbury Group shales intruded by Cape Granites, belonging to the Saldanha-Langebaan Pluton. A large Pleistocene dune field with both loose and stable dune sand crosses the area south and east of Langebaan town, along a generally north- south axis originating at Yzerfontein (Boucher 1981).

Calcareous sands and granitic soils form the lower-lying flats. Some limestone deposits form prominent ridges with an approximate north-south longitudinal axis, and are located over Elandsfontein Farm.

6.1.9. FLORA

6.1.9.1. REGIONAL BOTANICAL CONTEXT


Elandsfontein Farm is considered to be part of the Southwest Fynbos bioregion (Mucina & Rutherford 2006), and is part of the Fynbos biome, located within what is now known as the Core Region of the Greater Cape Floristic Region (GCFR; Manning & Goldblatt 2012).

The GCFR is one of only six Floristic Regions in the world, and is the only one largely confined to a single country and is the smallest floristic region of the world's land surface supporting about 11500 plant species, over half of all the plant species in South Africa.

At least 70% of all the species in the Cape region do not occur elsewhere, and many have very small home ranges (these are known as narrow endemics). Data from the nationwide plant Red Listing project indicate that 67% of the threatened plant species in the country occur only in the southwestern Cape, and these total over 1800 species (Raimondo et al 2009). It should thus be clear that the southwestern Cape is a major national and global conservation priority, and is quite unlike anywhere else in the country in terms of the number of threatened plant species.

The study area falls within what is generally known as the Sandveld. The Sandveld supports various different vegetation types, each with distinct floras (with some overlap), and large numbers of threatened plant species (Helme & Koopman 2007; Helme 2012). The point at which two (or more) ecosystems or vegetation types meet is

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known as an ecotone, and is an ecologically important area. Ecotones may range from relatively narrow (less than 50m wide) to very diffuse (over a kilometre or more). In the Fynbos region different vegetation types (and hence the ecotones) are often driven by different underlying soil types (de Villiers et al 2005). The greater study area includes numerous important ecotones, most of which are relatively diffuse, covering a distance of hundreds of metres, and in fact many of the plant communities are themselves best described as ecotonal (transitional), in that they contain significant elements of two or more different vegetation types.

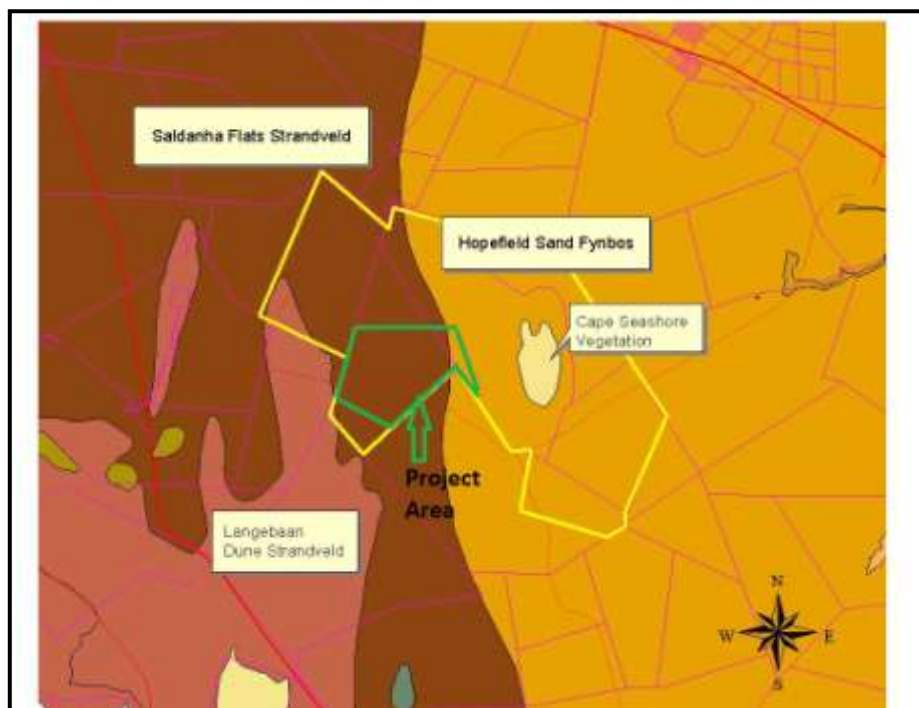


Figure 6-11: Extract of the Saldanha Municipality Fine Scale Vegetation Map (Helme & Koopman 2007), showing the vegetation types in the greater study area (yellow outline) and proposed project area (green outline).


6.1.9.2. SITE SPECIFIC ANALYSIS

The project (or focus) area is a fairly prominent depression (about 20 - 40m deep) bounded by two ridges. The ridges are underlain by calcrete, which outcrops in places, and is often very fragmented, producing what is essentially a rocky surface with extensive sand.

There are four primary vegetation types on site, almost half the greater site supports Hopefield Sand Fynbos, with Saldanha Flats Strandveld making up the bulk of the remaining area. Langebaan Dune Strandveld occupies the main dune field, and a mosaic of this vegetation type and Saldanha Limestone Strandveld occupies a large portion of the central area, and about 50% of the focus area.

Alien vegetation is, as noted, a major problem in the greater study area, and it is a lesser problem within the focus area. The primary invasive aliens are *Acacia saligna* (Port Jackson willow) and *Acacia cyclops* (rooikrans), and both species have been present on site for at least thirty years, and probably much longer. Biocontrol agents are evident

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on both species and active spread and seed set seems to have been curtailed, but numerous mature plants are still healthy. There are patches (<5ha) of planted gum trees (*Eucalyptus* spp) in the southeastern parts of the dune field, and this area is particularly degraded, which is probably at least partly a result of the toxins released into the soil by these trees. There is also a small patch of these trees around the old farmhouse (Elandsfontein Wes) and werf in the proposed mine area.

According to the National List of Threatened Ecosystems the four vegetation types found on the site are listed as follows:

- Hopefield Sand Fynbos – Vulnerable;
- Saldanha Flats Strandveld – Vulnerable;
- Langebaan Dune Strandveld – Least Threatened; and
- Saldanha Limestone Strandveld – Least Threatened.

The primary plant communities identified by Boucher (2010) within the current focus area are:

Saldanha Flats Strandveld elements:

- *Salvia africana-lutea* - *Indigofera procumbens* Fynbos Shrubland
- *Salvia africana-lutea* - *Anthospermum spathulatum* Fynbos Restioid
- *Willdenowia incurvata* - *Diospyros austro-africana* Shrubland

Langebaan Dune Strandveld elements:

- *Euclea racemosa* - *Zygophyllum morganiana* Dune Strandveld Scrub

Saldanha Limestone Strandveld elements:

- *Maytenus lucida* – *Crassula ammophila* Tall Shrubland
- *Olea exasperata* – *Muraltia harveyana* (demissa) Restioid

A total of 74 plant species were identified and recorded in the study area.


6.1.9.3. SPECIES OF CONSERVATION CONCERN

Seventeen plant Species of Conservation Concern (SCC; Raimondo et al 2009 and annual online updates at redlist.sanbi.org; previously referred to as Red Data Book species) were recorded in the greater study area, but only four of these were confirmed from within the project area, excluding the access road footprint.

Table 6-3: Species of Conservation Concern Present in the Study Area

Species	Red List status
<i>Echiostachys spicatus</i>	Endangered
<i>Caesia sabulosa</i>	Vulnerable

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<i>Leucospermum hypophyllocarpodendron</i> ssp. <i>canaliculatum</i>	Vulnerable
<i>Leucospermum rodolentum</i>	Vulnerable
<i>Leucospermum tomentosum</i>	Vulnerable
<i>Protea scolymocephala</i>	Vulnerable
<i>Otholobium venustum</i>	Vulnerable
<i>Lachnaea grandiflora</i>	Vulnerable
<i>Macrostylis crassifolia</i>	Vulnerable
<i>Muraltia harveyana</i>	Vulnerable
<i>Lampranthus densifolius</i>	Data Deficient
<i>Diosma aspalathoides</i>	Near Threatened
<i>Lampranthus explanatus</i>	Near Threatened
<i>Aspalathus ternata</i>	Near Threatened
<i>Phylica strigosa</i>	To be listed as Vulnerable
<i>Ruschia langebaanensis</i>	Threatened
<i>Thamnochortus punctatus</i>	Declining

Seven of the SCC have only small populations (<100 plants) within the greater study area, and only one of these (*Echiostachys spicatus*) was recorded from within the main project footprint (with fewer than 5 plants). Only two SCC have substantial populations within the main footprint (*Caesia sabulosa* and *Lampranthus densifolius*), but the percentage of the total site population within the footprint for both these species is probably less than 5%, meaning that the potential loss of these focus area populations is not likely to be very significant in either a site or regional perspective. All four of the plant SCC within the main project footprint are either bulbs or succulents and could thus potentially be translocated fairly successfully.



Figure 6-12: Saldanha Flats Strandveld in the main pit development area, looking east across the proposed mining area.

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6.1.9.4. CONDITION AND SENSITIVITY OF THE VEGETATION

About 90% of the greater study area is regarded as pristine to lightly disturbed (ecologically fully functional), and has been disturbed only by moderate grazing and basic infrastructure (roads and fencing). These areas can be considered to be of either Medium or High botanical sensitivity. The High sensitivity areas support four or more plant Species of Conservation Concern (SCC), and the Medium sensitivity areas support three or less SCC.

Disturbance on the remaining 10% of the greater site (about 500ha) includes heavy grazing, trampling and alien vegetation invasion (in some cases actually planted, such as around the dune field). The most heavily disturbed areas are of Low botanical sensitivity (see Figure 7), and species diversity in most of these areas is less than 20% of it what it is in surrounding less disturbed areas, and these areas do not support significant populations of SCC. The bulk of the proposed development footprint (>80%) is in areas of Medium botanical sensitivity, whilst about 80% of the access road route will cross areas of High sensitivity, with the remaining 20% being of Medium sensitivity.

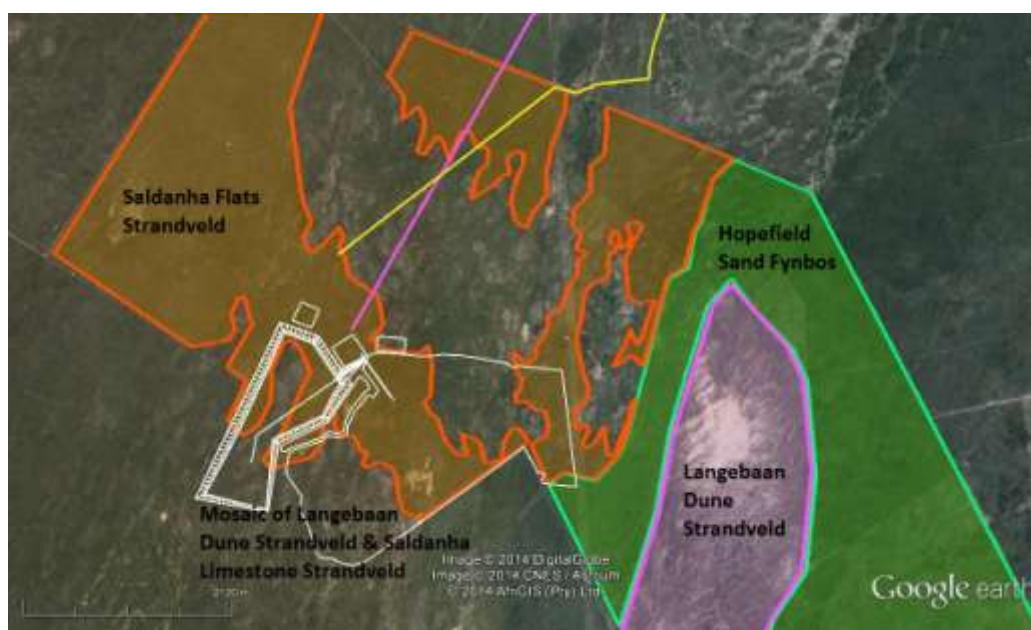



Figure 6-13: Simplified vegetation map of the project area and original study area, with proposed development shown as white outline, access road as yellow line and powerline as pink line. Unshaded areas are a mosaic of Saldanha Limestone Strandveld and Langebaan Dune Strandveld (Helme, 2014).

6.1.9.5. ECOLOGICAL CORRIDORS

Ecological corridors are regarded as key elements of a “living landscape” and of ecological process, in that they allow for animal and plant movement across the partly fragmented landscape. Insects and birds are key pollinators of many plant species, and it is important that they be able to move from one patch of natural vegetation to the next

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relatively easily, without having to cross large areas of hostile, barren terrain with little or no natural vegetation. These corridors also allow for seed movement, which may be by means of animals or by the wind.

Existing ecological corridors can be inferred wherever there is natural vegetation, and thus one should not take a single line on a map too seriously – in reality it is more like a web than a corridor, with numerous lateral connections and interconnections, and it is important to maintain as many as these as possible, and the broader and more numerous the links the better.

Ecological connectivity across the site is currently regarded as fully functional, and care should be taken not to disrupt this connectivity, especially on a site bordering on a National Park.

6.1.9.6. ECOLOGICAL DRIVERS


Fire is widely acknowledged to be one of the primary drivers of Fynbos ecosystem dynamics (de Villiers et al 2005) and is one of two extremely important ecological drivers on this site. The other is soil type, although this cannot be manipulated, and is therefore not further discussed. Soil moisture is important in determining species composition (plant communities) but is not a major ecological driver on this site.

Optimum fire frequency for Sand Fynbos in this region is once every twelve to twenty years, with a fairly high degree of variance in terms of natural frequency. Fire more often than at the optimum frequency will result in certain slow growing species being eliminated, and will change plant community structure, whilst for Sand Fynbos fire at less regular intervals will have a similar effect, but usually on slightly different species. Many Sand Fynbos species germinate only immediately after a fire, and in the absence of fire will not establish young plants. Lack of fire also means that many bulbs and annuals that normally flourish only in the first few years after a fire, when there is plenty of light and open space, struggle to flower and hence set seed. Alien invasive *Acacia* species produce vast quantities of seed (at least until the recent introduction of biocontrol agents which limit or even prevent seed production) and this seed falls to the ground and persists for up to forty years as an underground seedbank. It is thus very likely that there is a fairly large soil stored seedbank (millions of seeds may be produced annually, at least until the introduction of biocontrol some years ago) on many parts of the site just waiting to germinate after a fire, but this can be systematically dealt with as it comes up, as part of a Management Plan.

6.1.9.7. CRITICAL BIODIVERSITY AREAS

According to the Saldanha Bay Municipal Spatial Development Framework the study area is located in a terrestrial CBA, connecting two existing parts of the West Coast National Park (WCNP) (see Figure 6-14). Critical Biodiversity Areas (CBAs) represent biodiversity priority areas which should be maintained in a natural to near natural state. The CBA maps indicate the most efficient selection and classification of land portions requiring safeguarding in order to maintain ecosystem functioning and meet national biodiversity objectives. The West Coast National Park (WCNP) is expanding towards the east and northeast, and the proposed mine is within the proposed expansion corridor, and will in fact also border on the existing WCNP boundary.

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6.1.9.8. FAUNA STUDY

Faunal baseline studies were undertaken by Ecolife Consulting. The findings of these investigations are presented below.

6.1.9.8.1. TERRESTRIAL INVERTEBRATES

Based on the field work and observations undertaken, it was confirmed the alien invasive land snail *Theba pisana* is the only invertebrate found in large numbers in the study area. Given the very high densities that *T. pisana* can attain at some sites, plus their apparently catholic feeding habits, their potential impact on the vegetation of the study area is cause for concern and should be further investigated.

6.1.9.8.2. AMPHIBIANS

Hanekom N., Randall R.M., Nel, P. & Kruger, N. (2009) states that very little is known about the amphibians in the West Coast National Park which has been found to also be the case in Elandsfontein.

Of the 16 species occurring in the greater area, only the Namaqua Rain Frog (*Breviceps namaquensis*) and the Namaqua Caco (*Cacosternum namaquense*) potentially occur within the study area. The Karoo Toad (*Bufo gariepensis*) may be present further inland. The Namaqua Rain Frog breeds terrestrially, i.e., there is no larval stage and no water body required for breeding. The Namaqua Caco, on the other hand, needs at least a temporary water body for breeding. None of the three species potentially occurring in the study area are classified as Red Data species (Minter et al., 2004).

6.1.9.8.3. REPTILES


A series of studies have been done on the angulate tortoise (*Chersina angulate*) in this region. Angulate tortoises at Elandsfontein have a cyclic reproductive pattern, initiating egg production in February and were highly variable and correlated to ambient temperature (inversely) and rainfall (positively) (Hofmeyr 2004).

The tortoises are active throughout most of the year. Clutch frequency ranged from one to six per year, with annual fecundity being influenced by the date of reproductive onset and egg-retention time. The retention is throughout the day, but become bimodal in the warmer and drier summer and autumn months (Ramsay *et al.* 2002).

A variety of lizards, tortoises and snakes occur in the greater area, and according to Mouton (2008) three are classified as Vulnerable:

- i. Lomi's Blind Legless Skink (*Typhlosaurus lomii*) is found in sand dunes along the West Coast. It is threatened due to habitat destruction from alluvial diamond mining. This species was recorded in the inland Succulent Karoo habitat just south of Groenriviermond (Mouton et al., 2007) and it may be present further south as far as the present study area.

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ii. Due to its gregarious nature (big family groups) and popularity as a pet, the Armadillo Girdled Lizard (*Cordylus cataphractus*) is vulnerable to over-exploitation for the pet trade (Mouton et al., 1987). This species requires high levels of solar radiation and will be present close to the coast.

iii. The Namaqua Dwarf Adder (*Bitis schneideri*) prefers semi-stable, vegetated coastal sand dunes.

Table 6-4: Tortoises Occurring in the Greater Area Including Elandsfontein Farm 349/2 & 4

Species	Common Name	Conservation Category
<i>Homopus signatus cafer</i>	Speckled Padloper	Data Deficient
<i>Chersina angulata</i>	Angulate Tortoise	
<i>Psammobates tentorius trimeni</i>	Tent Tortoise	

Table 6-5: Snakes Occurring in the Greater Area Including Elandsfontein Farm 349/2 & 4

Species	Common Name	Conservation Category
<i>Rhinotyphlops lalandii</i>	Delalande's Beaked Blind Snake	
<i>Lamprophis guttatus</i>	Spotted House Snake	
<i>Pseudaspis cana</i>	Mole Snake	
<i>Prosymna sundevalli</i>	Sundevall's Shovel-snout Snake	
<i>Psammophis leightoni</i>	Namib Fork-marked Sand Snake	
<i>Psammophis notostictus</i>	Karoo Sand Snake	
<i>Dasypeltis scabra</i>	Common Egg-eater	
<i>Aspidelaps lubricus</i>	Coral Snake	
<i>Naja nivea</i>	Cape Cobra	
<i>Bitis cornuta</i>	Many-horned Adder	
<i>Bitis schneideri</i>	Namaqua Dwarf Adder	Vulnerable

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Table 6-6: List of Lizard Occurring in the Greater Area Including Elandsfontein Farm 349/2 &

Species	Common Name	Conservation Category
<i>Acontias lineatus</i>	Striped Legless Skink	
<i>Acontias litoralis</i>	Coastal Legless Skink	
<i>Typhlosaurus caecus</i>	Cuvier's Blind Legless Skink	Data Deficient
<i>Typhlosaurus lomii</i>	Lomi's Blind Legless Skink	Vulnerable
<i>Typhlosaurus vermis</i>	Boulenger's Dwarf Burrowing	
<i>Scelotes sexlineatus</i>	Striped Dwarf Burrowing Skink	
<i>Trachylepis capensis</i>	Cape Skink	
<i>Trachylepis sulcata</i>	Western Rock Skink	
<i>Trachylepis variegata</i>	Variegated Skink	
<i>Meroles ctenodactylus</i>	Smith's Desert Lizard	
<i>Meroles knoxii</i>	Knox's Desert Lizard	
<i>Nucras tessellata</i>	Western Sandveld Lizard	
<i>Pedioplanis lineocellata</i>	Spotted Sand Lizard	
<i>Cordylus sublineatus</i>	Dwarf Plated Lizard	
<i>Gerrhosaurus typicus</i>	Namaqua Plated Lizard	Near Threatened
<i>Cordylus cataphractus</i>	Armadillo Girdled Lizard	Vulnerable
<i>Cordylus macropholis</i>	Large-scale Girdled Lizard	Near Threatened
<i>Cordylus polyzonus</i>	Karoo Girdled Lizard	
<i>Agama sp nov.</i>	Southern Rock Agama	

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<i>Agama hispida</i>	Southern Spiny Agama	
<i>Bradypodion occidentale</i>	Namaqua Fwarf Chameleon	
<i>Pachydactylus austeni</i>	Austen's Thick-toed Gecko	Data Deficient
<i>Pachydactylus formosus</i>	Rough Thick-toed Gecko	Data Deficient
<i>Chondrodactylus angulifer</i>	Giant Ground Gecko	
<i>Goggia lineata</i>	Striped Dwarf Leaf-toed Gecko	
<i>Pachydactylus bibronii</i>	Bibron's Thick-toed Gecko	
<i>Pachydactylus labialis</i>	Western Cape Thick-toed Gecko	
<i>Pachydactylus geitje</i>	Ocellated Thick-toed Gecko	
<i>Pachydactylus mariquensis</i>	Marico Thick-toed Gecko	
<i>Pachydactylus weberi</i>	Weber's Thick-toed Gecko	

6.1.9.8.4. MAMMALS

Only two Red data species occurring in the greater study area, may be present in the study area:

- i. Grant's Golden Mole (*Eremitalpa granti*), is listed as Vulnerable (Friedmann & Daly, 2004), but Rautenbach (1990) is of the opinion that the species cannot be considered as rare, vulnerable or endangered as it is quite common along the western coastal regions from Langebaan to the Namib desert. In the Namakwa Sands mining area, Rautenbach (1990) recorded this species in both the coastal white sand dunes and inland red sand dunes.
- ii. Namaqua Dune Mole-rat (*Bathyrgerus janetta*), is listed as Near Threatened (Friedmann & Daly, 2004). The present study area lies at the southern limits of its known range (Friedmann & Daly, 2004) and its presence in the study area is unconfirmed.).

It is concluded that the study area contains no unique or important mammalian habitats relative to the surrounding West Coast area. Furthermore, the area appears to have low species diversity.

Several large wildlife species has been brought into the Elandsfontein reserve during the past three years in the process of establishing a wildlife reserve.

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Table 6-7: Small Mammals Occurring in the Greater Area Including Elandsfontein Farm 349/2 & 4

Species	Common Name	Conservation Category
<i>Myosorex varius</i>	Forest Shrew	
<i>Crocidura cyanea</i>	Reddish-grey Musk Shrew	
<i>Suncus varilla</i>	Lesser Dwarf Shrew	
<i>Macroscelides proboscideus</i>	Round-eared Elephant Shrew	
<i>Chrysocloris asiatica</i>	Cape Golden Mole	
<i>Eremitalpa granti</i>	Grant's Golden Mole	Vulnerable
<i>Eptesicus hottentotus</i>	Long-tailed Serotine Bat	
<i>Eptesicus capensis</i>	Cape Serotine Bat	
<i>Tadarida pumila</i>	Little Free-tailed Bat	
<i>Tadarida aegyptiaca</i>	Egyptian Free-tailed Bat	
<i>Otocyon megalotus</i>	Bat-eared Fox	
<i>Vulpes chama</i>	Cape Fox	
<i>Canis mesomelas</i>	Black-backed Jackal	
<i>Ictonyx striatus</i>	Striped Polecat	
<i>Genetta genetta</i>	Small-spotted Genet	
<i>Genetta tigrina</i>	Large-spotted Genet	
<i>Suricata suricatta</i>	Suricate (Meerkat)	
<i>Cynictis penicillata</i>	Yellow Mongoose	
<i>Galerella pulverulenta</i>	Small Grey Mongoose	

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<i>Felis sylvestris lybica</i>	African Wild Cat	
<i>Procavia capensis</i>	Rock Hyrax	
<i>Sylvicapra grimmia</i>	Common Duiker	
<i>Raphicerus campestris</i>	Steenbok	
<i>Bathergus Suillus</i>	Cape Dune Mole-rat	
<i>Bathergus janetta</i>	Namaqua Dune Mole-rat	Near Threatened
<i>Cryptomys hottentotus</i>	Common Mole-rat	
<i>Hystrix africaeaustralis</i>	Porcupine	
<i>Otomys unisulcatus</i>	Bush Karoo Rat	
<i>Gerbillurus paebo</i>	Hairy-footed Gerbil	
<i>Steatomys krebsii</i>	Kreb's Fat Mouse	
<i>Rhabdomys pumilio</i>	Striped Mouse	
<i>Mus minutoides</i>	Pygmy Mouse	
<i>Lepus capensis</i>	Cape Hare	
<i>Lepus saxatilis</i>	Scrub Hare	

Large animals occurring on Elandsfontein include:

- Eland
- Kudu
- Gemsbok
- Hartebeest
- Duiker
- Steenbok
- Black Wildebeest
- Zebra
- Springbok
- Ostrich

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6.1.9.9. AVIFAUNA STUDY


The proposed Elandsfontein Phosphate Mine is located on the farm Elandsfontein 349, that falls within the Fynbos Biome on the western edge of the West Strandveld Bioregion. The area is likely to support over 200 bird species, including eight red-listed species, 33 endemics, and five red-listed endemics, at least three of which - Southern Black Hottentot Buttonquail and Black Harrier- could breed on or close to the development area, in association with the tracts of unmodified coastal vegetation which characterise the site. The latter species, a suite of Strandveld/Fynbos endemic passerines, and various additional raptor, large terrestrial and wetland species that may be implicated, make up the short-list of priority species considered as central to the findings of this assessment.

The proposed development area is located directly adjacent to the West Coast National Park and Saldanha Bay Islands Important Bird Area (IBA) which regularly supports >35 000 wetland birds in summer (sometimes >50 000 shorebirds alone) and >10 500 birds in winter, and is listed as one of only 20 Ramsar sites in the country. Also, the Lower Berg River Wetlands IBA (SA104) is situated only about 15 km to the north, and is a feeding and/or roosting site for 10 000s of wetland and coastal birds. However, the development site does not have any significant seasonal or permanent water sources or exposed water bodies (other than small, artificial drinking holes established to sustain herds of game), so it is unlikely to attract significant numbers of birds from either of these critical wetland areas. Also, while it falls more or less on a predicted fly-way for these birds between the two IBAs and between Langebaan Lagoon and the Soutrivier to the north-east, such commuting birds are unlikely to be directly and adversely affected by the proposed mining activities.

The site overlaps with the known distribution of the Hottentot Buttonquail, a nationally endangered and endemic species. The generally good condition of the vegetation indicates that the area could support a viable population of this species (Hockey et al. 2005). However, this is a small, inconspicuous and cryptic bird that is easily overlooked and very difficult to survey.

- The location of an active Jackal Buzzard nest on the existing Ankerlig-Aurora 132kV line. The proximity of this nest to the mining pit suggests that it will be subject to significant levels of harmful disturbance.
- A Southern Black Korhaan was seen in the national park property just west of the development area. This species could occur in numbers on the site, especially if the vegetation is subject to more regular burning, introducing a mosaic of different vegetation heights and densities.
- The location of a disused quarry about 5 km west of the proposed pit which could host a suite of cliff-nesting, possibly impact susceptible birds, including two red-listed species - Verreaux's Eagle *Aquila verreauxii* and Lanner Falcon *Falco biarmicus*, and a range of other predatory birds that could play an important role in shaping the ecology of the area, e.g. Peregrine Falcon *Falco peregrinus*, Cape Eagle-Owl *Bubo capensis*, Barn Owl *Tyto alba* and Rock Kestrel *Falco rupicolus*.
- The proximity of the proposed development to a previously known Martial Eagle *Polemaetus bellicosus* nest site, located some 8 km to the north-west. This is a globally red-listed species with huge range requirements (Hockey et al. 2005). It is conceivable, but perhaps not likely, that this pair of eagles could be impacted by the proposed mine development.

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On the basis of these on-site observations, and in combination with the available SABAP2 data for the general area, 10 priority species are recognised as key in the assessment of avian impacts of the proposed Elandsfontein Phosphate Mine. These are mostly nationally and/or globally threatened species which are known or suspected to occur in relatively high numbers in the development area, and which could be negatively affected the proposed development.

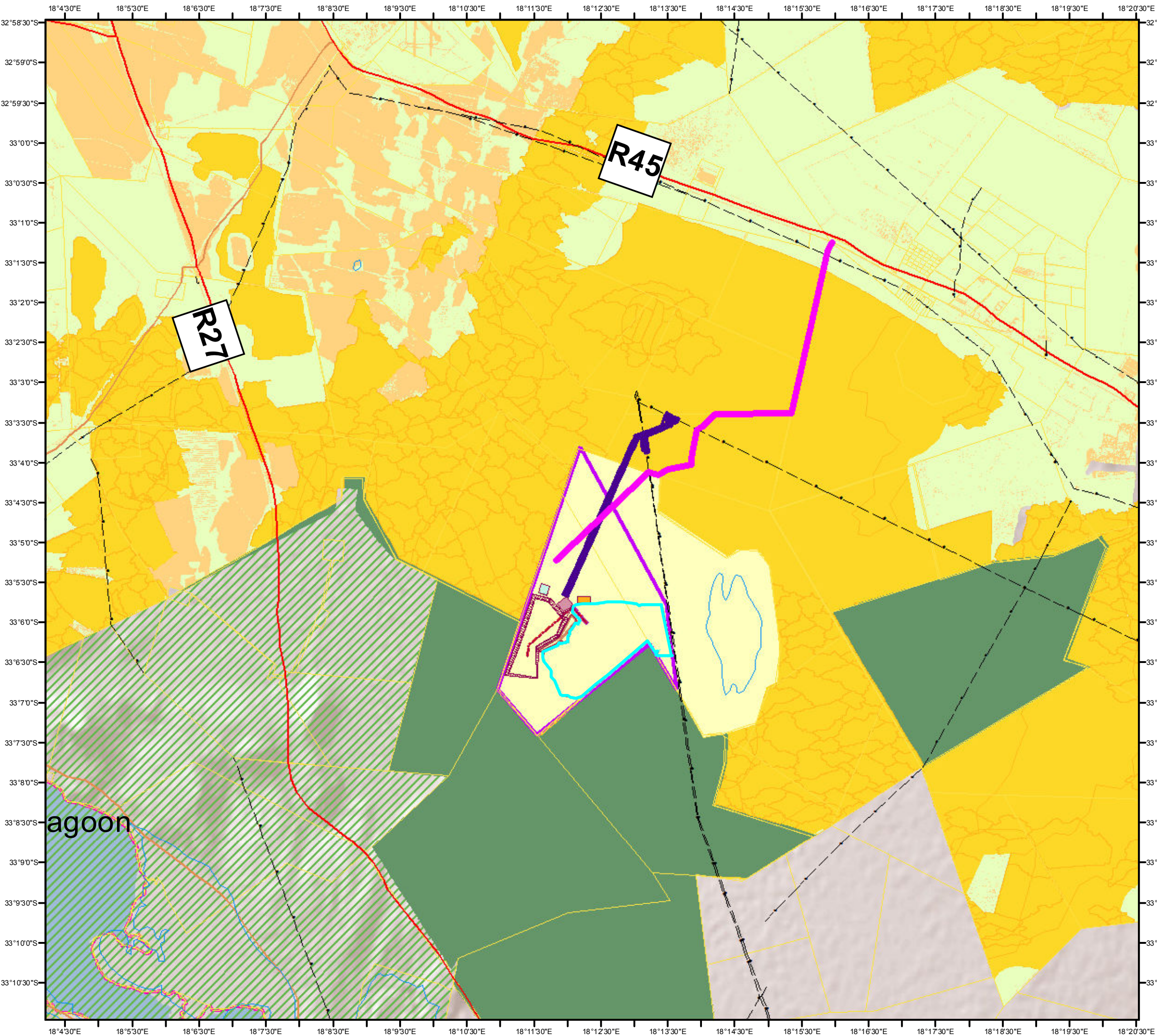
6.1.9.10. NOISE AND AIR QUALITY

The site is surrounded by other private farms and borders the West Coast Nature Reserve towards the south. The closest communities are Langebaan and Hopefield, situated approximately 14 km to the west and east of the site respectively. The Farm Elandsfontein 349 is situated between the West Coast Road (R27), which provides access to the site, and the R45. Potentially sensitive receptors within the study area are the neighbouring farms and the communities in Langebaan and Hopefield.

There are no major noise sources in the areas surrounding the mine application site. The main activities in the area are animal farming, subsistence agricultural farming and related operations, which serve the local communities. The general area around the site is rural, and noise levels are expected to be in the range of between 45 dBA and 35 dBA during daytime and night-time respectively. The only areas with higher noise levels are expected to be in the immediate vicinity of the existing main roads of R27 and R45, with noise levels expected to be between 55 dBA and 45 dBA. The existing noise levels within and around the mine application site and at relevant communities will be determined via measurements in the detailed EIA. In addition, the noise generated by the mine operations and local traffic on the R27 and R45 will be modelled and the noise impact determined for each community and noise sensitive receptor.

Presently, there are no heavy industries in the general area of the site. The main dust generating source in the region is the existing road network within and around the farms and the R27 and R45 roads.

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Legend

-  Elandsfontein Land Parcels
-  Critical Biodiversity Area
-  No natural remaining
-  Other natural area
-  Protected Areas

SCALE:
0 0.5 1 2 3 4
km


PROJECT: Elandsfontein Phosphate Mine

Figure 6-14: Critical Biodiversity Areas

CLIENT: 

Project No: 10043		Rev No. 1.0
Scale: 1:100 000		A3
Drawn:	06/06/2014	OB
Checked:	06/06/2014	RR
Approved:	06/06/2014	GA

P O Box 692
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7579
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Projection: Geographic, Datum: WGS 1984
Source: Enpat (2001),
Demarcation Board (Dec 2005)
Inset ESRI Data and Maps



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Table 6-8: Priority species considered likely to occur within the impact zone of the proposed mining area, with estimates of their relative susceptibility to the environmental impacts of the construction and operational phases of the development. National and global conservation status is listed as per the most recent assessment (Taylor In press, <http://www.iucnredlist.org/search>. Red-listed endemic species are highlighted in grey.

Common name	Scientific name	SA conservation status (Global status)	Regional endemism	Relative importance of local population ¹	Susceptibility to habitat loss	Sensitivity to disturbance	Risk of accidental mortality
Ludwig's Bustard	<i>Neotis ludwigii</i>	Endangered (Endangered)	Near-endemic	Low	Low	Moderate	High
Blue Crane	<i>Anthropoides paradiseus</i>	Near-threatened (Vulnerable)	Near-endemic	Low	Moderate	Moderate	High
Verreaux's Eagle	<i>Aquila verreauxii</i>	Vulnerable (Least concern)	-	Low	Low	Low	High
African Marsh Harrier	<i>Circus ranivorus</i>	Endangered (Least concern)	-	Moderate	Moderate	Moderate	Moderate
Black Harrier	<i>Circus maurus</i>	Endangered (Vulnerable)	Endemic	High	High	High	Moderate
Martial Eagle	<i>Polemaetus bellicosus</i>	Endangered (Vulnerable)	-	Moderate	Low	Moderate	High
Secretarybird	<i>Sagittarius serpentarius</i>	Vulnerable (Vulnerable)	-	Low	Low	Moderate	High
Peregrine Falcon	<i>Falco peregrinus</i>	-	-	Low	Low	Low	Moderate
Hottentot Buttonquail	<i>Turnix hottentottus</i>	Endangered (Least concern)	Endemic	Moderate?	High	Moderate	Moderate


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Southern Korhaan	Black	<i>Afra afrotis</i>	Vulnerable (Vulnerable)	Endemic	Moderate	High	Moderate	Moderate
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Relative to the national/global population

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6.2. SOCIO-ECONOMIC ENVIRONMENT

6.2.1. INTRODUCTION

The socio-economic baseline report provides a demographic, cultural and economic overview of the Project area and also describes the physical infrastructure and services available in the communities visited. The purpose of collecting this information is to provide a basis upon which the impact assessment can be conducted, and to enable the monitoring and measurement of changes over time.

6.2.1.1. METHODOLOGY

This socio-economic baseline is primarily based on the socio-economic baseline report undertaken in 2014 for the Project.

A combination of qualitative and quantitative methods was used. This involved key informant discussions, focus group discussions with the community, and a survey of businesses in the surrounding areas.

Discussions and interviews were conducted with key stakeholder groupings in the area, i.e. Saldanha Bay Industrial Development Zone (IDZ), Saldanha Bay Tourism Association, West Coast Chamber of Business, South African National Parks (SANPARKS), SMME's, NGO sector, Saldanha Bay Municipality (SBM), Ward committee of Ward 7 which includes Hopefield and the proposed Elandsfontein mine.


The study further included a community engagement component wherein a meeting with the Mayor, Speaker and Mayoral Committee member for economic development, indicated that the Saldanha Bay Municipality approach to community engagement in projects is based on a Ward system. According to this system, if a project is located in a particular ward then the community of that ward has to be engaged in the project. This approach was adopted and the community of Hopefield was engaged through the ward committee of Ward 7.

6.2.2. WESTERN CAPE PROVINCE

The Provincial Government of the Western Cape has formulated a Provincial Strategic Plan (PSP) that is branded on three pillars namely: Growth, Development and Inclusivity. The PSP is based on 12 Strategic Objectives (SOs). SO1 concerns increasing opportunity for growth and job creation, the principles of which are that:

- Economic growth is the foundation of successful development;
- Growth is driven by the private sector business operating in a market environment; and
- Saldanha Bay Industrial Development Zone (IDZ) Feasibility Study.

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The role of the state is:

- to create and maintain an enabling environment for business and
- to support demand-led, private sector driven support for growth sectors, industries and business.

The other relevant Strategic Objectives are relevant strategic objectives are SO7: mainstreaming sustainability and optimizing resource-use efficiency; SO11: creating opportunities for growth and development in rural areas.

WCPG's Department of Finance, Economic Development and Tourism (MEC: Alan Winde) is the lead/custodian department for SO1, and has compiled a strategic directive or a multi- functional programme plan to implement SO1. An Economic & Infrastructure Strategic Sector Committee Steering Group (EISSSG) has been established to drive a coherent approach and implementation plan supported by other key provincial departments, including the Departments of the Premier, the Department of Transport and Public Works, the Provincial Treasury, the Department of Environmental Affairs and Development Planning, and the Department of Agriculture.

There are four high level objectives for SO1:

- To create an enabling environment that minimizes hurdles to sustainable business growth, investment and job creation
- To facilitate demand-led, private sector-driven government support for growth sectors, industries and business
- To improve competitiveness of the region through infrastructure-led economic growth, and
- To facilitate through EPWP the skills required for shared economic growth and work opportunities.

Each high level objective will be realized through the implementation of a number of key economic initiatives.


6.2.3. WEST COAST DISTRICT MUNICIPALITY

West Coast District total population is 391 766, representing 6.73% of the Western Cape Province total population of 5 822 734 million. Saldanha Bay has the 2nd largest population in the West Coast District, the population was estimated at 99 193 in the 2011 census, which represents a 41% change from 2001-2011.

In 2007, WCDM GDP amounted to R11 billion and contributed 0.63% to National GDP and 4.31% to Western Cape GDP (IDP, 2011-2015). WCDM GDP per capita was 7.1% lower than national GDP per capita (IDP, 2011-2015). Important sectors of the formal economy are manufacturing, agriculture, fishing, retail and tourism.

Some 56.5% of the WCDM population is not economically active. Of those who are, roughly 141 177 (or 36% of the WCDM population) were employed and 24 204 (or 6.2% of the population) were unemployed, while 5 524 (or 1.4% of the population) were discouraged job seekers in 2011 (Census, 2011). As such, approximately 14% of the economically active population in the WCDM was unemployed.

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The focus is on ways to retain existing and create employment through restructuring the following key existing sectors/clusters which includes construction and mining, and tourism. The former issues are in alignment with the proposed Saldanha IDZ. There may however, potential conflict between tourism and mining/ industrial development.

The WCDM is the biggest contributor of crop-based agriculture in the Western Cape, contributing 59% of the value of crops in the province (RED, 2007). The fishing industry in the Western Cape is centered along the West Coast, as the Benguela upwelling system increases the biological activity in this region. Over 60% of the jobs in the Western Cape's fishing industry are along the West Coast and approximately 73% of the income earned in the Western Cape fishing industry is earned in the harbour towns of the West Coast (WCDM RED, 2007). The aquaculture sector is expanding rapidly with many companies applying for aquaculture rights, especially in the sheltered portions of Saldanha Bay. The tourism sector is also increasing rapidly, with the West Coast becoming a popular domestic and international destination, supporting employment. The oil and gas industry is an important current and future potential contributor to the economy and the proposed Saldanha Bay IDZ is focused on supporting upstream service companies operating in oil and gas fields in sub Saharan Africa.

The WCDM is determined to improve the human capital in the region, which in turn will encourage an economically active population with skills that can ensure opportunities for them to better their livelihoods and well-being (IDP 2011-2015).

The West Coast draws tourists from all over the world, attracted by the unspoilt white beaches, mountain ranges and Spring wild flowers. The West Coast region comprises six main tourist areas, namely: Saldanha Bay and Langebaan Lagoon, St Helena Bay, the Cederberg, the Olifants River Valley, the Swartland and the Sandveld.


The West Coast District Municipality Spatial Development Framework attempts to do just this by aligning future settlement and investment with places of economic and resource potential, also taking into account efficiency at regional level:

- Enhancing job creation opportunities
- Correcting existing negative developmental legacies of the past
- Conserving and strengthening a sense of place for all
- Ensuring the wise use of existing resources
- Conserving biodiversity resources

6.2.4. SALDANHA BAY MUNICIPALITY

The mining site is situated within the Saldanha Bay Municipality (SBM) (WC014). The locality of the excavation site is roughly between Hopefield and Langebaan. SBM is a local municipality located on the West Coast of South Africa, approximately 140 kilometers north of Cape Town. It forms part of the West Coast District Municipality (DC1), situated in the Western Cape Province. The Swartland Municipality borders the municipality in the west by the Atlantic Ocean, in the north by the Bergrivier Municipality and the east.

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The Saldanha Bay Municipality covers an area of 2 015 km² (approximately 166 565,48 hectares) and has a coastline of 238km. In total 0.4% of the geographical land are urban land and 96.96% rural land. Overall Saldanha Bay municipality constitutes 5.8% of the entire West Coast geographical land making it the smallest municipal area in the district. The head office is located in Vredenburg, with satellite offices in Hopefield, St Helena Bay, Paternoster, Saldanha and Langebaan. Saldanha Bay has the largest natural port in Africa and the area is earmarked as a regional engine for the development of the Western Cape Province.

Saldanha Bay municipal area's economy is based on the manufacturing industry, agricultural and fishing industry, tourism industry and harbour industries. In this regard there are large fish factories, processing plants and the Saldanha Steel plant.

6.2.4.1. ETHNICITY, AGE AND LANGUAGE

In the WCDM, SBM and Ward 7, the majority of the population is comprised of Coloured people with 67%, 56% and 80% respectively. Whilst the second largest ethnic group in the WCDM and SBM are Black/African representing 16% and 25% respectively, in Ward 7 Black/Africans represent merely 2.5% of the population as the second largest ethnic group in Ward 7 is White people representing 16% of the Hopefield population.

The majority of residents within the ward and municipalities fall into the 20 – 54 age categories. The minority of the population is in the 55+ age category.

Table 6-9: Age distribution in Ward 7, Saldanha Bay and West Coast District Municipality (%)

	Saldanha Bay Municipality	West Coast District Municipality
0 – 4	10%	9%
5 – 14	15%	16%
15 – 19	8%	8%
20 – 34	29%	27%
35 - 54	26%	26%
55 - 64	7%	8%
65+	5%	6%
Total (%)	100.00	100.00

The majority of residents in Ward 7 and in SBM speak Afrikaans (94% and 71% respectively). The second most spoken language differs from English in Ward 7 (3%) to Xhosa in the SBM (16%).

6.2.4.2. EDUCATION

Table 6-10: Education levels in Ward 7, Saldanha Bay and West Coast District Municipality (%) demonstrates the education levels in the Ward 7, SBM and the WCDM community. The majority of the residents do have some schooling with 16% to 20% of people having passed Grade 12. However, the representation of the community with higher education is quite low at 6%.

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Table 6-10: Education levels in Ward 7, Saldanha Bay and West Coast District Municipality (%)

	WARD 7	SALDANHA BAY MUNICIPALITY	WEST COAST DISTRICT MUNICIPALITY
No schooling	4%	3%	4%
Primary schooling	36%	26%	31%
Some secondary schooling	30%	34%	29%
Grade 12	16%	20%	16%
Higher	6%	6%	6%
Not applicable/Other	9%	11%	14%
Total (%)	100.00	100.00	100.00

Source: Census 2011

6.2.5. DESCRIPTION OF THE BASELINE ECONOMIC ENVIRONMENT

The significance of impacts is often highly dependent on the economic environment or context within which they occur. For example, job creation in a small local community with a stagnating economy will be far more significant than it would be in a larger community with a healthy economy. With this in mind, this section describes the economic environment focusing on the local area and sub-region where the majority of impacts are likely to be felt. The main information sources used were Census 2001 and 2011 data, 2007 Community Survey data, Integrated Development Plans (IDPs), Locals Economic Development (LED) Strategies and Spatial Development Frameworks (SDFs).


Given the scale of the project, the economic context includes information on the Western Cape, the West Coast District and the Saldanha Bay Local Municipal area as well as, where available, the key local areas within the local municipality (Hopefield, Saldanha Bay, Vredenburg and Langebaan). Note that the currently available data presented in this section only provides data for the one ward, namely Hopefield.

6.2.5.1. ECONOMIC OUTPUT, GROWTH AND TRENDS

The Western Cape has continuously outperformed the South African economy during the period 2000-2010 as seen in the graph below. The PERO report indicates that economic activity in the Western Cape during 2011 was estimated to be 3.3%, outpacing the national growth rate of 3.1%, but still significantly less than the emerging and developing countries' average of 6.2%.

Between 1999 and 2007, South Africa's economy experienced a record long economic expansion and between 2004 and 2007 (the second phase) both the Western Cape and national economies achieved high real economic growth rates. For example, it averaged 6.1% and 5.2% per annum for the Western Cape and the national economy respectively. However, the PERO report (2012: 50) states that the growth masked the following problems: Unsustainable high rates of credit extension was an important driver of the growth in consumption driven services industries, such as Finance, insurance and real estate, Transport, storage and communication and Wholesale, retail, catering and accommodation. These sectors created the jobs, which tended to be skill-intensive, whilst low and semi-skilled intensive productive sectors of the economy (such as Manufacturing, Construction, Agriculture and

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Mining) grew at low rates and barely added to their workforces, if at all. The outcome was a high current account deficit (averaging 7% of GDP in 2007) and unemployment not falling below 22.8% despite the 5% annual growth between 2005 and 2007. The growth in the economy was not pro-poor with very little impact on the high levels of inequality prevalent in the economy.

“The high-growth sectors (7-9% real value-added growth) in the province (e.g. Finance & insurance, Construction, Communication; furniture, other transport equipment, including boat building) are poor labour absorbers. A whole range of primary and secondary industries shed jobs despite the better economic conditions over the biggest part of the 2000-9 periods. This group is led by the job-shedding that occurred in the Agricultural and Manufacturing sub-sectors specifically clothing & textiles, non-metal minerals, electronics, food & beverages, petrochemicals (all exhibiting below-average growth) furniture, leather & footwear and automotives (exhibiting high growth).

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Even though these sectors are the largest contributors to GDP, the greatest growth between 2000 and 2008 was recorded in the Construction sector (7.7%) followed by Finance, real estate and business services (6.1%) and Transport & Communication (5.3%). Low growth was primarily recorded in the primary sectors of the economy, i.e. Agriculture, forestry and fishing and Mining & Quarrying.

The PERO report (2012) states that Agriculture, Forestry and Fishing sector grew by 2.2 % between 2000 and 2010, with a significant decline in 2011. This sector also shed significant jobs - occurring alongside the retrenchment of farm workers at an annual rate of 7.8%.


According to the Department of Agriculture (2007), agricultural activity in the Western Cape covers an area of 11, 5 million hectares (ha). Although this is only approximately 12, 4% of the total agricultural land available in South Africa, the Western Cape produces between 55% and 60% of South Africa's agricultural exports. The Western Cape also contributes approximately 20% towards South Africa's total agricultural production.

The Western Cape has a diverse production capacity with 11 commodities contributing significantly to agricultural production. Agricultural production like fruit, poultry and eggs, winter grains such as barley, wheat and hops, viticulture and vegetables together contribute more than 75% of the total output. Consequently, the diversity of the agricultural enterprises also contributes to the sector's general stability.

The manufacturing sector is a significant sector in the Western Cape economy. Its share of the GDP is 17.3%. It expanded by 2.6 % per annum during 2000 – 2010. Job losses in this sector has been substantial - 63 590 jobs were lost during the period 2000 – 2010, with 85% of all employment opportunities lost occurring in the Cape Metro.

The services sector is the largest contributing sector in terms of GDP. It is interesting to note that the increased employment in the services sector (2000-2010) compensated for the loss of employment in the agricultural,

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manufacturing and construction sectors and was the only sector that did not contract in the 2008/09 recession. The fastest of the services sector, the communications sub-sector recorded an 8.1% growth rate per annum between 2000 and 2010.

The business services sub-sector is the largest sub-sector, accounting for 30% of all services. This sector is projected to grow at an average of 4.1 %per annum between 2012 and 2017, with employment growth projected at 2.1 %per annum.

From the above analysis, the Western Cape government needs to facilitate expansion and job creation in the primary and secondary sectors of the economy which has the ability to absorb large quantities of unskilled labour because of the sector's labour intensive characteristics. The Elandsfontein development fits into this development strategy.

6.2.5.2. ECONOMIC SECTORS OF THE WEST COAST DISTRICT MUNICIPLIATY

The West Coast District is made up of the following local municipalities: Cederberg, Matzikama, Swartland, Bergrivier and Saldanha Bay. The five non-metro districts contribute 26.4 per cent of GDP, the largest district being Cape Winelands (43.3 per cent of non-metro GDP), followed by Eden (27.5 per cent), West Coast (16 per cent), Overberg (11 per cent) and Central Karoo (2.3 per cent) Provincial Treasury 2012). The West Coast District (WCD) is the fourth largest economy in the Western Cape but has had the poorest economic growth performance in the region.

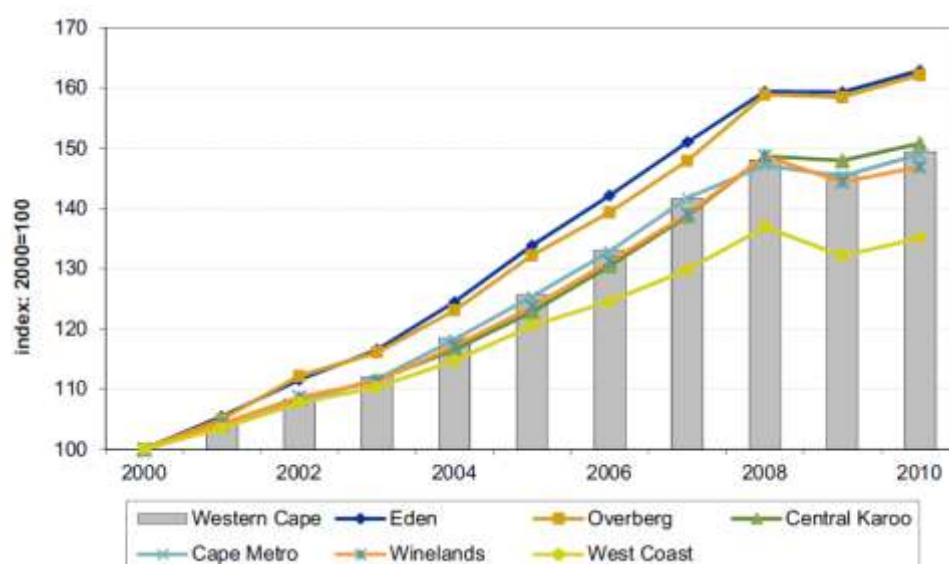



Figure 6-15: Comparative GDP Growth Rate (Theta, 2014)

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- According to Wesgro, the West Coast's key economic sectors are:
- Agriculture and fishing – the district produces various agricultural products including grapes, wines, wheat, rooibos tea (in Clanwilliam) and fruit. A number of fishing activities take place on the West Coast such as rock-lobster fishing, line fishing and deep-sea fishing, among other activities.
- Manufacturing – the district has a strong manufacturing sector in terms of contribution to GGP. Production activities in the district are agro-processing, fish processing (along the coast) and mineral processing. Wheat in Moorreesburg, forestry in Cedarburg, citrus farming in Citrusdal, cement making in Riebeeck West and Piketberg.
- Mining – the district has a sizeable mining sector. Titanium, zirconium, phosphate and limestone, sandstone, salt and diamonds are among the commodities found in the district.
- Other key sectors are the services sector, tourism and construction sectors.

The figure below shows that the composition of the West Coast's economy in terms of GGP. The Finance, real estate and business services sector is the largest sector in 2011, accounting for 26% of the regional GDP. The manufacturing sector and Agriculture, forestry and fishing sector were the second and third largest contributors to the West Coast GDP, accounting for 18% (ZAR1.9bn) and 15% (ZAR1.6bn) respectively.

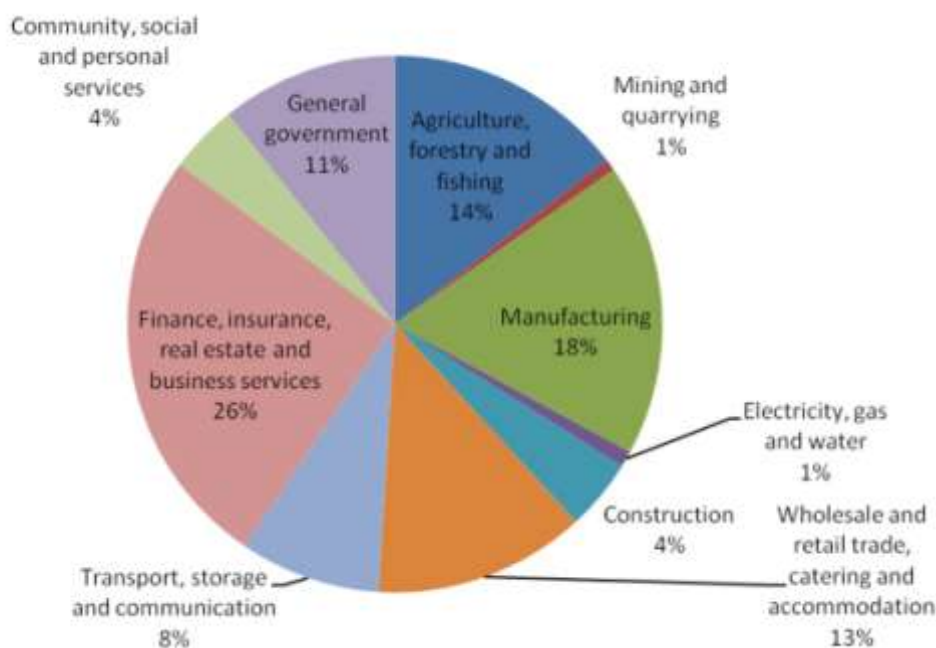



Figure 6-16: Provides the growth performance of the various sectors of the district economy both in terms of growth as well as GGP.

It is not surprising to note that the sectors that recorded the largest number of jobs and the highest economic growth rates are the tertiary sectors of the economy. The tertiary sectors accounted for more than 75% of the

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growth, whilst the productive sectors like Agriculture, etc and Manufacturing was job shedders. The Mining sector was the only productive sector that registered employment creation.

According to Wesgro (2014), the West Coast district is a key driver of exports in the Western Cape. Wesgro's data suggests that both exports and imports increased from 2003 to 2005 before declining from 2006 to 2007. In 2008, both exports and imports reached their highest level before declining from 2009 to 2011, however in 2012 both exports and imports experienced strong growth. The West Coast has maintained a positive trade balance during the period 2003 to 2012.

6.2.5.3. SALDANHA BAY ECONOMIC SECTORS AND LOCAL GDP


The Saldanha economy has been the best performing economy in the West Coast district. Its annual economic growth rate between 2000 and 2010 was 4.6% which is significantly higher than that of the other local municipalities in the West Coast district. The key growth sectors in Saldanha were; Finance, insurance, real estate & business services followed by Mining and quarrying and general government services. The sectors that contracted were Manufacturing and Electricity, gas and water.

In terms of the sectoral contribution of economic activity in the Saldanha Bay municipality, Finance, insurance, real estate & business services is the largest sector; this is followed by general government, Manufacturing and Wholesale and retail trade, catering and accommodation. Mining and quarrying, despite its significant growth rate, only represents 1.2% of the municipality's GDP.

The principal sectors are briefly described in the table below:

Sector	Method
Mining	<ul style="list-style-type: none"> Several mining activities have established near Saldanha and Langebaan and include mining of construction materials such as lime scales and sand.
Industry / manufacturing	<ul style="list-style-type: none"> Development of the Port of Saldanha for iron ore export promoted large scale industrial growth in the area e.g. establishment of the ArcelorMittal steel plant, the Namakwa Sands smelter. Additional industrial development, e.g. through the increase of port capacity and establishment of the IDZ, is currently being promoted.
Agriculture	<ul style="list-style-type: none"> Crops grown in the SBM include wheat, canola, rooibos tea, fruit, grapes and vegetables. Animal products include poultry, fresh milk and dairy products, beef, mutton, lamb and pork. Due to increased mechanisation, the sector is becoming less important for employment generation;
Fishing	<ul style="list-style-type: none"> Historically an important economic activity - fishing activities represented in SBM include deep-sea fishing, line fishing, lobster, trapping and aquaculture. Aquaculture takes place both in Saldanha Bay and St. Helena Bay. Fish is processed locally in various fishmeal, fish canning and other fish processing plants located primarily in St. Helena Bay and Saldanha

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Tourism

SBM is a well-known and popular tourist destination and the sector plays an increasingly important role in the economy

The previous dependency of the SBM economy from the principal economic sectors of fishing and agriculture is diversifying to include manufacturing and tourism as major economic sectors. Since 1995 over 9000 jobs have been lost in the agricultural, manufacturing, construction and trade sectors, especially in the agricultural sector. Employment in the other sectors - particularly in the finance, transport and service sectors, which are now the largest employers in the area - has increased since 1995, with approximately 13 300 new jobs added by 2010. This diversification should deliver major economic growth, but can also lead to social displacement, with social cohesion of the municipality threatened if locals are not able to take advantage of opportunities due to a lack of skills (SBM IDP, 2006).

6.2.5.4. EMPLOYMENT

In accordance with the Census 2011 statistics, approximately 76% of the population active in the labour market were employed, while 10 470 (24%) were unemployed in 2011. Amongst the various population groups, employment rates are lower for Black African and Coloureds than Whites, while a larger proportion of the White and Coloured population is not economically active. The wards with the most people in employment are those that include towns (e.g. Saldanha and Vredenburg). The sectors in which most people were employed are:

- Finance, insurance, real estate and business services;
- General government services;
- Community, social and personal services;
- Mining and quarrying; and
- Wholesale and retail trade, catering and accommodation

Employment in the agriculture, manufacturing, trade and construction sectors have decreased since 1995. In all the remaining sectors (mining, transport, finance and service) employment has shown an increase since 1995. Particularly noticeable is the sharp increase in mining since 2004.


6.2.5.5. HOUSING

The total number of households within the municipal area increased from 18 889 households in 2001 to a total of 28 811 households in 2011, representing a growth rate of nearly 53%. The number of households per ward in Saldanha Bay Municipality ranges from 1 247 to 3 533.

The current status of housing in the community is as follows:

- The majority of households (80%) in Saldanha Bay Municipality live in formal dwellings (houses, flats and townhouses);
- About 18% of households live in informal and/or traditional dwellings;
- Since 2010 the percentage of informal houses increased from 9% to 18%;
- 5084 households will form part of the municipality's housing backlog. The number of households that have a house, flat or room in a backyard has increased by 71% from 2010.

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6.2.5.6. SERVICE PROVISION

6.2.5.6.1. WATER

The bulk sources of fresh water for the municipal area are wet catchment areas that are naturally recharged by rainfall. Water is provided to the Saldanha Bay Municipal area by the District Council through the Saldanha-Berg River Water Provision Scheme (VKE Engineers, 1999, cited in Urban Dynamics Western Cape, 2011). The main bulk water source is the Berg River, which feeds to the Misverstand Dam from where the water is pumped to a purification facility. It is then stored in the Bezaansklip and Vergeleë reservoirs (Urban Dynamics Western Cape, 2011). Due to the growing population of the municipal area, the demand for potable water is due to increase significantly. In cooperation with the WCDM, the SBM has instituted a water demand management programme to ensure effective, affordable and sustainable water services.

6.2.5.6.2. SEWERAGE

There are 3 major pump stations with high capacity in the municipal area. There are five sewage treatment plants in the municipal area and they are located at Saldanha, Vredenburg, Langebaan, Laingville and Paternoster. Most of the freshwater inputs that are discharged annually through the sewage treatment works are not recycled and discharge into environmental sinks. In general the sewerage treatment system is adequate to address the demands of the study area although a number of improvements are required which includes upgrades to Saldanha wastewater treatment works (WWTW) is now approaching the maximum annual limit (Urban Dynamics Western Cape, 2011). Both the WWTW and pump stations at Saldanha will have to be upgraded / extended in anticipation of a population increase.


6.2.5.6.3. ELECTRICITY

Bulk electricity (400 kV) is supplied by Eskom throughout the municipal area. Saldanha Steel receives electricity (132 kV) directly from Eskom. There is a 132 kV substation in Blue Water Bay that distributes electricity to the industrial areas. 66kV networks supply electricity to Vredenburg, Saldanha, St Helena Bay and Velddrif, while 11 kV networks supply Langebaan, Jacobs Bay and Paternoster. The bulk of the municipal areas electricity is provided by Council except for St Helena Bay and the rural areas that receive electricity directly from Eskom. (Urban Dynamics Western Cape, 2011).

6.2.5.6.4. SOLID WASTE MANAGEMENT

The Saldanha Bay Municipal area produces 634 tons of solid waste per week (Entech Consultants, 2001 cited in Urban Dynamics Western Cape, 2011), which is serviced from 16 611 service points. The solid waste is transported to the following municipal solid waste disposal sites: Vredenburg Landfill and Langebaan Landfill Site. Of these, only the Vredenburg landfill has medium to long term capacity.

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6.2.6. LAND USE

The proposed mine application area is located on two portions of the Farm Elandsfontein No. 349, Malmesbury RD, namely the whole of Portion 4 and a portion of Portion 2, measuring 942.185ha. These portions previously formed part of the Elandsfontein Private Nature Reserve, with guesthouse facilities.

The area is characterised by largely by indigenous vegetation, a fossil area which is being studied by the University of Cape Town (UCT) and eco-tourism activities; mainly game farming and game lodging.

Currently EEM who obtained a prospecting right in April 2013 from the DMR is undertaking prospecting activities on the properties in accordance with their right.

There are a small number of farm dwellings on the site; and the farm is crossed by electricity transmission lines; other land uses would be investigated on site. The sand tracks through the site are suitable for 4x4 only.

Within the district area the challenges that are found include degradation of the land caused by industrial activities, alien infestation and informal settlements.




Figure 6-17: Current Land Use at Elandsfontein

6.2.7. SURROUNDING LAND USE

Elandsfontein Farm 349/2 and Farm 349/2 are largely surrounded by vacant, undeveloped agricultural land. The farms are bordered by the West Coast National Park, which was initially proclaimed in 1985 as the Langebaan

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National Park (Proclamation 138 in GG 9904 of 30 August 1985), with the name later being changed to the West Coast National Park (WCNP) (GN 1135 in GG 10789 of 26 June 1987). In October 2013, two additional portions, namely, Farm 349/3 and the Farm Grootfontyn No. 305, Malmesbury RD was declared as forming part of the WCNP. The Elandsfontein Prospecting Right was issued by the DMR prior to the latter coming into effect. Figure 6-18 shows the relation of the proposed mine area to the WCNP. The areas earmarked for the mining operation (Farm 349/4 and 349/2) is within the buffer zone of the WCNP and has been identified as forming part of the parks expansion area.


The Biodiversity Policy and Strategy for South Africa: Strategy on Buffer Zones For National Parks (Government Notice 106 of 102), came into effect on 8 February 2012, with its purpose of function to reduce or mitigate the negative influences of activities taking place outside the parks on the parks and, to better integrate parks into their surrounding landscapes. This concept has been widely recommended, including in the operational guidelines of UNESCO's World Heritage Convention.

Therefore, the purpose of a buffer zone is to:

- Protect the purpose and values of the national park, which is to be explicitly defined in the management plan submitted in terms of section 39(2) of the Act;
- Protect important areas of high value for biodiversity and/or to society where these extend beyond the boundary of the Protected Area;
- Assist adjacent and affected communities to secure appropriate and sustainable benefits from the national park and buffer zone area itself by promoting a conservation economy, ecotourism and its supporting infrastructure and services, and sustainability through properly planned harvesting.

A buffer zone may be established around a national park when considered necessary for the proper conservation and effective protection of the national park in achieving its objectives. This includes the immediate setting of the national park, important views and other areas or attributes that are functionally important as a support to the national park and its protection. Figure 6-18 indicates the borders of the WCNP and the core expansion area to the north which includes the Elandsfontein Mine area.

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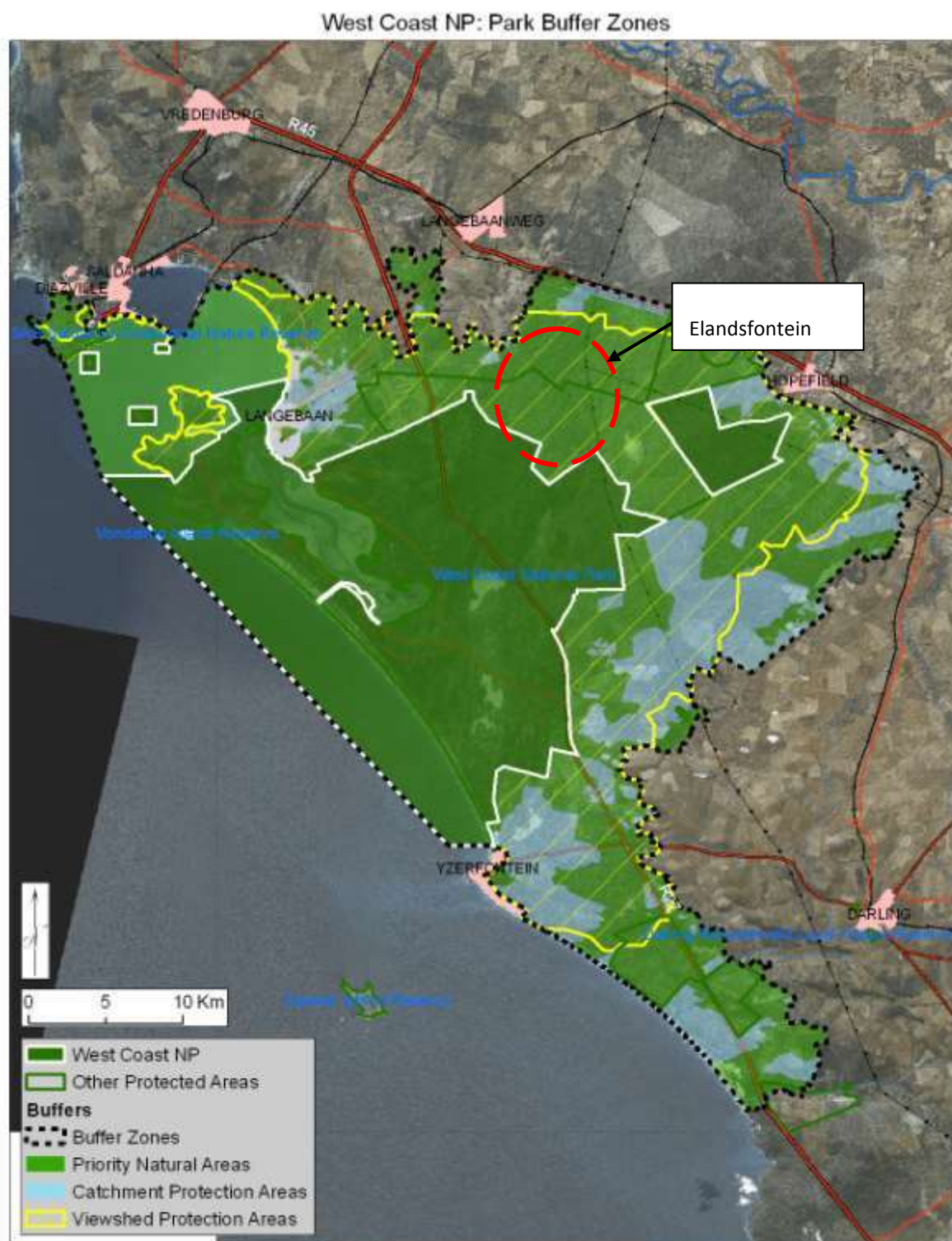



Figure 6-18: West Coast National Park Buffer

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6.3. VISUAL

Karen Hansen Landscape Architects were commissioned to carry out a Visual Assessment for the Mine and associated infrastructure (refer to Annex C for the full report).

6.3.1.1. LANDSCAPE CHARACTER

Between the farm and the coast, (both north and south), the land is very undulating with many small koppies; whereas, to the east, the land is more open, with gentler slopes.

The mining right site is characterised by a valley lying north-west – south-east between 77 and 78m asl.; the whole of the works will be at 77 and 120m asl. The land to the immediate south-west rises to Staankop, 136m, and to the north-east to Stinkkruidkop at 114m. The valley is the original route of the Berg River, which now flows north to Velddrif.

The land to the south and west is occupied by a range of low hills in a north-south grouping; the R27 is shielded from the site by these hills as is the lagoon, Langebaan town and Saldanha Bay. To the east of the site is a gentle north-south ridge to 105m asl., beyond which, further east, is Hopefield. Hopefield lies in the Soutrivier valley at 20 to 60m elevation. The flora has been grazed by cattle, and there are antelope on the farm now. The farm lies within the Fynbos biome with the vegetation reaching heights of around 2 metres.

6.3.1.2. SENSITIVE VIEW LOCATIONS

Sensitive viewer locations would be views from users of the R27 and R45 and local roads.

Potential Receptor

Users of existing transport corridors including in each case, travelling in each direction, i.e. roads, R45, R27, local roads and rail line


People living and working locally in Agriculture; no major farmsteads within 7km, but there are a few scattered buildings in the area: sensitive receptors

Local tourist facilities and routes: the R27 is a tourist route; no tourist facilities within the zone of visual impact

Local protected landscapes, West Coast National Park; areas currently publicly accessible are not within the zone of visual impact

Local population centres, such as Hopefield, Langebaanweg, etc, beyond the zone of visual impact

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6.4. HERITAGE, ARCHAEOLOGY AND PALEONTOLOGY

A Heritage and Archaeological Impact Assessment was undertaken by Dr. David Braun, Mr. Jonathan Kaplan and Mr. Henry Aikman. In order to outline the nature of paleontological artefacts (fossils) in the subsurface of the Project area, which may potentially be affected by construction and operational activities, Mr. John Pether was appointed to undertake a desktop Paleontological Impact Assessment.

6.4.1.1. FARM ELANDSFONTEIN 349/4 AND FARM 349/2

The following information was extracted from the Heritage Scoping Report for the proposed mining right on Portion 4 and a portion of Portion 2 of the Farm Elandsfontein 349; dated December; compiled by the Agency for Cultural Resource Management.

The proposed mining application area is located adjacent to the well-known 'Elandsfontein Fossil Site'. The fossil site (about 3 kms to the east of the proposed mining area) is known for producing Middle Stone Age tools with associated fauna (bone) more than 200 000 years old (Goodwin 1953; Klein 1988; Braun & Archer 2010) and the 'Saldanha or 'Hopefield' Man' skull from the fossil site, is the oldest known human in the Cape, with a date between 700 000 and 400 000 years ago (Drennan 1953, 1954; Singer & Wymer 1968). Early Stone Age tools more than 1 million years old have also been found on the ancient fossil floors (or palaeosoils), exposed by wind erosion. The fossil site is only one of a few localities in South Africa that preserves both archaeological and organic remains (bones) in an open air context (Braun 2013).


6.4.1.2. ARCHAEOLOGY

The history of scientific research at Elandsfontein spans more than 60 years, with the initial survey of fossil and archaeological material taking place in the 1950s (Braun et al 2013). This research has seen more than 20 scientific reports/published papers dedicated to the site. Internationally, it is one of the most recognised Pleistocene heritage sites in South Africa. The 'Elandsfontein Fossil Beds', known for producing Early Stone Age (ESA) artefacts older than 1 million years, are of global scientific importance (Pether 2013).

It is well-known that the Saldanha Bay area is a region of high archaeological importance, particularly with regard to Pleistocene archaeology. The Elandsfontein fossil site is also only one of a few localities in South Africa that preserves both archaeological and organic remains (bones) in an in situ (open air) context, allowing archaeologists a unique opportunity to study the evolution of early modern humans and how they interacted with their ecosystems more than 200 000 years ago (Braun 2013).

New observations at the site indicate that the main assemblage at Elandsfontein may now be as old as ~1 million years (Braun et al 2013). The context of fossil bones and artefacts in aeolian sands is well-illustrated by the 'Elandsfontein Fossil Beds' which include a sparse bone content in the uppermost Langebaan Formation, and a more persistent bone and artefact content in the overlying Springfontyn Formation sands.

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Dr Braun, who currently has a research permit for the archaeological site, has noted that the area is 'one of the richest sites of its kind in Africa' (in Bluff & Hart 2010:10). Current research, however, suggest that if this ancient landscape extends outside of the (now stable) dunefield, that any artefacts or fossils recovered from it will be patchily distributed (Braun et al 2013), but that if fossils are encountered, they will likely be 'numerous and densely concentrated' (Braun 2013:5).

Plasket (2013) logged a few Middle Stone Age (MSA) flakes, fossil bone and coprolites during a survey of the proposed mining application area, while Kaplan (2013) found only one MSA silcrete flake during an assessment of the 17 proposed prospecting drill sites.

While little is known about the Holocene Later Stone Age (LSA) archaeology in the area, Kaplan (2011) did document relatively large numbers of LSA silcrete stone flakes on a limestone ridge (outside the application area) on Farm 349, alongside the Eskom servitude that runs between the Elandsfontyn fossil site, and the proposed mining area. Orton (2007) identified a single LSA flake on Farm 349/6.

6.4.1.3. PALAEOLOGY


The specialist report by Pether (2013), addresses the palaeontological sensitivity of the stratigraphic section below the near-surface, fossiliferous deposits, viz. the Langebaan and Varswater formations. It is the calcareous Langebaan Formation that contains much of the archaeological and fossil remains which have been encountered at the nearby fossil site (Singer and Wymer 1968). The high fossil potential of the Langebaan Formation is therefore well known and according to Pether (2013), most of Farm 349 is underlain by this formation.

Pether (2013) notes, that it is generally not possible to predict the buried fossil content of an area other than in general terms, based on what has been previously observed of the fossil content of a particular formation in a particular area. But, as Pether (2013) argues, there is ample information (more than 100 scientific papers for the region have been published), to predict with some probability, the impact of a proposed mining operation on the palaeontological heritage.

In coastal-plain deposits of the Langebaan Formation, for example, the important fossil bone material is generally sparsely scattered and unless large and obvious, is not generally seen, underestimating the fossil prevalence. Much therefore depends on careful scrutiny of exposures and on spotting this material as it is uncovered during digging i.e. by monitoring excavations.

While the high fossil potential of the Langebaan Formation is well known, the pre- Langebaan Formation (i. e. the Varswater Formation) phosphatic aeolianite (the target area for mining), have an unproven, 'but strong potential' to yield fossil remains additional to the known marine microfossil content, such as land snails and micro mammals (Pether 2013:36). Bluff & Hart (2010) note that the Varswater Formation at Langebaanweg (the old Samancor Chemo's Mine and now the West Coast Fossil Park), for example, is highly fossiliferous, containing the world's densest known concentration of

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Pliocene vertebrate fossils, about 5 million years old. Preservation of cores from the phosphate prospecting programme, including sub sampling of selected intervals, sample disaggregation, sieving and macro - and optical microscopic inspection, may yield interesting observations and inform further investigations (Pether 2013).

6.4.1.4. GRAVES

Historical graves are usually well marked and mostly occur in small farm graveyards. Pre- colonial graves, on the other hand, can occur at any location where sand suitable for excavation and burial exists. This is particularly the case in the coastal area where dunes abound. Pre-colonial graves are unmarked and their locations cannot be predicted and no plans can be made to avoid intersecting such graves.

6.5. TRAFFIC

The baseline traffic loads have been determined and two main points of impact need to be considered, at the mine access and roads leading to the Port. The mine access road will intersect the R45 between Hopefield and the Aurora substation, at coordinates 33° 1'18.40"S, 18°15'54.52"E. Refer to Appendix C for the Traffic Impact Assessment.

6.6. AIR QUALITY


6.6.1. EXISTING AIR QUALITY

The area around the Elandsfontein mine is that of a typical rural environment, and as such the air quality in the area is expected to be of a good standard with low pollution levels. Based on Demos Dracoulide's (appointed specialist) observation during a site visit, the area's air quality appears to be generally good and there are no major dust or PM₁₀/PM_{2.5} sources that were identified within or around the proposed mine, other than windblown dust and dust re-entrainment due to traffic on the existing gravel road network.

6.6.2. EMISSIONS FROM THE PROPOSED ACTIVITIES

The main emission sources were identified as the concentrate transportation trucks travelling on unpaved roads (the air quality study assumed all roads as unsurfaced, however the main access road will be a tarred road and hence greatly reduce dust emissions around this route), the mining activities within the mining pit, the stockpiling of overburden and topsoil, as well as wind erosion at exposed areas and stockpiles. The latter sources, the transportation trucks on the access road and the haul trucks were the main contributors to the

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total emissions. Therefore, during the operational phase the main effort in reducing the project's impact on the ambient air quality should be focused primarily on minimising the emissions from the access road, the haul roads and haul truck loading area.

The *heavy* dust deposition ($> 500 \text{ mg/m}^2/\text{d}$) occurs primarily within the mining area and in close proximity to the access road. The dust deposition, at a distance of 100 m away from the access road and the mining pit, will be less than $250 \text{ mg/m}^2/\text{d}$, i.e. *light*.


Sensitive receptors were identified as largely adjacent farm houses (see Figure 6-19). The average daily dust depositions at all receptors are expected to be below the guideline of $600 \text{ (mg/m}^2/\text{day)}$, except for R01 and R02, which are located within the mining pit area.

The average 24 hour PM₁₀ concentration levels were above the South African Standard for four times of the year at an area between 600m to 1000m from the mining pit. The predicted PM₁₀ annual maximum concentrations exceed the annual guideline of $40 \text{ } \mu\text{g/m}^3$ (as applicable from 2015) only within the mining pit and within a few meters from the access road. It can be seen that the maximum 24-hour concentrations are below the guideline of $65 \text{ } \mu\text{g/m}^3$ contour (as applicable from 2015), but exceed the future guideline of $40 \text{ } \mu\text{g/m}^3$ and $25 \text{ } \mu\text{g/m}^3$, primarily around the mining pit. The number of exceedances great than 4 times a year are expected to occur only at vicinity of the mining pit. The modelled annual PM_{2.5} concentrations are below $15 \text{ } \mu\text{g/m}^3$. Therefore there will be no guideline exceedances expected to occur.

The essential mitigation measures for the operational phase are summarised in the emissions reduction should include:

- Dust fallout monitoring should be conducted before and after the commencement of the project, in order to collect background data and verify modelling results. During the operational phase of the project, annual monitoring should take place for dust fallout at 4 selected locations around the site boundaries and 2 locations along the access road.
- The performance targets for the monitoring should be set to a maximum total daily dust deposition (calculated from the monthly dust deposition) to be less than $600 \text{ mg/m}^2/\text{day}$ for residential areas, and the maximum annual average dust deposition within the site to be less than $1,200 \text{ mg/m}^2/\text{day}$.
- Along the access road, a reduction of speed is recommended in order to reduce the dust generation. The dust deposition levels at 2 locations along the road should be monitored, and if these exceed the limit then additional measures, such as chemical stabilisation, should be considered.

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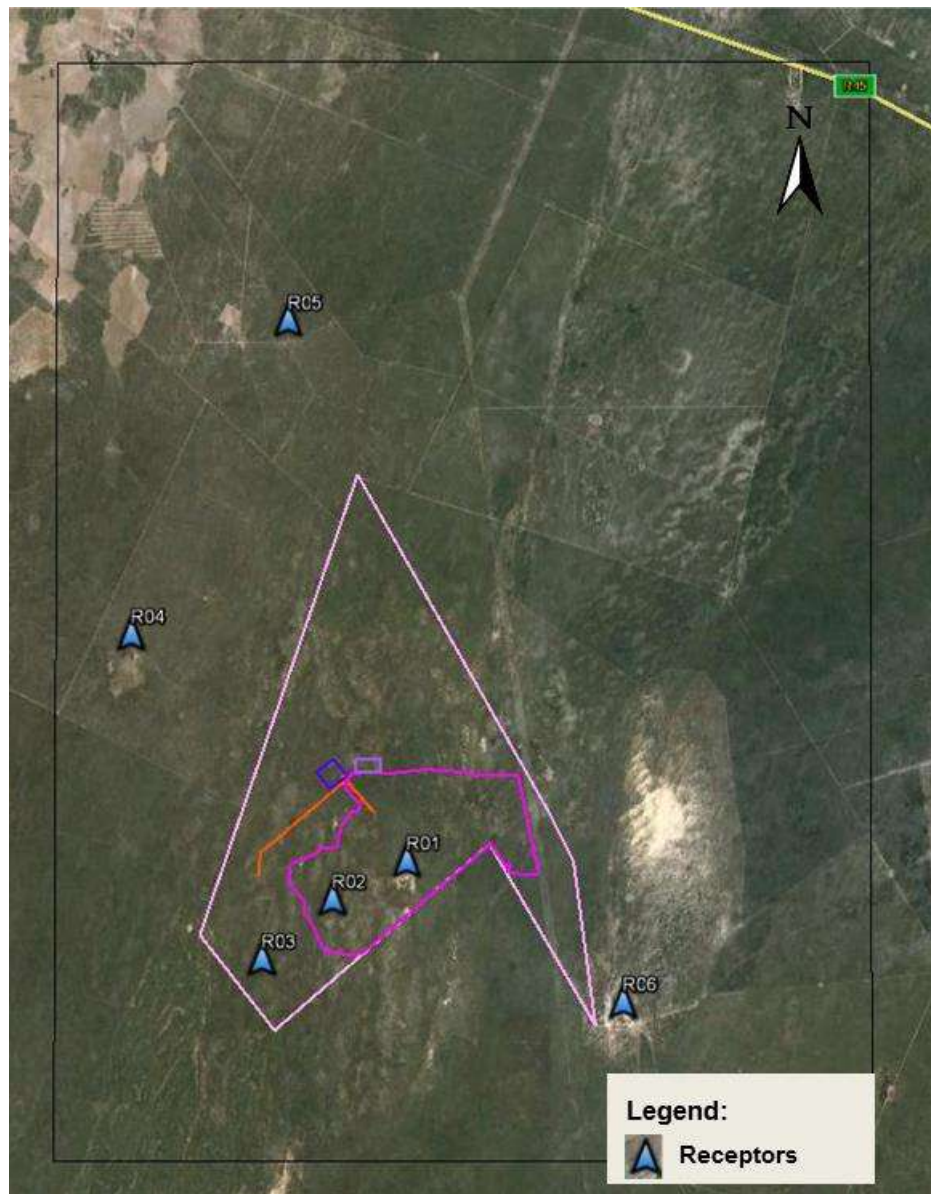



Figure 6-19: Sensitive receptor locations

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7. WASTE MANAGEMENT AND CLASSIFICATION

7.1. INTRODUCTION

This Chapter identifies the different types of waste that will be generated during the construction, operation and decommissioning phases of the Project. These waste types are classified and various ‘preferred’ and ‘alternative’ management options are provided for each.

Following this, potential impacts that such waste streams pose to human health and the environment are assessed and presented in tabular format. Finally, a number of mitigation measures/recommendations are provided that seek to minimise/avoid the environmental and health impacts identified.

The concept of ‘Waste Management Hierarchy’, which aligns with principles set out in terms of key National Waste Legislation, is applied throughout the Section. This approach is discussed in further detail in the following section. These recommendations are intended to inform final Waste Management Plans (WMPs) that will be developed as part of this process (refer to EMPr) to ensure that all waste generated at the Project site is collected, handled, transported and disposed of in an environmentally sustainable manner.

7.2. APPLICATION OF A WASTE HIERARCHY APPROACH


The fundamental focus of the National Waste Management Strategy aims to meet the key objectives of the Waste Act, by implementing the waste hierarchy (see Figure 7-1).



Figure 7-1: Waste Hierarchy

The hierarchy consists of options for waste management during the lifecycle of waste, arranged in descending order of priority. The foundation of this hierarchy and the first choice of measures in the management of

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waste are waste avoidance and reduction. As such waste that cannot be avoided should be recovered, reused, recycled and treated (with recovery, re-use and recycling being preferred management options to the treatment of waste). Furthermore, waste should only be disposed of as a last resort.

The NEMWA and the NWMS place an emphasis on Industry Waste Management Plans (IndWMPs), which are the central element in the co-regulatory system. These WMPs are expected to report on, amongst other things, how the site is going to manage its waste and to provide targets for achieving waste hierarchy issues, particularly with regard to waste reduction and recycling. As such, it is essential to introduce the principles of clean technology and the waste hierarchy during the design phase of the project.

Table 8.1 below details the types of waste generated by the Project and provides some preferred management options that speak to the waste hierarchy concept as described above. Further application of the Waste Hierarchy is given in Section 8.5.2 below, whereby specific recommendations to minimise, reduce, recycle and re-use certain types of waste generated by the Project are listed.

7.3. WASTE GENERATION AND CLASSIFICATION

The Project will generate two primary waste streams, which can be categorised as mineral and non-mineral wastes.

7.3.1. MINERAL WASTES

Mineral wastes that will be generated by Project activities will include overburden and a waste stream generated from ore processing (tailings).

7.3.2. NON-MINERAL WASTES

Non-mineral wastes (domestic, non-hazardous and hazardous) are generated during construction works and mine operations, particularly at maintenance workshops, administrative offices and processing plant. Specific types of that will be generated as a result of the Project are listed in Table 8.1 below. In addition to listing the types of wastes generated, Table 8.1 also provides 'preferred' and 'alternative' management options for each waste stream identified.

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Table 7-1: Types of Non-mineral Wastes that will be Generated by the Project and Possible Management Options


Unit / Source	Description	Waste Type/Composition	Estimated Quantity, tons/annum	Preferred Management Option(s)	Alternative Management Option(s)
<i>1. Construction Phase</i>					
Construction Wastes	Metal Scrap	Steel scrap Electrical cable scrap	NA	Recycle/Recover	Dispose to General Waste Landfill
	Building Rubble	Cement Bags, bricks, soil, cut-offs, etc	NA	Recycle if possible	Dispose to General Waste Landfill; Use bricks, soil etc. to form a berm to improve aesthetics
	General Waste	Paper, Plastic, Food (Putrescible) Waste	NA	Recycle if possible	Dispose to General Waste Landfill or Incinerate.
	Paint	Waste Paint, "Empty" Containers	NA	Recycle to "Collect-a-Can"	Dry out/Solidify and Dispose to General Waste Landfill
	Fuels	Spillage, Contaminated Soil	NA	See Section 7 below	
	Lubricating Oil and Grease	Used oil and grease, oil filters, oily rags, etc	NA		
	Sewage Treatment	Activated Sludge	NA		
	Health care risk waste	Used bandages, plasters, syringes, Sanitary Towels, and Pads etc from Clinic.	NA		

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Unit / Source	Description	Waste Type/Composition	Estimated Quantity, tons/annum	Preferred Management Option(s)	Alternative Management Option(s)
	Hazardous Packaging:	Drums, Plastic and Paper Bags, "Empty" Containers of Cleaning Agents	NA		
	Batteries	Vehicle Batteries Batteries from electrical equipment, e.g. cell phones, torches	NA		
2. Mining					
Overburden	Quartz sand with CaO	Natural material from the mining area.	9 million	Dispose to softs stockpile for first 33 months, in accordance to Requirements, then returned to pit for rehabilitation	
Drilling Oils	Soluble petroleum oils	Soluble oil can be considered potentially hazardous if it enters the ground and surface water	NA	Waste to Energy: Cement Kiln or Dedicated Treatment Facility	Dispose any residual Oil and packaging to an A(HH) Landfill
Explosives	Ammonium Nitrate Fuel Oil (ANFO)	Classed as SANS 10228/GHS 10234 Class 1 Waste, Explosive, when not de-sensitized.	NA	Dilute with water to de-sensitize and compost with green waste	Small amounts can be treated with water and disposed to hazardous waste landfill
Crusher Dusts	Rock dusts	Spillage, Dust from extractors	NA	Process in flotation plant if possible	Dispose to Tailings Dam

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Unit / Source		Description	Waste Type/Composition	Estimated Quantity, tons/annum	Preferred Management Option(s)	Alternative Management Option(s)
Petroleum Wastes		Diesel, Petrol	Spillage, Contaminated Soil	NA	See Section 7 Below	
Oil and Grease		Vehicle lubricants, Drag Line Grease	Used oil, oil filters, oily rags, empty oil cans, grease, etc.	NA		
3. Ore Processing and Beneficiation						
Flotation agent		Tall oil	Low toxicity product , delivered in bulk liquid so no empty bags or residues	30		
Flocculant (starch based)			Waste material, spillages, empty containers	3	Return Containers to Manufacturer	Dispose to Class A(HH) Landfill
Sodium Silicate		Flotation Reagent	Waste material, spillages, empty containers	40	Return Containers to Manufacturer	Dispose to Class B Landfill
Laboratory		Laboratory Waste	Waste Samples Waste or redundant chemicals	NA	Classified as a Type 1 risk in small amounts. Dispose to Class A Landfill	
4. Ore and Concentrate Management						
Spillage			The ore and concentrate generate spillages, sweepings, etc.	NA	Recover values by adding back to process, all process areas will be bunded to contain spillage, and fitted with spillage pumps to recycle the spillage back into the circuit.	
5. Maintenance including Vehicle Wash Bay						
Effluent Treatment System		Oily Sludge	Oily waste from Workshops, Maintenance Yard, Sludge from Vehicle Wash Bay	NA	Oil recovery – ROSE foundation. Waste to Energy:	Treatment or Disposal to Hazardous Waste Landfill, if

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Unit / Source	Description	Waste Type/Composition	Estimated Quantity, tons/annum	Preferred Management Option(s)	Alternative Management Option(s)
	Oily Wastes	"Empty" oil cans, oily rags	NA	1) Cement Kiln or 2) Dedicated On-Site Facility Oily Cans to Recycling Oily Rags to Landfill, if permitted	permitted
6. Tailings					
Tailings	Residues from flotation process.	Analytical data still required.	3.8Mtpa	Dispose to softs stockpile ensure pH of 8 to 9 and a high alkalinity to minimise possibility of leaching of heavy metals and fluoride.	
7. Effluent Treatment System					
	Bio Sludge	Activated Sludge	NA	Agricultural Use, Compost	Treatment/Disposal to Landfill, if permitted
	Water Treatment Sludge	Mainly Inorganic Solids	NA	Could be used in the manufacture of clay bricks	Treatment/Disposal to Tailings Dam or Class A or B Landfill, if permitted
8. Plant and Office Buildings					
	Office waste	Non-hazardous Paper, packaging waste, plastics, putrescibles	320	Recycle where possible.	Treatment/Disposal of Residues to General Waste Landfill
	Garden waste	Green waste from gardens	NA	Compost	Excess and non-compostable material, dispose to General

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Unit / Source	Description	Waste Type/Composition	Estimated Quantity, tons/annum	Preferred Management Option(s)	Alternative Management Option(s)
	Empty Metal Containers	Soft drink cans, paint cans, empty oil cans, etc.	NA	Recycle to Collect-a-Can	Waste Landfill.
	Scrap Tyres and rubber waste	Scrap tyres from cars, trucks plus conveyer belt waste.	NA	Utilise/Recover to reclaim rubber and recycle steel. Waste to Energy: 1) Cement Kiln or 2) Dedicated On-Site Facility	Dispose to licensed to General Waste Landfill, if permitted. Landfill of tyres whole or quartered to be prohibited: see text and table 3(a)
	Batteries	1) Lead-acid Batteries from Vehicles 2) Dry Cell Batteries, e.g. from cell phones, torches and other equipment.	NA	1) Recycle Lead-Acid Batteries 2) Dry Batteries recycle, if possible.	Treatment/Disposal of Residues to Landfill, if permitted: see text.
	Waste Electric and Electronic Equipment (WEEE)	1) Lamps 2) Other, e.g. Computers, Cell Phones	NA	Recycle through licensed WEEE management company.	Incinerate
	Cleaning Materials	Hazardous Packaging: Drums, Plastic and Paper Bags, "Empty" Containers of Cleaning Agents, Aerosols, Pesticides, etc.	NA	Clean and recycle if possible. Use principles of the Responsible Packaging Management Association of South Africa (RPMASA, 2013)	Dispose to Licensed General or Hazardous Waste Landfill as required by regulations.
	Health care risk waste	Used bandages, plasters, syringes, Sanitary Towels, and Pads etc.	NA	Incinerate or preferably Sterilise, e.g. by Autoclaving before disposal to landfill	Direct Disposal to landfill not permitted

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7.4. ASSESSMENT OF POTENTIAL ENVIRONMENTAL IMPACTS

Table 7-2 below provides an assessment of the impacts associated with the handling, storage and disposal of the different waste types identified above.

From this table, it is evident that there are a number of potentially significant risks (particularly related to human health, air quality, pests and fire) that may be associated with the handling, storage and disposal of waste, both on- and off-site. Furthermore, it illustrates how the use of innovative technology/designs can create instances where the management of a particular waste stream can result in a positive impact (eg recycling initiatives that create new job opportunities and composting which provides additional nutrients for the soil).

Section 8.5 provides some important management approaches/activities to the mitigation of the environmental and health risks identified in this section.

Furthermore, a number of best practice management options are provided for consideration. This specifically relates to the use of cleaner design and production options that relates to an improvement in a company's environmental efficiency and the subsequent improvement of their financial bottom line

As discussed before, these waste management measures/recommendations have been incorporated into Waste Management Plans (WMPs) developed for the construction, operation and decommissioning phases of the Project. These WMPs will then inform management procedures to ensure environmentally friendly and safe collection, transport, handling, storage and disposal of waste generated at the Project site.

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Table 7-2: Waste Management Impacts that May Occur During Construction, Operation and Decommissioning

General Non-Hazardous Waste Management


ACTIVITY	NATURE OF IMPACT/ASPECT	EXTENT	DURATION	IMPACT PHASE	SEVERITY	PROBAB-ILITY	IMPACT RATING	INTERPRET-ATION
Collection of general non-hazardous waste	Air – diesel/petrol fumes.	1	2	2	1	2	6	Moderate Low
Handling and storage of builders rubble, soil, etc.	Air – dust	1	1	1	1	1	4	Low
Re-use of builders rubble	Reduction of waste to landfill. In line with government waste minimization policies. Decrease in use of resources.	1	1	1	1	1	4	Moderate Low
Handling and Storage of general waste, including office waste, garden waste and recyclable wastes including paper, tins, glass and plastics at Salvage Yard	Contamination due to bulking at salvage yard. Wind-blown litter	2	2	2	1	2	7	Low
Recycling or re-use of packaging material and other recyclables	Positive impact – reduction of waste to landfill. In line with government waste minimization policies. Protection of a natural resource.	1	1	1	1	1	4	Moderate Low

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Handling and storage of scrap tyres and rubber waste	Storage - fire hazard Storage – provide receptacles for the collection of rain water which stagnates. Provides receptacle for living and breeding of vermin.	1	2	2	1	1	5	Moderate Low
Disposal to landfill of scrap tyres and rubber waste	Difficulty in handling on landfill – non compactable, fire hazard, vermin breeding receptacles, damage to landfill equipment and do not remain buried. Landfilling will be not be allowed by August 2018.	2	2	2	2	2	6	Moderate Low
Utilisation of scrap tyres and rubber waste in a cement kiln or on On-site facility	<i>Positive Impact</i> – energy recovery, decrease in use of natural resources, and reduction in amounts of solid waste disposed to landfill.	2	2	2	2	2	8	Low
Recycling or re-use of scrap tyres and rubber waste	<i>Positive impact</i> – reduction of waste to landfill/incineration. In line with government waste minimization policies. Decrease in use of resources	2	2	2	2	1	8	Low
Disposal to landfill of general waste	Reduction in landfill airspace	2	2	2	2	1	9	Low
Disposal to landfill of general waste, including	Wind-blown litter.	3	2	2	2	2	9	Low

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office waste, garden waste and paper, tins, glass and plastic waste, scrap tyres and rubber waste								
Composting of vegetation from On-site	Positive – reduction of waste to landfill. In line with government waste reduction policies. Addition of nutrients to soil.	1	2	2	1	2	6	Moderate Low
Re-use of clean storm water run-off	Positive impact – in line with government waste minimization policies. Protection of a scarce natural resource.	1	2	1	1	1	4	Moderate Low

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7.5. WASTE MANAGEMENT

7.5.1. HAZARDOUS AND NON-HAZARDOUS SOLID WASTE DISPOSAL

Disposal is viewed as the last option in the management of waste and should only be undertaken if the avoidance, re-use or recycling of the waste in question is not practical. In such instances, only transport operators or companies that are licensed (by the competent authorities) shall be contracted to remove waste from the Project site. General waste which cannot be either re-used or recycled; shall be sent to a licensed landfill that may accept that category of waste. All hazardous wastes shall be transported to EnviroServ's Vissershok HH Waste Management Facility Landfill in Cape Town. Removal of waste materials at end of mine will be handled as part of the mine rehabilitation closure plan.

7.5.2. CLEANER PRODUCTION AND DESIGN

Cleaner Production and design are possible mechanisms, which could be used to enhance the Projects efficiency particularly during the beneficiation of ores. This would assist any company in attaining an improved environmental efficiency and subsequent improved financial bottom line. The long-term objective for waste prevention, minimisation and recycling is to ensure that minimisation and recycling procedures and practices are adopted by all sectors of society as part of a broader initiative focusing on cleaner production. This includes measures to:

- Harness renewable materials and energy sources or reduce the use of natural resources by using them more efficiently and productively.
- Reduce or eliminate pollution and toxic wastes.
- Deliver equal or superior performance compared with conventional offerings.
- Provide investors, companies, and customers with the promise of increased returns, reduced costs, and lower prices.
- Create quality jobs in management, production, and deployment.
- Clearly, for a project of this size and nature, the proponent has the opportunity to select the technologies for each part of the process that that would be more efficient, thereby minimising waste production.

7.5.3. WASTE MANAGEMENT INFRASTRUCTURE

Certain waste management infrastructure will be required in order for waste to be appropriately managed throughout the lifecycle of the Project. Specific infrastructure and facilities that are applicable to the Project are detailed in the table below. The waste storage facilities required for the Project will be housed within the confines of the Concentrator Plant.

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Table 7-1: Potential Waste Management Infrastructure/Facilities Required

Waste Infrastructure/ Facilities	Description
Chemical and Waste Storage Facilities	<p>Storage facilities will be necessary for hazardous chemicals and any hazardous wastes used and generated during the construction, operation and decommissioning phases of the Project. Note that storage facilities will require either a basic assessment or possibly a full EIA assessment, although these can be included in the final authorisation for the whole facility: (Draft NEMWA Amendment, Government Gazette 33880, 14th December 2010). Specific requirements that must be considered when designing such facilities include:</p> <ul style="list-style-type: none"> • They must be built in accordance with requirements from the Department of Environmental Affairs and will include linings, bunds, roofing (except for large stockpiles such as ore, rock and tailings). • A hazardous chemical and waste storage facility should include a low permeability surface, preferably concrete, that is protected from the ingress of storm water from surrounding areas to ensure that accidental spillage does not pollute local soil or water resources. • All storage areas must also be properly demarcated and, if the material is hazardous, there should be adequate labelling and security at the facility. • A facility must provide for separate storage of incompatible chemicals or wastes (ie acids and bases; calcium cyanide and acid) and for flammable materials. • The migration of spillage into the ground and groundwater regime around storage areas must be prevented. This is particularly important for temporary storage areas that may be required during construction. • Flammable materials must be kept separate from other hazardous materials and be well ventilated in order to prevent build-up of explosive vapours and gases.
A Disposal Facility for Uncontaminated Construction Waste.	Uncontaminated construction waste (Inert waste or very low risk waste) can be disposed of at a Class D site. Alternatively, the material could be used to landscape the Project area to ensure the correct run-off of rainfall from clean areas and its diversion from potentially contaminated areas to a holding dam. In addition, construction waste could be used as cover material in the General Waste Site or be crushed and used as backfill or building bunds, etc.
A Potable Water Treatment Plant	Analysis of the aquifer water show that dissolved solid levels are all within the prescribed limits of SANS 241:2005 Class 1 Drinking Water Specification. As a result, treatment by flocculation, filtration and chlorination will suffice (Braaf, 2014) A potable water treatment plant for the purification of water for the offices and plant a flocculent, pH correction, carbon filtration to remove any trihalomethanes generated in the first stage chlorination step. Usually, any solids generated for disposal can be disposed to a general waste, if demonstrated to be a low hazard, or, alternatively, as hazardous waste
Water Containment Dam(s).	Dams for storage of potentially contaminated water such as the stormwater

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	dam(s) which will receive all process and in pit runoff as well as general runoff around the mine.
General Waste and a Central Recycling and/or Reclamation Yard.	Storage Areas for General Waste and a Central Recycling and/or Reclamation will be necessary. A Central Recycling area would recycle and recover general waste materials and possibly collect and store selected generic hazardous wastes such as used oil, fluorescent tubes, batteries and electronic wastes for bulking and final collection for recycling or possibly disposal.
Lubricating oils from workshops and other areas.	Lubricating oils from workshops and any other areas can be stored on-site and the waste collected for recycling by a company approved by the Recycling Oil Saves the Environment Programme. Up to 80% of South Africa's recoverable oil is already collected by this country wide programme. An area at the central recycling/reclamation yard would be required for storage
On-site health care risk waste.	As the amount of health care risk waste, including sanitary waste generated at the proposed Facility, is expected to be very low, it is recommended that the licensed removal service be used to collect and remove this waste from the site.
Treatment Area for Potentially Contaminated Soil.	A Treatment Area for Potentially Contaminated Soil should be made available. Soil that is inadvertently contaminated with petroleum hydrocarbons, eg lubricating oil, can be treated by biodegradation technologies to a standard that would be acceptable for using as a fill, as landfill cover or even to bulk compost. A central facility is normally preferable to using in-situ technologies where less control can be maintained over the processing. Bioremediation of contaminated soil will be undertaken at the onsite EEM facility unless quantities exceed the carrying capacity of the site, in which case, this soil will be transported to HH facility.

7.5.4. IMPLEMENTING THE WASTE HIERARCHY

7.5.4.1. METHODS TO MINIMISE WASTE PRODUCTION

- Specifications of construction material quantities for contractors are to be as accurate as possible to avoid the over-ordering of materials and the potential for excess waste.
- The ordering of stock during the operation of the mine will be regularly reviewed to ensure efficient stock control and to avoid wastage.
- The use of degreasers is regulated in workshop areas to ensure the efficiency of the oil-water separator.
- All waste areas are to be clearly identified and marked as waste storage areas. This includes bins and other receptacles for domestic waste, which would be marked according to the type of waste being accepted (eg scrap metal, oil filters and oily rags, other recyclables, general waste, etc.).
- Clear written instructions are to be erected at appropriate locations detailing recycling and waste separation information. There shall be no long term storage of any waste materials on the Project site.

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7.5.4.2. RECYCLING

- Facilities should be provided for recycling paper and cardboard.
- Used metals should be stored for reuse or recycled as scrap metal and placed into large skip bins, which shall be collected by a metal recycler as sufficient quantities are available.
- Waste Oil should be collected within bunded fuel storage, refueling and maintenance areas and stored within waste oil bins once it has passed through an oil-water separator. The waste oil shall be removed from site by a licensed waste oil contractor for recycling.
- Batteries are removed from site for delivery to a facility able to despatch them to an appropriate recycling facility.
- The Environment Control Officer shall undertake regular inspections of waste storage locations to check that appropriate separation and collection of waste is being undertaken.
- EEM will maintain a register of recycled material at the Mine site.

7.5.4.3. REUSE

Opportunities for the re-use of materials on site should be evaluated on a regular basis. Investigations shall be undertaken for the use of effluent from the site office, bathhouse and other amenities once treated to be re-used as irrigation water on rehabilitation and landscaped areas in accordance with relevant standards.

7.5.4.4. OTHER RECOMMENDATIONS


Training and Awareness

- Waste management requirements are incorporated into existing induction and awareness training systems.
- Additional waste specific communication will be included in Tool Box Talks and rolled out across the site on an as required basis.
- The site requirements for waste management are displayed at prominent positions across the mine in the form of charts outlining the correct disposal methods for the different waste streams.

7.5.4.5. WASTE INVENTORY

A comprehensive waste inventory containing information on all wastes generated, handled and disposed of, whether on or offsite is maintained by the Environment and Community Officer. The waste inventory is a database that focuses on the procedures for safe storage, handling, treatment, recycling and disposal of non-mineral wastes. This inventory will be further developed and updated over the first year of mine operation.

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7.5.4.6. MONITORING

Waste handling and storage facilities shall be managed by operational staff within each department. Waste quantities, including hazardous materials (eg waste oil/grease), are monitored accordingly by operational staff and collection schedules are arranged as required.

7.5.4.7. FACILITY INSPECTIONS AND AUDITS

Onsite waste storage, treatment and disposal facilities are inspected on a regular monthly basis to ensure compliance with procedures. These facility inspections are incorporated into existing workplace inspections and carried out by the relevant area personnel.

7.5.4.8. EMERGENCY RESPONSE

A suitable emergency response procedure must be in place (eg provision of appropriate absorbents) for the clean-up of any accidental spills. Note that spilled materials are classified as wastes.

With respect to this, the following should be noted:


- Separation of incompatible materials (so that they cannot come into contact with one another) is essential (eg alkali and acid materials). The following standard is available - SANS 310-1:2007, Storage Tank Facilities for Hazardous Chemicals P1, Above Ground facilities for Non-flammable Substances; and
- SABS approved tanks should be utilised in all cases. These tanks should have installation certificates, as well as annual certificates when they are inspected
- Any complaints as to the management regarding waste generated at the site will be directed to the relevant Department Manager and the Environment Control Officer for investigation and rectification. Complaints and actions arising from a complaint will be recorded in a complaints register to be maintained by the Environment Control Officer.

7.5.5. CONCLUSION

From an environmental point of view, the Project could pose a significant risk to human health and the environment, if the wastes are not managed in an environmentally sustainable manner. Some key risks identified in terms of this Section include:


- Incorrect storage of hazardous waste could result in contamination of air, soil and water resources.
- Disposal of hazardous waste to landfill will result in a reduction in landfill airspace, the production of leachate and reduction in quality of leachate.
- Emissions from incinerator are likely to impact on air quality.
- Health risks associated with personnel exposure to hazardous, infectious and/or toxic wastes.

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Although significant risks have been identified, these are generally associated with poor management practices and the absence of mitigation measures to reduce the chance of such impacts occurring. As such, should the prescribed mitigation measures, identified in the previous Section, be suitably implemented, the residual risk that waste streams generated at the Site would pose to the environment and human health should be dramatically reduced or avoided altogether. In addition to this, should EEM decide to employ/implement some of the innovative design/technologies presented in this Section (i.e. clean technologies, energy recovery measures, recycling practices etc), it is possible that a number of a positive impacts could stem from the Project.

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8. ENVIRONMENTAL IMPACT ASSESSMENT METHODOLOGY


The anticipated impacts associated with the proposed project have been assessed according to Braaf Environmental Practitioners impact assessment methodology which is presented below. This methodology has been utilised for the assessment of environmental impacts where the consequence (severity of impact, spatial scope of impact and duration of impact) and likelihood (frequency of activity and frequency of impact) have been considered in parallel to provide an impact rating and hence an interpretation in terms of the level of environmental management required for each impact.

This matrix thus provides a rating on a scale of 1 to 16 (moderate low, low, high or very high) based on the consequence and likelihood of an environmental impact occurring.

Natural and existing mitigation measures, including built-in engineering designs, are included in the pre-mitigation assessment of significance. Measures such as demolishing of infrastructure, and reinstatement and rehabilitation of land, are considered post-mitigation.

Table 8-1: Criteria for assessing significance of impacts

CATEGORY	VALUE	DESCRIPTION OR DEFINITION
Extent		
Extent to which the impact will occur		
Site	1	Only as far as the activity
Local	2	Site and immediate surroundings
Regional	3	Impact on a regional scale
National/ International	4	National or International
Duration		
The term or time period during which the impact is expressed, not the time until the impact is expressed. Where necessary, the latter is separately specified.		
Temporary	1	This is very short term, usually a construction impact
Short term	2	During the operational activities
Long term	3	During closure / decommissioning of the operation
Permanent	4	Post-closure phase
Impact Phase		
The time period until the impact is expressed. This is not the time period during which the impact is expressed.		
Temporary	1	This is very short term, usually a construction impact
Short term	2	During the operational activities
Long Term	3	During closure / decommissioning of the operation
Permanent	4	Post-closure phase
Severity		
The magnitude of the potential impact		
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Very Low	1	Natural, cultural and social functions are not affected
Low	2	Affected environment is altered but natural, cultural, and social Functions and process continue both in a modified way
Moderate	3	Natural, cultural and social functions and processes are altered to The extent that it would temporarily cease
High	4	Natural, cultural and social functions and process are altered to the Extent that it would permanently cease
Probability	The likelihood of the impact occurring	
Improbable	1	Low possibility because of design or historic experience
Probable	2	Distinct probability to occur
Highly probable	3	Most likely to occur
Definitely	4	Will occur regardless of any prevention measures and/or there is a History of (an) incident/s and/or complaints

Table 8-2: Interpretation of Impact Rating


No impact		
Moderate Low	1-6	No management required
Low	7-10	Maintain current management
High	11-14	Maintain current management
Very High	15-16	Improve current management

SIGNIFICANCE = extent+ duration+ severity +probability

The impacts identified below are as a result of I&AP concerns raised, project team identification, initial baseline specialist reports and discussions regarding potential impacts and mitigation measures. In certain instances, specialists applied their own impact rating methodology.

Impact Assessment (In fulfilment of Section 39(3)(b)(i)(ii) and (iii) of the MPRDA Act read together with Regulation 50(c) and (e))

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8.1. FLORA IMPACTS

Immediate and direct impacts on plant diversity that may result from the proposed mining and road construction in this area include:

- The alteration and degradation of currently natural habitat within the main footprint area, including the disruption of critical ecological linkages (only partially restored after rehabilitation);
- The loss of site subpopulations of plant Species of Conservation Concern (SCC), and potential local (site) extinction of these species; and
- The fragmentation of the landscape as a whole, including significant loss of habitat mapped as CBAs.


Indirect impacts of mining include immediate spatial impacts on the biodiversity of the surrounding landscape (such as the “sink effect” outlined below), and temporally delayed impacts that will only become apparent through time. Indirect impacts are nearly always difficult to measure and observe, and would require extensive pre and post development measurements in order to document them. Some of the main indirect impacts may include:

- Disruption of metapopulation structure and dynamics for specific species, with potential consequences for their survival in the local or regional landscape beyond the mine. This impact includes the “sink effect”, whereby seeds from reintroduced topsoil and surrounding natural areas arrive in the rehabilitation areas, but due to unsuitable soil chemistry and structure are unable to establish and/or grow to maturity, reducing the overall availability of seed (reproductive potential) in the area over time, and thus severely reducing or even eliminating local populations of these species.
- Disruption of key ecological processes – including invasive alien Argentine ants and their negative impacts on seed dispersal. Also included here is windblown sand impacting on adjacent sensitive areas.
- Reduction in the total amount of available habitat for species, with potential impacts on species whose minimum viable area thresholds for persistence are compromised.
- Impacts related to the dewatering of the pit and the creation of 4m deep trenches downstream of the pit where this water will be reintroduced to the subsoil aquifer. This may impact on plant species downstream (extra water), and in the areas where the drawdown cones around the pit make less soil water available to plants outside the direct development footprint.
- Loss of specialised pollinators and seed dispersers, with resultant impacts on both seed set and seed dispersal of certain plant species.
- Facilitated spread of alien invasive plants. Soil disturbance is known to be a primary facilitator of alien invasive plant spread.
- Loss of mapped CBAs, which may have knock on implications for conservation planning in the region, as current CBAs are designed to be the least “land hungry” layouts required in order to achieve conservation targets. Thus if a CBA is lost the total available area for conservation decreases, necessitating a recalculation of targets and optimum CBA layouts on the remaining natural areas.
- Disruption of natural fire regime in surrounding areas of natural vegetation.

Impact Assessment

The nature of the impact would be medium to long term loss of natural vegetation in the project area. The sources of loss would be all mining related pits, storage areas, dams, buildings and roads. The impact would occur at the local (site) scale, and would take place when topsoil is stripped. The impact would not be reversed until the same

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area has regained a significant degree of the original ecological functionality, at which point it could be termed to be “adequately rehabilitated”. About 75ha of High sensitivity vegetation would be lost (11%), about 10ha would be of Low sensitivity vegetation (1%), and the remainder (590ha; 88%) would be of Medium sensitivity. No Critically Endangered vegetation types would be impacted.

It is unlikely that more than 75% of the floristic diversity will return in less than twenty years after the cessation of mining, and some of the more specialised species are likely to take longer to return, and not until soil chemistry and structure is functionally similar to the original, undisturbed soils (which may take many decades). Full ecological functionality may thus take in excess of fifty years.

The proposed 5km powerline link will have a Very Low negative botanical impact, and is not likely to result in loss of more than 1ha of natural vegetation.


The proposed 11km access road will result in the loss of at least 15ha, and probably at least 18ha, of natural vegetation, including at least 9 SCC. Overall botanical impact of this road is Medium negative at a regional scale.

Proposed mitigation measures: Primary mitigation would involve use of the best rehabilitation measures possible, as determined by Vula Environmental Services, who has undertaken extensive rehabilitation of the old Foskor mine some 17km northwest of this site. All disturbed areas should be rehabilitated once disturbance to these areas has ceased (in the case of the pit this would be ongoing from 33 months), with the possible exception of the access road, which will presumably remain. Secondary mitigation would include Search and Rescue for all translocatable plant Species of Conservation Concern from within the development footprints. Critical additional mitigation for this primary impact would be a biodiversity offset, in order to further reduce the residual medium negative impacts.

Assessment of impact: The proposed development would have a High negative impact, before mitigation. Primary and secondary mitigation (ongoing vegetation rehabilitation and Search & Rescue respectively) could possibly reduce the overall impact to Medium negative. An appropriate biodiversity offset could further reduce the residual medium negative impacts to low negative.

Statement of acceptability: Currently natural vegetation will be lost, and all of this is in areas mapped as CBAs (which are flags in terms of the area’s ecological value), 88% of the development will take place in areas of Medium botanical sensitivity, and only 11% in areas of High sensitivity. The impact is acceptable provided that all essential mitigation is put in place, and a biodiversity offset is strongly recommended (but is not factored into the assessment) in order to help minimise the unavoidable Medium negative residual impacts of loss and degradation of habitat.

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Summary Of Impact

Nature: Loss of natural vegetation in project area		
	Without mitigation	With mitigation (excluding biodiversity offset)
Extent	Local	Local
Duration	Long Term	Medium-Long
Magnitude/Severity	High	Moderate
Probability	Definite	Probable
Interpretation of the Impact Rating	High	Medium
<p>Mitigation:</p> <p>Full rehabilitation of all disturbed areas (except possibly the access road) after cessation of use, using the best available methodology. Strip mined areas to be rehabilitated continually, starting 33 months after first mining.</p> <p>Search and Rescue of all translocatable plant Species of Conservation Concern from within the development footprints.</p> <p>Appropriate biodiversity offset, which could further reduce impacts to Low negative</p>		


Impact Assessment

The loss of site subpopulations of plant Species of Conservation Concern (SCC), and potential local (site) extinction of these species.

Description of impact: The nature of the impact would be medium to long term loss of at least 4 plant SCC in the mining area, and loss of 9 SCC in the access road area.

Seventeen plant Species of Conservation Concern (SCC; Raimondo et al 2009 and annual online updates at redlist.sanbi.org) were recorded in the greater study area, but only four of these were confirmed from within the project area, excluding the access road footprint. Seven of the SCC have only small populations (<100 plants) within the greater study area, and only one of these (*Echiostachys spicatus*) was recorded from within the main project footprint (with fewer than 5 plants). Only two SCC have substantial populations within the main footprint (*Caesia sabulosa* and *Lampranthus densifolius*), but the percentage of the total site population within the footprint

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for both these species is probably less than 5%, meaning that the potential loss of these focus area populations is not likely to be very significant in either a site or regional perspective. All four of the plant SCC within the main project footprint are either bulbs or succulents and could thus potentially be translocated fairly successfully.

The proposed 11km access road crosses a currently largely pristine area of vegetation, and at least seven additional plants of SCC occur within the road footprint, plus two of those in the main footprint area, making a total of 9 SCC. The additional plant SCC in the access road area are *Leucospermum hypophyllocarpodendron ssp. canaliculatum* (Vulnerable), *Leucospermum rodolentum* (Vulnerable), *Lachnaea grandiflora* (Vulnerable), *Macrostylis crassifolia* (Vulnerable), *Lampranthus densifolius* (Data Deficient), *Aspalathus ternata* (Near Threatened) and *Thamnochortus punctatus* (Declining).

The impact would occur at the local (site) scale, and would take place mainly when topsoil is stripped. The impact would not be reversed until the same area has been functionally and adequately rehabilitated, but this may take many decades.


Proposed mitigation measures: Avoidance of as many of the populations of SCC would be the primary mitigation, in line with the mitigation hierarchy. This has been serendipitously achieved in terms of the mine footprint, as most of the SCC are in Hopefield Sand Fynbos to the east of the mine. Search and Rescue of plants of the only two commonly recorded and translocatable SCC from within the mine footprint (*Caesia sabulosa* and *Lampranthus densifolius*) should be undertaken prior to each strip being cleared. There is little that can be done to mitigate impacts further, nor to mitigate this impact for the proposed access road, as most of the SCC in the latter area are not translocatable.

Assessment of impact: The currently proposed development would have a Low- Medium negative impact, before mitigation, and Low negative after mitigation (see above). Duration is long term as it is expected to take more than 15 years for more than 50% of the SCC to re-establish viable populations in the mined areas, even with normal rehabilitation as mitigation. Intensity is High rather than Medium before mitigation, but all of the SCC in the mining area should maintain healthy subpopulations on the non developed portions of the site, and some should re-establish viable populations within 15 years, suggesting that a case for Medium intensity (after mitigation) could also be made.

Summary Of Impact

Nature: loss of local subpopulations of 4 plant Species of Conservation Concern (SCC) in the mining footprint, and of 9 SCC in the access road footprint.		
	Without mitigation	With mitigation (excluding biodiversity offset)
Extent	Local	Local
Duration	Long Term	Medium-Long

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Magnitude/Severity	High	Moderate
Probability	Definite	Definite
Interpretation of the Impact Rating	Low-Medium	Low
Mitigation: Full rehabilitation of all disturbed areas (except possibly the access road) after cessation of use, using the best available methodology. Strip mined areas to be rehabilitated continually, starting 33 months after first mining. Search and Rescue of all translocatable plant Species of Conservation Concern from within the development footprints. Appropriate biodiversity offset, which could further reduce impacts to Low negative		

Statement of acceptability: Low – Medium negative prior to mitigation, and acceptable at this level. The impact would be readily reduced to a more acceptable Low negative with the same mitigation as recommended for the primary impact (loss of habitat).


Impact Assessment

Description of Impact: All of the approximately area to be impacted by the development mapped as a Critical Biodiversity Area (CBA) in the Saldanha Municipality Fine Scale Conservation Plan. The CBAs are mapped as such for various reasons, including the recorded presence of plant SCC, to include habitat and soil type gradients, in order to include representative samples of vegetation types or habitats, and / or for ecological connectivity (Pence 2008).

The loss or degradation of significant extents of designated CBAs is not supported by CapeNature, especially in areas that currently have undisturbed natural vegetation, as these areas are designed to ensure the most efficient (least “land take”) layouts for achieving provincial and national conservation targets, and any loss thus has knock-on effects elsewhere in the region, as the entire analysis then has to be rerun without the areas concerned, which means that additional areas will need to be found to meet the targets (Maree & Vromans 2010). As these analyses cannot be regularly updated (due to capacity and cost constraints, among other reasons) the loss of CBAs thus undermines the validity of the entire mapping exercise. As noted in the Mining and Biodiversity Guideline (DEA 2013) “CBAs are required to meet biodiversity targets for ecosystems, species and ecological processes, as identified in a systematic biodiversity plan. The desired management objective for CBAs is for them to remain in a natural or near natural ecological condition, i.e. to prevent loss or degradation of habit in these areas, and CBAs are “biodiversity priorities that must be afforded special attention in assessing and evaluating impacts of prospecting or mining”.

The loss of ecological connectivity caused by mining will be most relevant during the mining and initial (first 5 years) rehabilitation phases, as thereafter some degree of connectivity will be restored as the vegetation recovers, with increasing levels of connectivity expected as revegetation improves with time. The structural and floristic

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diversity of a mined landscape is likely to be significantly different from a pristine landscape for many decades (possibly for over fifty years), implying that full ecological connectivity and functionality will not be restored for a similar duration. Ecological connectivity and functionality is most easily measurable at the species level, and what is functional and connected for one species may not be so for another species. Connectivity may also be inferred at an ecosystem level, but given the complexity of ecosystems this will always be a generalisation. The loss of connectivity may have particularly severe negative impacts on fossorial (burrowing) micro and megafauna, and we do not yet know how this may impact on the vegetation, but it can be assumed that they help aerate the soils, which is usually a positive for plant growth. Some may also help disperse propagules such as bulbs and corms.

Proposed mitigation measures: The proposed strip mining means that no more than 60ha will be mined at any one time, which will help reduce the loss of ecological connectivity across the site. Starting in the fourth year of operation there will also be rehabilitation of the previously mined strips, which will help maintain some sort of connectivity across the pit area. There is however little to be done to avoid the loss of connectivity caused by the large softs stockpile (14.9ha footprint), although most of this will eventually end up being backfilled into the pit, and thus after mining has ceased the loss of connectivity caused by the stockpile will be reduced to levels lower than during operation, although the disturbed maximum footprint of the stockpile will remain.


Assessment of impact: The currently proposed development would have a Medium negative impact on ecological connectivity, before mitigation, and Low - Medium negative after mitigation. Duration is by definition long term as it is expected to take more than 15 years for more than 50% of the species to re-establish viable populations in the mined areas, and adequate ecological connectivity cannot be expected again until at least this 50% level is achieved. Intensity is Medium, and extent is regional. Duration of impact is reduced by rehabilitation (commencing in year 4) and by the fact that mined strips will be no larger than 60ha at a time, and rehabilitation is likely to have partially restored connectivity within 10 - 15 years of cessation of mining each strip.

Statement of acceptability: Medium negative, and acceptable prior to mitigation. The impact may be reduced to a more acceptable Low negative after mitigation.

Summary Of Impact

Nature: Loss of ecological connectivity, and loss or degradation of at least of portion of a CBA.		
	<i>Without mitigation</i>	<i>With mitigation (excluding biodiversity offset)</i>
<i>Extent</i>	Local & Regional	Local & Regional
<i>Duration</i>	Long Term	Medium - Long
<i>Magnitude/Severity</i>	Medium	Low-Medium
<i>Probability</i>	Definite	Definite

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Interpretation of the Impact Rating	Medium	Low- Medium
<p>Mitigation:</p> <p>Full rehabilitation of all disturbed areas (except possibly the access road) after cessation of use, using the best available methodology. Strip mined areas to be rehabilitated continually, starting 33 months after first mining.</p> <p>Mining of no more than 60ha strips at a time</p>		

Impact Assessment

The indirect impacts of mining include immediate spatial impacts on the biodiversity of the surrounding landscape, and temporally delayed impacts that will only become apparent through time and which are often a result of the direct impacts. Indirect impacts are nearly always difficult to measure and observe, and would require extensive pre and post development measurements in order to document them. Because of these data deficiencies the indirect impacts are assessed together, as one. Some of the main potential indirect impacts include:


Disruption of metapopulation structure and dynamics for specific species, with potential consequences for their survival in the local or regional landscape beyond the mine. This impact includes the “sink effect”, whereby seeds from reintroduced topsoil and surrounding natural areas arrive in the rehabilitation areas, but due to unsuitable soil chemistry and structure are unable to establish and/or grow to maturity, reducing the overall availability of seed (reproductive potential) in the area over time, and thus severely reducing or even eliminating local populations of these species.

Disruption of key ecological processes – including invasive alien Argentine ants and their negative impacts on seed dispersal. Also included here is windblown sand impacting on adjacent sensitive areas. Argentine ants (*Iridomyrmex/Linepithema humile*) are a worldwide problem, as these aggressive alien species displace indigenous ants, and in the Fynbos this is a problem as many Fynbos plants have co-evolved with the indigenous ants, which disperse and bury their seeds in their underground nest. The alien ants eat the attractant on the seed and then just leave the seeds on the ground, which are then eaten by birds and rodents, making the seeds unavailable for regeneration, which can lead to complete failure of recruitment for these species. Argentine ants are strongly associated with human development, and with refuse and structures in particular, and fortunately seldom spread more than 50m into undisturbed vegetation, which limits their impacts to the immediate surrounds of disturbance.

Reduction in the total amount of available habitat for species, with potential impacts on species whose minimum viable area thresholds for persistence are compromised. This is not likely to be a major issue in this area as there is ample nearby natural habitat.

Impacts related to the dewatering of the pit and the creation of 4m deep trenches downstream of the pit where this water will be reintroduced to the subsoil aquifer. This may impact on plant species downstream (extra water, which may lead to unnatural dominance of certain species capable of exploiting this), and in the areas where the drawdown cones around the pit make less soil water available to plants outside the direct development footprint. The latter may result in death of many plant species in the impacted area. This needs to be closely monitored, as it

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could be a significant indirect negative impact on the vegetation within up to 300m of the pit. The digging of the 4m deep trenches would be a direct negative impact on the vegetation.

Loss of specialised pollinators and seed dispersers, with resultant impacts on both seed set and seed dispersal of certain plant species. Fortunately the large areas of intact natural vegetation around the project area should ensure that key pollinators and seed dispersers persist in the area, and the impacts are thus likely to be negligible.

Facilitated spread of alien invasive plants. Soil disturbance is known to be a primary facilitator of alien invasive plant spread, and thus all aspects of the proposed project can be expected to facilitate invasion of alien plant species, including grasses, herbs, shrubs and trees. This is relatively easily mitigated, in the form of alien invasive plant management, but it needs to be ongoing for the duration of the project, and invasives need to be removed as soon as possible to limit overall negative impacts. The access road also needs to be part of the managed area, as its length through otherwise pristine vegetation means that it could have a significant negative impact in terms of introduction of alien invasive vegetation.

Loss of mapped CBAs, which may have knock on implications for conservation planning in the region, as current CBAs are designed to be the least “land hungry” layouts required in order to achieve conservation targets. Thus if a CBA is lost the total available area for conservation decreases, necessitating a recalculation of targets and optimum CBA layouts on the remaining natural areas.


Disruption of natural fire regime in surrounding areas of natural vegetation. The fire history in the surrounding areas of natural vegetation is not known, although it appears that most of the vegetation has not burnt in the last ten years, and in most nearby areas this fire return interval would appear to be longer than twenty years. The only one of the four vegetation types in the area that really requires fire for optimum ecological functioning is Hopefield Sand Fynbos, and much of the vegetation of this type in the greater study area is now overdue for a fire, being more than twenty years old. The infrastructure associated with the proposed mine means that fire is likely to be suppressed in the immediate surrounds of the mine, but this should not have a significant negative impact on the vegetation, as only a small portion (<15%) of the bordering vegetation is in fact Hopefield Sand Fynbos. A fire management plan should ensure that the Hopefield Sand Fynbos up to 100m from the edge of the mine area burns at the appropriate intervals (which are once every 12 – 15 years).

Proposed mitigation measures: Many of the indirect impacts cannot be effectively mitigated, but the impacts of windblown dust can usually be mitigated by erecting wind fences if necessary, and can usually be avoided or at least minimised by minimising the total extent of exposed soil. In the case of the strip mining the exposed areas are likely to be less than 60ha, but some of the stockpiles (softs and topsoil) may be significantly larger than this.

Annual monitoring of the vegetation around the project area needs to be undertaken, and in particular in the areas where windblown dust may be an issue, where the drawdown cones caused by the dewatering boreholes around the pit may impact on the natural vegetation outside the pit, and where the surplus water is reintroduced into the upper aquifer. This would probably be best undertaken by suitably qualified members of the vegetation rehabilitation team, or otherwise by a botanical consultant.

Alien invasive vegetation management needs to be part of the ongoing rehabilitation program, and must continue for the Life of Mine and beyond, until mine closure and land handover. The work would be ideally undertaken by the rehabilitation contractors, and they should remove all invasive alien plant species as and when they are observed. It should not be necessary to use herbicides, and indeed this is not desirable, due to the impacts on nearby non-target plants.

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It is not possible to mitigate for the loss of areas mapped as CBAs. The impacts of Argentine ants are best mitigated by making sure that all refuse (and particularly organic and food waste) is disposed of in bins that are located well within the development footprint (not on the periphery) and are regularly emptied at formal municipal dumps.

A fire management plan should ensure that the Hopefield Sand Fynbos up to 100m from the edge of the mine area burns at the appropriate intervals (which are once every 12 – 15 years).


Assessment of impact: The currently proposed development is likely to have an overall Medium negative impact in terms of indirect impacts, although some of the potential impacts are difficult to assess and monitor, with the exception of dust and its impacts, changes in soil moisture, and alien invasive vegetation. Duration is long term as it is expected to take more than 15 years for more than 50% of the species to re-establish viable populations in the mined areas, which will in turn then minimise dust moving into sensitive areas. Intensity is Medium, and extent is mainly local. Duration of impact is reduced by rehabilitation, and rehabilitation is likely to have partially restored connectivity within 15 years of cessation of mining. Alien vegetation management should be ongoing until mine closure, and should be able to effectively restrict that particular impact to Low negative. The changes to soil moisture and the impacts on vegetation in these areas may have a Medium negative at a local scale, and need to be closely monitored.

Statement of acceptability: Medium negative, and acceptable prior to mitigation, although can and should be mitigated. The impact may be reduced to Low negative after mitigation.

Summary of Impact

Nature: Indirect impacts, including dust, invasive alien vegetation spread, changes to nearby soil moisture, disruption of ecological processes and metapopulation dynamics		
	<i>Without mitigation</i>	<i>With mitigation (excluding biodiversity offset)</i>
<i>Extent</i>	Local & Regional	Local & Regional
<i>Duration</i>	Long Term	Medium - Long
<i>Magnitude/Severity</i>	Medium	Low
<i>Probability</i>	Definite	Definite
<i>Interpretation of the Impact Rating</i>	Medium	High
<i>Mitigation:</i>		

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Full rehabilitation of all disturbed areas (except possibly the access road) after cessation of use, using the best available methodology. Strip mined areas to be rehabilitated continually, starting 33 months after first mining.

Mining of no more than 60ha strips at a time

Ongoing alien invasive vegetation management until mine closure

Annual monitoring of vegetation in dewatering drawdown cones and in water reintroduction areas

Erection of wind fences if windblown dust and sand becomes an issue

All organic refuse to be disposed of in regularly cleared bins placed well inside the development footprint and not on the perimeter

Fire management plan for all natural vegetation surrounding the project area, to be approved by SANParks. The Hopefield Sand Fynbos portions bordering the project area (in the south and southeast) are the only areas requiring fire during Life of Mine, and this should be part of the plan.

Overall botanical impacts of the proposed project (mine, road and powerline) are likely to be High negative prior to mitigation, and Medium negative after standard mitigation. An appropriate biodiversity offset could reduce the overall botanical impact to Low negative, by means of securing conservation priority areas of threatened natural habit in the region.


8.2. AVIFAUNA

Each of the three phases of the greater mining project (construction, operation and decommissioning/closure) will have a suite of impacts on both resident and peripheral bird communities. Levels of habitat modification in the proposed pit area during the operational phase of the mine will be extreme, involving total loss of functional habitat. Although some aspects of the local avifauna may persist in the surrounding areas, the species most severely affected by all three phases of the mine will be those most closely linked with and dependent on the availability of relatively pristine, natural vegetation – most importantly Black Harrier, Southern Black Korhaan, Hottentot Buttonquail, and a suite of endemic passerines.

The directly impacted areas of Strandveld and Fynbos cannot reasonably be considered as safe and serviceable habitat for any of these key species for the lifetime of the mine, hence the actively mined area will effectively be lost habitat. Such loss of habitat is likely to be expressed at least for the medium to long-term, and perhaps more permanently. While some level of rehabilitation of the natural vegetation may be possible after the closure of the mine, this is unlikely to restore the habitat to its original functional levels, sufficient to maintain densities or diversities of birds comparable with those supported now.

Hence, at this provisional stage, the impacts of all three phases of the mine are generally considered to be of Moderate-Low significance, except for the imposed destruction of habitat and the risk of mortality for key species which could be of High significance. However, there are mitigation options available for most impact factors which should reduce the impacts of mine to sustainable levels.

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Impact Assessment

Construction Phase

The Avifauna assessment identified the following potential impacts as a result of the project activity which includes:

- Disturbance associated with noise, movement and artificial light generated by construction activities.
- Loss of avian habitat through site clearance and establishment of lay-down and assembly areas during construction activities.
- Possible chemical pollution associated with the construction process.

Summary of Impact


Nature: Construction activities would result in a direct negative impact on the avifauna, with noise and visual disturbance affecting all species, but especially Southern Black Korhaan, Black Harrier, Hottentot Buttonquail, a suite of endemic Strandveld/Fynbos passerines, and possibly a suite of cliff-nesting raptors.

	<i>Without mitigation</i>	<i>With mitigation (excluding biodiversity offset)</i>
Extent	Local	
Duration	Temporary	
Magnitude/Severity	Low	
Probability	Definite	
Interpretation of the Impact Rating	Medium-Low	Low

Mitigation:

Minimising the disturbance impacts associated with the construction of new facilities around the periphery of the existing mine. This to be done by abbreviating construction time wherever possible, scheduling construction activities around avian breeding schedules where necessary and possible (to be determined by a pre-construction walk-through of the areas targeted for development), minimising the incursion of temporary storage lay-down areas into undeveloped Fynbos/Strandveld vegetation, minimising levels of noise, air, water and light pollution stemming from the construction process, and keeping the aggregate size of the inclusive development footprint as small as possible.

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Reducing disturbance impacts of the operating mine, by minimising levels of associated noise, air, water and light pollution.

Nature: Construction activities (material preparation and lay-down areas, temporary personnel facilities) would result in a direct negative impact on the avifauna, with permanent loss of optimal habitat for all species, but especially Southern Black Korhaan, Black Harrier, Hottentot Buttonquail and a suite of endemic Strandveld/Fynbos passerines.

	<i>Without mitigation</i>	<i>With mitigation (excluding biodiversity offset)</i>
Extent	Site only	
Duration	Temporary	
Magnitude/Severity	Low	
Probability	Definite	
Interpretation of the Impact Rating	Moderate-Low	Low

Mitigation:

Minimising the disturbance impacts associated with the construction of new facilities around the periphery of the existing mine. This to be done by abbreviating construction time wherever possible, scheduling construction activities around avian breeding schedules where necessary and possible (to be determined by a pre-construction walk-through of the areas targeted for development), minimising the incursion of temporary storage lay-down areas into undeveloped Fynbos/Strandveld vegetation, minimising levels of noise, air, water and light pollution stemming from the construction process, and keeping the aggregate size of the inclusive development footprint as small as possible.


Impact Assessment

Operational Phase

The Avifauna assessment identified the following potential impacts as a result of the project activity which includes:

- Disturbance associated with mining activities, including noise, movement and artificial lighting.

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- Loss of avian habitat to the inclusive mined area, and all additional infrastructure i.e. roads, dams, processing plant, dump sites etc.
- Mortality in collisions with power lines or by electrocution on new power infrastructure.
- Unintended creation of new wetland habitats such as pollution control and tailings dams.

Summary of Impact

Nature: Ongoing mining activities would result in a direct negative impact on the avifauna, with substantial disturbance and degradation/destruction of habitat within and peripheral to the mine, affecting all species, but especially Southern Black Korhaan, Black Harrier, Hottentot Buttonquail, a suite of endemic Strandveld/Fynbos passerines, and possibly a suite of cliff-nesting raptors.		
	Without mitigation	With mitigation (excluding biodiversity offset)
Extent	Local	
Duration	Permanent	
Magnitude/Severity	Moderate	
Probability	Highly likely	
Interpretation of the Impact Rating	Moderate-High	Moderate-Low
<p>Mitigation:</p> <p>Minimising the size of the topsoil stockpile area and the waste rock dumping site to limit the absolute footprint of activities peripheral to the mining pit.</p> <p>All intact natural Fynbos/Strandveld areas peripheral to the required footprint of the mine should be retained and left intact.</p> <p>To minimize peripheral impacts around the central mining pit, all ancillary infrastructure to be kept as close to the main mining area as possible.</p> <p>The vicinity of the mine should be subject to regular (annual) surveys for nesting Black Harriers. If at any stage Black Harrier nest/s or breeding area/s are identified, the immediate area/s should be buffered sufficiently to ensure the safety and protection of the nest site or area until the breeding attempt/s is completed.</p> <p>All artificial waterbodies created by the mining process, including tailings dams, and the pollution</p>		


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control and storm water dams, should be subjected to regular chemical testing to ensure that polluting by-products do not reach levels that may be toxic to visiting waterbirds. In the event that toxic pollutants exceed these levels, steps must be taken immediately to mitigate this risk factor.

<p>Nature: The standing power infrastructure will result in a direct negative impact on the avifauna, with exposure of all large species, but especially Southern Black Korhaan, and possibly Blue Crane, Ludwig's Bustard, Secretarybird, Martial Eagle, Verreaux's Eagle, Black and African Marsh Harriers, Peregrine and Lanner Falcons and a variety of commuting wetland species to the risk of mortality in collision with the overhead line/s and/or electrocution on live components.</p>		
	<i>Without mitigation</i>	<i>With mitigation (excluding biodiversity offset)</i>
<i>Extent</i>	Local	
<i>Duration</i>	Long-Term	
<i>Magnitude/Severity</i>	Moderate	
<i>Probability</i>	Highly likely	
<i>Interpretation of the Impact Rating</i>	Moderate-High	Moderate-Low
<p><i>Mitigation:</i></p> <p>Ensuring that all new power infrastructure is comprehensively insulated and bird friendly in configuration (Lehman et al. 2007), with maximum air gaps between all live components, and minimum opportunity for birds to nest, roost or perch in close proximity to any live components.</p> <p>All new overhead power lines are marked with bird flight diverters along their entire length. Note that current understanding of power line collision risk in birds suggests that bird flight diverters can reduce collision rates by up to 80% (on a situation- and species-specific basis), but precludes any guarantee of successfully distinguishing high-risk from medium or low-risk sections of a new line. The relatively low cost of marking the entire length of a new power line during construction (especially quite a short length of line in an area frequented by collision prone birds) more than offsets the risk of incurring collision mortalities on sections of unmarked line, and then having to retro-fit the line with markers post-construction.</p> <p>Selecting option B for the proposed 132kV power line, which follows the proposed road access to the</p>		

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site from the north, rather than option A which runs directly to the tie-in point with the existing transmission line, but requires a new and dedicated corridor through an area of natural vegetation. Option B concentrates the impacts of the power line and the new road into a single corridor, and positions the power line in an area of increased human disturbance, where it is less likely to pose a collision risk to overflying birds.

Impact Assessment

The Avifauna assessment identified the following potential impacts as a result of the project activity which includes:

Decommissioning Phase

- Disturbance associated with noise, movement and artificial light generated by construction equipment /personnel.
- Possible chemical pollution derived from the decommissioning process.

Summary of Impacts


Nature: Decommissioning/Closure activities would result in a direct negative impact on the avifauna, with noise and visual disturbance affecting all species, but especially Southern Black Korhaan, Black Harrier, Hottentot Buttonquail, a suite of endemic Strandveld/Fynbos passerines, and possibly a suite of cliff-nesting raptors.

	<i>Without mitigation</i>	<i>With mitigation (excluding biodiversity offset)</i>
<i>Extent</i>	Local	
<i>Duration</i>	Only until decommissioning is complete	
<i>Magnitude/Severity</i>	Low	
<i>Probability</i>	Definite	
<i>Interpretation of the Impact Rating</i>	Moderate-Low	

Mitigation:

Rehabilitation of disturbed or degraded Fynbos/Strandveld as soon as sources of disturbance/degradation are removed (e.g. after construction activities are complete and post-

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closure of the mine). In some areas at least, it should be possible to restore original levels of avian biodiversity (Little et al. 2005).


Nature: Decommissioning/Closure activities (material preparation and lay-down areas, temporary personnel facilities) would result in a direct negative impact on the avifauna, with permanent loss of optimal habitat for all species, but especially Southern Black Korhaan, Black Harrier, Hottentot Buttonquail and a suite of endemic Strandveld/Fynbos passerines.

	<i>Without mitigation</i>	<i>With mitigation (excluding biodiversity offset)</i>
Extent	Site only	
Duration	Temporary	
Magnitude/Severity	Low	
Probability	Definite	
Interpretation of the Impact Rating	Moderate-Low	
<p>Mitigation:</p> <p>Rehabilitation of disturbed or degraded Fynbos/Strandveld as soon as sources of disturbance/degradation are removed (e.g. after construction activities are complete and post-closure of the mine). In some areas at least, it should be possible to restore original levels of avian biodiversity (Little et al. 2005).</p>		

Offsets

Even after rehabilitation it seems unlikely that the area of the mine subjected to its core activities (strip mining and additional destruction of habitat through construction and operational activities) will ever be meaningfully restored. Hence the inclusive footprint of the mine should probably be considered as permanently lost to the natural environment, and efforts should be made to compensate for this biodiversity loss by exploring conservation off-set opportunities. An area covering 4000 ha surrounding the proposed mine is currently under investigation for conservation offset purposes. Because of the close proximity of the proposed Elandsfontein Phosphate Mine and the West Coast National Park, an off-sets approach presents opportunities to commit more land to effective conservation management (under SANParks), and also to create corridors between fragments of natural vegetation that are currently isolated, and might otherwise be lost to agriculture or mismanagement. The

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resulting increase in the extent of contiguous protected Fynbos/Strandveld vegetation could significantly benefit those species identified in this study as most dependent on the availability of tracts of intact, properly managed natural habitat, most notably Black Harrier, Southern Black Korhaan and Hottentot Buttonquail.

8.3. VISUAL ASSESSMENT

The visual study identified the following potential receptors which may be impacted by the mining activity. Below a table identifying potential receptors and the potential direct and indirect impacts.

Potential Receptor	Reason
Users of existing transport corridors including in each case, travelling in each direction, i.e. roads, R45, R27, local roads and rail line: sensitive receptors	<p><u>Direct Impacts:</u> on the R27 southbound from where the mine infrastructure could be visible.</p> <p><u>Indirect impacts:</u> on the R45, due to increased heavy and light vehicles and due to the creation of a potentially busy junction with the mine access road; and on other local roads between the mine and the port.</p> <p>No impact on the rail line.</p> <p>The development could be held in view resulting in changed landscape character from increased road use and visual clutter.</p>
People living and working locally in Agriculture; no major farmsteads within 7km, but there are a few scattered buildings in the area: sensitive receptors	Direct Impact: no farm dwellings within the zone of visual influence, but the works would be visible to receptors working on the land; could be aware of different land use; the proposed development may be considered a discordant element in the landscape
Local tourist facilities and routes: the R27 is a tourist route; no tourist facilities within the zone of visual impact	Direct and Indirect Impacts: on the R27
Local protected landscapes, West Coast National Park; areas currently publicly accessible are not within the zone of visual impact	Indirect Impacts: Users of the landscapes and sites could be affected by off-site infrastructure
Local population centres, such as Hopefield, Langebaanweg, etc, beyond the zone of visual impact	Indirect Impacts: Users of the towns would experience indirect impacts such as increased numbers of heavy and light vehicles

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Impact Assessment

Construction Phase

The potential construction of the following may impact on the aesthetics of the surrounds:

- Establishment of the construction camp, haul roads and ramps from locally sourced material
- Establishment of all buildings and other mine infrastructure, silo, beneficiation plant, control centre
- Establishment of the fencing and security access.


Summary of Impact

Nature: Establish construction camp, haul roads and ramps from locally sourced material Establish all buildings and other mine infrastructure, silo, beneficiation plant, control centre Establish fencing and security access.		
	<i>Without mitigation</i>	<i>With mitigation</i>
<i>Extent</i>	Local (2)	Local (2)
<i>Duration</i>	Temporary (1)	Temporary (1)
<i>Magnitude/Severity</i>	Moderate (3)	Moderate (3)
<i>Probability</i>	Highly Probable (3)	Probable (2)
<i>Interpretation of the Impact Rating</i>	Low (9)	Low (8)
<i>Mitigation:</i> Keep disturbed areas to a minimum. No clearing of land to take place outside the demarcated footprint. Utilise existing roads and tracks to the extent possible. Where new roads are required, they should be gravel roads, maintained to prevent dust plumes and erosion. Surfacing of roads in locally sourced material would ensure that the colour is appropriate		

Impact Assessment

The potential construction of the following may impact on the aesthetics of the surrounds:

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- Construction of the new road access from the R45 to the site.
- Road transport of deliveries by truck to the site.

Summary of Impact

Nature: Construction of the new road access from the R45 to the site. Road transport of deliveries by truck to the site.		
	Without mitigation	With mitigation
Extent	Local (2)	Local (2)
Duration	Long Term (3)	Long Term (3)
Magnitude/Severity	Moderate (3)	Low (2)
Probability	Highly Probable (3)	Probable (2)
Interpretation of the Impact Rating	High (11)	Low (9)
Mitigation: Keep disturbed areas to a minimum. No clearing of land to take place outside the demarcated footprint. Route is proclaimed and not directly affecting sensitive receptors. Junction standards with R45 must reflect eventual frequency of heavy and light vehicles with good sightlines; road to be regularly cleaned The increased mine traffic on the R45, generally is not capable of being mitigated		


Impact Assessment

The potential construction of the following may impact on the aesthetics of the surrounds:

- 132kV Transmission Line via loop in-loop out from existing lines.

Summary Of Impact

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Nature:

132kV Transmission Line via loop in-loop out from existing lines.

	<i>Without mitigation</i>	<i>With mitigation</i>
Extent	Local (2)	Local (2)
Duration	Long Term (3)	Long Term (3)
Magnitude/Severity	Low (2)	Low (2)
Probability	Highly Probable (3)	Probable (2)
Interpretation of the Impact Rating	Low (10)	Low (9)

Mitigation:

This appears to be the shortest feasible route, sited away from sensitive receptors and in a landscape where there is context from other power lines.

Keep disturbed areas to a minimum.

No clearing of land to take place outside the demarcated footprint.

Associated maintenance track should be gravel, maintained to prevent dust plumes and erosion.

Impact Assessment

Operational Phase

These potential operational phase activities may impact on the aesthetics of the surrounds:

- Development of the strip mine, haulage operations


Summary of Impact

Nature:

Development of the strip mine, haulage operations

	<i>Without mitigation</i>	<i>With mitigation</i>
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Extent	Local (2)	Local (2)
Duration	Long Term (3)	Long Term (3)
Magnitude/Severity	Moderate (3)	Low (2)
Probability	Highly Probable (3)	Probable (2)
Interpretation of the Impact Rating	High (11)	Low (9)
Mitigation: Strip mining has been demonstrated to be acceptable in terms of no blasting, etc, and facilitating on-going environmental rehabilitation. Keep disturbed areas to a minimum. No clearing of land to take place outside the demarcated footprint. The excavations and the gravel roads, maintained to prevent dust plumes and erosion.		

Impact Assessment

Operational Phase


These potential operational phase activities may impact on the aesthetics of the surrounds:

- Establishment of stockpiles and conveyors

Summary Impact

Nature: Establishment of stockpiles and conveyors		
	<i>Without mitigation</i>	<i>With mitigation</i>
Extent	Local (2)	Local (2)
Duration	Long Term (3)	Long Term (3)

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Magnitude/Severity	Moderate (3)	Moderate (3)
Probability	Highly Probable (3)	Probable (2)
Interpretation of the Impact Rating	High (11)	Low (10)
<p>Mitigation:</p> <p>Anticipated height of 38m could be visually intrusive; perceived movement of conveyors on top of the softs stockpile could raise visual awareness; mitigate by a) considering an angle of repose on the north and west facing slopes at a lesser gradient; soiling and seed the most visible slopes, (north and west facing). The softs stockpile would also be visible down the 'valley' towards the south east, where it will 'background' some of the visible clutter from mine infrastructure. Maintain to prevent dust plumes and erosion. Keep disturbed areas to a minimum. No clearing of land to take place outside the demarcated footprint.</p>		

Impact Assessment

Operational Phase


These potential operational phase activities may impact on the aesthetics of the surrounds:

- Beneficiation Control Centre and Silo

Summary Of Impact

<p>Nature:</p> <p>Beneficiation Control Centre and Silo</p>		
	Without mitigation	With mitigation
Extent	Local (2)	Local (2)
Duration	Long Term (3)	Long Term (3)
Magnitude/Severity	Moderate (3)	Moderate (3)
Probability	Highly Probable (3)	Probable (2)

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Interpretation of the Impact Rating	High (11)	Low (10)
<p>Mitigation:</p> <p>Anticipated heights of 25 and 30m could be visually intrusive, but the visual clutter of all elements would be shielded from the west and north by the softs stockpile; the zone of visual influence that extends to the south east could be impacted by the top third of these installations. Can be mitigated by the use of cladding colours that blend in, and by the avoidance of materials that shine such as metals.</p> <p>Keep disturbed areas to a minimum.</p> <p>No clearing of land to take place outside the demarcated footprint.</p>		

Impact Assessment

Operational Phase


These potential operational phase activities may impact on the aesthetics of the surrounds:

- Operating timescales and programming, Lighting

Summary Of Impact

<p>Nature:</p> <p>Operating timescales and programming, Lighting</p>		
	Without mitigation	With mitigation
Extent	Local	Local
Duration	Long Term	Long Term
Magnitude/Severity	Moderate	Moderate
Probability	Highly Probable	Highly Probable
Interpretation of the Impact Rating	High	High

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Mitigation:

As the mine will operate through 24 hours, the roads and road junctions will be affected during these periods.

As the mine will operate through 24 hours it will be lit at night, both security and work lights will function; lighting should be managed in accord with western cape guidelines.

Impact Assessment

Operational Phase

These potential operational phase activities may impact on the aesthetics of the surrounds:


- Road transport of deliveries and personnel

Summary Of Impacts

Nature: Road transport of deliveries and personnel		
	Without mitigation	With mitigation
Extent	Regional (3)	Regional (3)
Duration	Long Term (3)	Long Term (3)
Magnitude/Severity	Low (2)	Low (2)
Probability	Highly Probable (3)	Probable (2)
Interpretation of the Impact Rating	High (11)	Low (10)
Mitigation: Three shifts per 24hour period, to bring in and collect labour using about 10 minibuses or equivalent has a significant impact which could be reduced visually by 'staggering' the vehicles or by providing a traffic control at the junction with the R45 to facilitate local road users. Utilise existing roads and tracks to the extent possible; gravel roads, maintained to prevent dust plumes and erosion.		

Impact Assessment

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Operational Phase

These potential operational phase activities may impact on the aesthetics of the surrounds:

- Transport of beneficiated material

Summary of Impact

Nature: Transport of beneficiated material		
	<i>Without mitigation</i>	<i>With mitigation</i>
<i>Extent</i>	Regional (3)	Regional (3)
<i>Duration</i>	Short Term (2)	Short Term (2)
<i>Magnitude/Severity</i>	Moderate (3)	Low (2)
<i>Probability</i>	Highly Probable (3)	Probable (2)
<i>Interpretation of the Impact Rating</i>	High (11)	Low (9)
<i>Mitigation:</i> Road transport from the mine to the port has been demonstrated to be the most cost effective. Road transport has a noticeable visual impact. Consider transport of the beneficiated material via pipeline for at least part of the distance to reduce visual impact.		

Impact Assessment


Decommissioning Phase

These potential decommissioning phase activities may impact on the aesthetics of the surrounds:

- Completion of environmental rehabilitation of the mine, (landform and vegetation).
- Removal of buildings, conveyors, silos, etc
- Clearing of site; the mine access road would remain.

Summary of Impacts

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Nature:

Completion of environmental rehabilitation of the mine, (landform and vegetation).

Removal of buildings, conveyors, silos, etc

Clearing of site; the mine access road would remain.

	<i>Without mitigation</i>	<i>With mitigation</i>
Extent	Local (2)	Local (2)
Duration	Long Term (3)	Long Term (3)
Magnitude/Severity	Moderate (3)	Moderate (3)
Probability	Highly Probable (3)	Probable (2)
Interpretation of the Impact Rating	High (11)	Low (10)

Mitigation:

Keep disturbed areas to a minimum.

No clearing of land to take place outside the demarcated footprint.

Major impact anticipated from heavy vehicles transporting infrastructure elements and surplus disposable material via local roads; can be mitigated by no night or weekend working.

Removal of buildings can be capable of part mitigation by determining an alternative use for them, on site

Consider disposing of re-useable components locally to reduce road transport and to potentially serve local communities


Recycling of materials should be undertaken off-site to minimise visual impact locally

8.4. HERITAGE, ARCHAEOLOGY AND PALEONTOLOGY ASSESSMENT

Impact on Archaeology

The history of scientific research at Elandsfontein spans more than 60 years, with the initial survey of fossil and archaeological material taking place in the 1950s (Braun et al 2013). This research has seen more than 20 scientific reports/published papers dedicated to the site. Internationally, it is one of the most recognised Pleistocene heritage sites in South Africa. The 'Elandsfontein Fossil Beds', known for producing Early Stone Age (ESA) artefacts older than 1 million years, are of global scientific importance (Pether 2013).

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It is well-known that the Saldanha Bay area is a region of high archaeological importance, particularly with regard to Pleistocene archaeology. The Elandsfontein fossil site is also only one of a few localities in South Africa that preserves both archaeological and organic remains (bones) in an in situ (open air) context, allowing archaeologists a unique opportunity to study the evolution of early modern humans and how they interacted with their ecosystems more than 200 000 years ago (Braun 2013).

New observations at the site indicate that the main assemblage at Elandsfontein may now be as old as ~1 million years (Braun et al 2013). The context of fossil bones and artefacts in aeolian sands is well-illustrated by the 'Elandsfontein Fossil Beds' which include a sparse bone content in the uppermost Langebaan Formation, and a more persistent bone and artefact content in the overlying Springfontyn Formation sands.

Dr Braun, who currently holds the research permit for the archaeological site (fossil area), has noted that the area is 'one of the richest sites of its kind in Africa' (in Bluff & Hart 2010:10). Current research, however, suggest that if this ancient landscape extends outside of the (now stable) dunefield, that any artefacts or fossils recovered from it will be patchily distributed (Braun et al 2013), but that if fossils are encountered, they will likely be 'numerous and densely concentrated' (Braun 2013:5). The latter fossil area falls outside of the mine area, some 2-3 km's away. The mine area will be fenced off from the fossil area.

Plasket (2013) logged a few Middle Stone Age flakes, fossil bone and coprolites during a survey of the proposed mining application area, while Kaplan (2013) found only one MSA silcrete flake during an assessment of the 17 proposed prospecting drill sites.

While little is known about the Holocene Later Stone Age (LSA) archaeology in the area, Kaplan (2011) did document relatively large numbers of LSA silcrete stone flakes on a limestone ridge (outside the application area) on Farm 349, alongside the Eskom servitude that runs between the Elandsfontyn fossil site, and the proposed mining area. Orton (2007) identified a single LSA flake on Farm 349/6.

Impact Assessment

The project activity could impact on archaeological resources during the construction and operational phase.

Construction and Operational Phase Impacts


Construction phase activities will include land clearance and excavation of different parts of the site in preparation of infrastructural development. The primary construction activities will include the following:

- Pre-stripping of the open pit;
- Excavation of the softs stockpile area;
- Construction of the concentrator plant (including some of associated infrastructure); and
- Construction of bulk service requirements (ie water, sewage and power infrastructure) and mine access roads.

The following activities will be characteristic of the operational phase of the Project:

- Further expansion of open pit;

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- Increase in the softs stockpile footprint;
- Construction of full internal road network; and
- Expansion of the concentrator plant and associated infrastructure.

Archaeological artefacts are considered, in each instance, a unique and non-renewable resource. The Project may result in losses to archaeological artefacts during both the construction and operational phases. The construction and operational phase impacts can be seen as permanent and irreversible, and would likely be experienced at both phases of the Project. It is likely that the construction and operation of infrastructure would contribute to the loss of archaeological artefacts. In light of this, the construction and operational phase impacts associated with the Project are assessed in an integrated manner, as they are closely linked.

Summary of Impacts

Nature: Construction and operational activities may result in a direct negative impact on archaeological resources.		
	<i>Without mitigation</i>	<i>With mitigation</i>
<i>Extent</i>	Local	Local
<i>Duration</i>	Permanent (Irreversible)	Permanent (Irreversible)
<i>Magnitude/Severity</i>	Moderate	Moderate
<i>Probability</i>	Highly Probable	Probable
<i>Interpretation of the Impact Rating</i>	High	Medium
<i>Mitigation:</i> Construction and Operational Phase Mitigation <ul style="list-style-type: none"> • Minimise the development footprint to only what is actually needed. • Restrict all construction activities to designated working areas with all work areas and access areas clearly marked and signposted. • Immediately report any heritage trace that may come to light during the construction phase. • Fence off the mine area from the fossil area to the north and ensure that it is a no-go area. This must be explained as part of the environmental education programme. • Restrict operational activities to designated working areas with all work areas and access areas clearly marked and signposted. • Immediately report any heritage trace that may come to light during the operation phase. 		

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- EEM, HWC and SANParks have signed a draft Memorandum of Understanding, where a portion of Portion 2 of the Farm Elandsfontein 349 will be donated to SANParks for preservation as an area of paleontological and archeological importance.

Residual Impact

The implementation of the above mitigation measures would reduce the decommissioning phase impacts from Major to Moderate significance.

Construction and Operational Phase Impacts

Similarly to the impact on archaeology, the construction and operational phase impacts to cultural heritage and sense of place will overlap between the two phases. As these impacts are closely linked, the construction and operational phase impacts will be jointly assessed.

Impact on Paleontology

A Paleontological Impact Assessment (PIA) was undertaken by John Pether in (refer to Annex C for the report) to outline the nature of paleontological heritage resources (fossils) in the subsurface of the Project area, which may potentially be affected by construction and operation activities (eg bulk earth works) during the development of the mine.


The specialist report by Pether (2013), addresses the palaeontological sensitivity of the stratigraphic section below the near-surface, fossiliferous deposits, viz. the Langebaan and Varswater formations. It is the calcareous Langebaan Formation that contains much of the archaeological and fossil remains which have been encountered at the nearby fossil site (Singer and Wymer 1968). The high fossil potential of the Langebaan Formation is therefore well known and according to Pether (2013), most of Farm 349 is underlain by this formation.

Pether (2013) notes, that it is generally not possible to predict the buried fossil content of an area other than in general terms, based on what has been previously observed of the fossil content of a particular formation in a particular area. But, as Pether (2013) argues, there is ample information (more than 100 scientific papers for the region have been published), to predict with some probability, the impact of a proposed mining operation on the palaeontological heritage.

In coastal-plain deposits of the Langebaan Formation, for example, the important fossil bone material is generally sparsely scattered and unless large and obvious, is not generally seen, underestimating the fossil prevalence. Much therefore depends on careful scrutiny of exposures and on spotting this material as it is uncovered during digging i.e. by monitoring excavations.

While the high fossil potential of the Langebaan Formation is well known, the pre-Langebaan Formation (i. e. the Varswater Formation) phosphatic aeolianites (the target area for mining), have an unproven, 'but strong potential' to yield fossil remains additional to the known marine microfossil content, such as land snails and micro mammals (Pether 2013:36). Bluff & Hart (2010) note that the Varswater Formation at Langebaanweg (the old Samancor Chemfos Mine and now the West Coast Fossil Park), for example, is highly fossiliferous, containing the world's densest known concentration of Pliocene vertebrate fossils, about 5 million years old. Preservation of cores from the phosphate prospecting programme, including subsampling of selected intervals, sample disaggregation, sieving and macro - and optical microscopic inspection, may yield interesting observations and inform further investigations (Pether 2013).

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The potential impacts of this development on paleontological resources are assessed and mitigation measures to reduce the impacts are outlined below.

Impact Assessment

The impacts of the proposed activities during both construction and operation could have the following impact.

- The long-term impact from potential mining in the future, involving the excavations of large volumes and continuous exposure and destruction of large vertical sections through the deposits.

Nature of the Impact of Mining

Mining and ancillary construction activities (excavations) will result in a negative direct impact on the fossil content of the affected subsurface. Fossils and significant observations will be lost in the absence of management actions to mitigate such loss. This loss of the opportunity to recover fossils and their contexts when exposed at a particular site is irreversible.

Conversely, mine pits and construction excavations furnish the “windows” into the coastal plain depository that would not otherwise exist and thereby provide access to the hidden fossils. The impact is positive for palaeontology, provided that efforts are made to watch out for and rescue the fossils. There remains a medium to high risk of valuable fossils being lost in spite of management actions to mitigate such loss.

Extent

There is a duality in the assigning of the “extent” of the impact of bulk excavations on fossil resource. The physical extent of impacts on potential palaeontological resources relates directly to the extents of subsurface disturbance, i.e. site specific.

The cultural, heritage and scientific impacts are of regional to national extent, as is implicit in the NHRA 25 (1999) legislation and, if scientifically important specimens or assemblages are uncovered, are of international interest. This is evident in the amount of foreign-funded research that takes place by scientists of other nationalities. Loss of opportunities that may arise from a significant fossil occurrence (tourism, employment) filters down to regional/local levels.

Duration


The impact of both the finding or the loss of fossils is permanent. The found fossils must be preserved “for posterity”; the lost, overlooked or destroyed fossils are lost to posterity.

Intensity

The intensity of potential impact of bulk earthworks on fossil resources is determined by the palaeontological sensitivity of the affected formations (see Appendix 3). The Langebaan Formation is known to contain palaeontological resources that include rare, well-preserved fossil materials important to on-going palaeoclimatic, palaeobiological and/or evolutionary studies. Fossils of land-dwelling vertebrates are typically considered significant. For the Langebaan Formation the intensity of impact is high in the absence of effective mitigation.

The palaeontological potential of the postulated older aeolianite is not objectively determinable due to lack of exposure and observations, but is likely to be reduced cf. the younger Langebaan Fm aeolianites.

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Nevertheless, some macrofossil fossil content is expected to occur. In view of the scientific importance of such fossils finds, as elucidated above, the palaeontological sensitivity must remain on par with the Langebaan Fm.

Probability

The likelihood of impact is definite with respect to future mining.

Reversibility

The loss of fossil material such as rare fossil bone is irreversible.

Status of the Impact

Negative without mitigation, positive with mitigation.

Confidence

The level of confidence of the probability and intensity of impact is certain with respect to the mining.

Significance

Note that the presence of fossils in the subsurface does not have an a priori influence on the decision to proceed with the mining. However, mitigation measures are essential. It is probable that sparse, valuable bone fossils will go undetected, even with the most diligent mitigation practicable. On the other hand, the finding and recovery fossils will have a positive impact ranging from local to international in extent, depending on the nature of the finds.

The general significance of coastal-plain fossils involves:

- history of coastal-plain evolution.
- The history of past climatic changes, past biota and environments.
- Associations of fossils with buried archaeological material and human prehistory.
- For radiometric and other dating techniques (rates of coastal change).
- Preservation of materials for the application of yet unforeseen investigative techniques.

The significance of the fossil content for resolving outstanding questions the stratigraphic status and age of the various formations has been outlined above.

Summary of Impact


Nature:

Completion of environmental rehabilitation of the mine, (landform and vegetation).

Removal of buildings, conveyors, silos, etc

Clearing of site; the mine access road would remain.

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	<i>Without mitigation</i>	<i>With mitigation</i>
Extent	Reg/Nat/Internat.	Reg/Nat/Internat.
Duration	Long	Long
Magnitude/Severity	High	Medium
Probability	Definite	Definite
Interpretation of the Impact Rating	High	Med-Hi
<p>Mitigation:</p> <p><i>Construction Phase Mitigation</i></p> <p>The ECO responsible for the development must remain aware that all sedimentary deposits have the potential to contain fossils and he/she should thus monitor all substantial excavations into sedimentary bedrock for fossil remains. If any fossils are found during construction, HWC and SAHRA should be notified immediately.</p> <p>If significant fossils are found, an appropriately qualified palaeontologist will investigate, and if required, a permit will be obtained to recover and preserve the paleontological resources for scientific purposes before work can be commenced again.</p> <p><i>Operational Phase Mitigation</i></p> <p>Monitoring and inspection of excavations</p>		

Residual

If the above-mentioned mitigation is adhered to, the residual impact significance on any paleontological resources is considered to be Negligible.


8.5. TRAFFIC IMPACT

Impact Assessment

Construction

Activities associated with the mine construction phase will result in 60 truck trips per weekday for the first three months of construction and 12 truck trips per weekday for the remaining nine months of the construction period.

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The cumulative volume of trucks that can be expected on the TR21/2 in one year without the Elandsfontein mine development and the total volume of trucks that will be generated by the mine development during the construction phase are shown in the table below.

Table 8-3: Truck traffic on the TR21/2 during the construction phase of the mine

Scenario	Without Elandsfontein mine development (per direction)			Elandsfontein development (per direction)
	Trucks per day	Cumulative annum (365 days)	Trucks per annum	Trucks per annum (247 work days)
Existing + 4% p.a.	116	42 340		-
Phase 1 construction (3 months)	30	-		1980
Phase 2 construction (9 months)	6	-		1180

The construction phase of about 12 months is relatively short when compared to the structural lifetime of a pavement which is usually about 20 years. The construction phase will result in a 7,5% increase in cumulative heavy traffic on the TR21/2 during 2015. *The significance of this negative impact on the road infrastructure is regarded as low for the construction phase.*

Operations

Heavy vehicle traffic associated with the mine operations activities will result from the delivery of solid reagents, maintenance and parts to the site that will travel from the N7 in the east and the delivery of the mined phosphate to the port in Saldanha in the west.


The TR21/2 in the westerly direction between the mine and the harbour will be worst affected when the phosphate transport results in an additional 192 trucks daily for four consecutive days every 18 days. This is a total of 15 360 loaded truck trips per annum to the harbour.

The cumulative volume of trucks that can be expected on the TR21/2 (westbound carriageway) without the Elandsfontein mine and the total volume of trucks that will be generated by the mining operations travelling to the harbour over a 20 year period are shown in Table 8-4: Cumulative truck traffic on the TR21/2 during the operation of the mine.

Table 8-4: Cumulative truck traffic on the TR21/2 during the operation of the mine

Scenario	Without Elandsfontein development (per direction)			Elandsfontein development* (per direction)
	Trucks per day	Cumulative years	Trucks over 20	Cumulative trucks over 20 yrs

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Existing + 4% p.a.	120	1 356 450	-
Operations (4 days every 18 days)	192	-	307 200

The truck trips from the mine to the harbour carrying phosphate amounts to 307 200 trips over a period of 20 years, which will increase the cumulative truck traffic on the road by 22,7%. The significance of this negative impact on the road infrastructure is regarded as medium for the operations phase.

Impact on Traffic Safety

The anticipated construction and operations activities for the proposed Elandsfontein development will result in an increase in traffic on the road network leading to a potential increase in the number of road accidents.

Information regarding road accident rates has been obtained from the Arrive Alive website, which indicates that for the year 2002 there were 8,71 fatal road accidents per 100 million vehicle kilometers travelled in South Africa. Although the information is outdated (more recent information is not available) it can give an indication of the number of fatal road accidents that can be anticipated due to the construction and operations activities of the development.

The potential increase in the number of road accidents has been quantified based on the additional vehicles kilometers that will be travelled on the road network by traffic associated with the proposed development.

It must be noted that many factors increase the risk of road traffic accidents for example trucks not being maintained or not in a roadworthy condition and dangerous driving habits.

Construction

The vehicle kilometers travelled (travel distances) during the construction phase is made up by the transportation of the earthworks during the first three months of construction and steel, plated and mechanical equipment during the remaining construction period (Saldanha and Langebaan area); as well as the transportation of the personnel (Hopefield and Saldanha area). At this point in time the location of the borrow pit site has not been confirmed. The calculations below have therefore been based on the distance to the largest commercial quarry in the area which is Lafarge located 35 km from the proposed access the mine site.


Assuming average travel distances for each trip type it is estimated that the construction activities, which will occur over a 12 month period, will result in approximately 224,270 additional vehicle kilometers travelled on the road network during the first three months of construction and 360,724 during the remaining nine months of the construction period. Based on the statistic of 8,71 fatal accidents per 100 million kilometers travelled, there is a potential for the transport related construction activities to result in 0,05 road accident fatalities during the 12 month construction period.

The significance of this negative impact on road safety is regarded as low for the construction phase

Operations

The vehicle kilometers travelled during the operations phase is made up by the transportation of the phosphate (between the site and Saldanha Port), consumables and maintenance materials and/or parts (from direction of the N7); as well as the transportation of the operations personnel (Hopefield and Saldanha area).

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Assuming average travel distances for each trip type it is estimated that the operations activities will result in approximately 1,966,120 additional vehicle kilometers travelled on the road network per annum. Based on the statistic of 8.71 fatal accidents per 100 million kilometers travelled, there is a potential for the transport related operations activities to result in 0.2 road accident fatalities per annum.

The significance of this negative impact on road safety is regarded as low for the operations phase.

Summary of Impact Assessment

No.	Description of Impact	Status	Extent	Duration	Intensity	Probability	Significance (without mitigation)
1.	Reduction in road based Level of Service due to increased traffic volumes associated with the transportation of personnel and construction materials to the site.	Negative	Local	Short Term	Low	Probable	Low
2.	Reduction in road based Level of Service due to increased traffic volumes associated with the transportation of personnel to the site during the operations phases.	Negative	Local	Long Term	Low	Probable	Low
3.	Reduction in road based Level of Service due to increased traffic volumes associated with the transportation of material for production and distribution of product during the operations phase.	Negative	Local	Long Term	Low	Probable	Low
4.	Accelerated degradation of road pavement structure due to the increase in heavy vehicle traffic during the construction phase.	Negative	Local	Short Term	Low	Probable	Low
5.	Accelerated degradation of road pavement structure due to the increase in heavy vehicle traffic during the operations phase.	Negative	Local	Long Term	Moderate	Probable	Medium
6.	Potential for an increase in number of road accidents as a result of increased traffic volumes and km travelled on road network during the construction phase.	Negative	Local	Short Term	Low	Possible	Low

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7.	Potential for an increase in number of road accidents as a result of increased traffic volumes and km travelled on road network during the operation phase.	Negative	Local	Long Term	Low	Possible	Low
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Recommended Mitigation Measures

The following mitigation measures have been identified in order to minimize the impacts that will arise from the construction and operation activities of the Elandsfontein development.

Traffic conditions (road capacity and intersections)

In order to minimize the impact of the additional traffic that will be added to the road network due to the construction and operations activities of the proposed Elandsfontein development, the following mitigation measures are recommended.

Construction materials

During the construction phase deliveries of material by truck to the site could be scheduled to avoid peak hour traffic. The weekday AM (06h30 – 07h30) and PM (16h30 – 17h30) peak hours will be the two busiest periods on the road with the highest traffic volumes. Heavy vehicle arrivals and departures will have less of an impact if occurring outside of the aforementioned time periods.

Operations materials

During the operations phase material deliveries to the site (solid reagents, maintenance and parts) and phosphate transport to Saldanha could also be scheduled to avoid peak hour traffic, as discussed under construction materials above.

Road infrastructure (heavy vehicle impact)


The construction phase will result in minimal impact due to the low volumes of heavy vehicle traffic especially considering that the 12+ months construction phase is relatively short when compared to the structural lifetime of a road pavement. The operations phase will result in moderate heavy vehicle traffic volumes.

In order to mitigate the effect of heavy vehicles on the roads within the study area it is essential that roads are properly and regularly maintained (by the relevant authorities) and that heavy vehicle overloading is curbed by traffic enforcement officials. Traffic enforcement officials should monitor overloading of heavy vehicles to limit the impact on the structural integrity of the roads surrounding the site. The existing weighbridge that is located on TR85/1 can be used to inspect vehicles for overloading.

Traffic Safety

The anticipated construction and operations activities for the proposed Elandsfontein development will result in an increase in traffic on the road network and vehicle kilometres travelled, which means that there is a potential for an increase in the number of road accidents.

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It is important to note that various factors influence the risk of road accidents for example vehicles (especially trucks) not being maintained to a roadworthy condition and dangerous driving habits. To limit the potential for accidents competent trained drivers must operate well maintained vehicles. Visible law enforcement should be present with traffic officers regularly conducting random inspections of vehicles for roadworthy conditions and drivers for the correct driving licenses and permits.

Impact assessment after implementation of mitigation measures

The significance of the majority of the impacts that will occur during the construction and operation phases of the development is regarded as low without mitigation. The majority of impacts will remain low even with the implementation of the recommended mitigation measures. This can be explained due to the significance of most of the impacts being rated as low, i.e. with the mitigation in place the impact is reduced and not removed.

The majority of impacts will remain low with the implementation of the recommended mitigation measures.

8.6. FAUNA ASSESSMENT

Impact Assessment

The fauna study undertook a risk assessment to determine the impact of the activity on the faunal populations on the site.

The risk assessment investigates direct mortality as a risk. This would occur when a species that cannot flee from the affected area by themselves during the mining activity and more regular use of the access road to the site could potentially suffer direct mortality.


Birds, large snakes and medium-sized mammals and large mammals would be able to move away from the affected areas but will get very used to any form of activity that does not pose a threat to them. Tortoises and many other reptiles, as well as amphibians and small mammals, will flee effectively albeit slower. Therefore except for the incidental invertebrate that could be killed by vehicles no faunal mortalities should occur during the construction and operational phase.

In the study area, the Red Data species which may be present, Lomi's Blind Legless Skink, the Namaqua Dwarf Adder, and Grant's Golden Mole, would not be affected to any large degree by road kills as the skink and the mole are subterranean species and the adder has low mobility. Grant's Golden Mole would probably only on occasion attempt to cross roads.

Due to the increase in traffic associated to the construction and operational phase of the mine it is envisaged that the mine area be fenced off to minimise any accidental deaths. Good road traffic rules will be implemented which will include adherence to speed limits. Should these measures be implemented the overall risk will be low.

As opposed to direct road kills, the barrier effect of roads probably impacts more species than the effects of either road kills or road avoidance. While it is particularly mammals, with their greater mobility and larger home ranges, that are seemingly heavily impacted on by road kills, lower vertebrates and invertebrates, on the other hand, may find hard road surfaces impassable barriers. The barrier effect of roads and fencing will only impact on species in the long term. The project will entail the construction of new roads and additional vehicular movement on the

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sandy roads and main mine access road which will be surfaced where one at times find the diggings of Golden Moles. Of these species, only Lomi's Blind Legless Skink and Grant's Golden Mole are Red Data species. Because of the low number of Red Data species that may be affected, the impact will only be of local extent.

The potential impact of the barrier effect will be minor and this also applies to fencing. The larger antelope species are contained on the larger reserve by a game proof fence of 2.2m in height (Bonox). All animals smaller than a Duiker are not restricted by this fence.

Prior to construction commencing on site, a fence must be erected to prevent animals from accessing areas which receive high levels of traffic. This must be maintained during the operational phase of the mine.

Other risks include:

Habitat loss and degradation; dispersal barriers and habitat fragmentation; reduced access to water; uncontrolled collecting and illegal hunting.

Additional mitigation measures include:


- Wildlife management plan by EEM focused on management of the medium to large faunal species and their habitat requirements to avoid habitat destruction through overgrazing;
- Fauna translocation plan from areas prior to disturbance when appropriate
- General awareness training will be done as part of the mine induction to inform all staff and contractors of the sensitivities of the biodiversity aspects of the mine and surrounds and appropriate environmental work-place etiquette;
- Measures to manage emergency, accident or upset conditions where biodiversity may be adversely affected.

There are a number of measures that will be implemented to minimise the impact on fauna and flora.

Measures to reduce at site:

- Barriers to terrestrial faunal movement, eg fine mesh fences, walls, trenches, a raised concrete base along a conveyor, will be avoided where possible, and measures implemented to reduce their fragmentation impacts.
- The following activities will be prohibited by staff and contractors: Hunting of wildlife within the mine property or mine controlled areas;
- Purchase, sale or transport of any wildlife products from local communities or passing traders;
- Collection of any animals or products thereof for consumption, medicinal use, cultivation or keeping as pets;
- Intentional killing of any animals including snakes, lizards, birds or other animals.
- All trenches and pits that are excavated for pipelines, caballing etc will be backfilled as soon as practically possible to avoid acting as a trap for small fauna.
- Escape routes for fauna will be provided within pitfall features and concreted drainage lines, and potentially dangerous situations inspected regularly to save trapped species.
- All new power line infrastructure should be bird-friendly in configuration (eg pylon designs that widely separate live wires to reduce electrocution of vultures and other large raptors) and adequately insulated to minimise the loss of raptors and other large birds. These activities should be supervised by someone with experience in this field.
- Redundant infrastructure will be removed at the earliest opportunity and these areas rehabilitated.

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- All roads within the mine properties and mine controlled areas to minimise the incidence of faunal road kills.
- Driver training will be provided to sensitise them to the importance of avoiding faunal road kills and the mine site, within the mine properties and on public roads.
- Trained mine personnel with capacity to safely capture and translocate dangerous snakes from construction sites and mine operational areas to safe areas of similar habitat within the mine property. Other nondangerous faunal species at risk from construction activities will be captured and translocated to safe areas as appropriate.
- Ongoing development of an inventory of species diversity within the mine sites will be maintained. EEM will collaborate with academic institutions with adequate competence to conduct research and monitor unexpected changes to the faunal baseline. Emphasis should be placed on the species considered to be at high and medium risk although not only restricted to these species. Such research may lead to improved mitigation to conserve the natural environments and species diversity.
- EEM will collaborate with academic institutions to conduct and interpret regular faunal monitoring studies to both expand on the current baseline study. The following aspects will be considered:

Additional conservation enhancement measures:

There are a number of measures that EEM could consider in improving the general conservation status of the area. These include the following:

Efforts will be supported to promote an appreciation of biodiversity features of the mine property and mine controlled areas among staff, contractors and their dependents as mentioned in the EMP.

Biodiversity offsets will be considered to remedy these and other residual impacts on biodiversity. Special consideration needs to be given towards choice of an offset that includes the plant and animal species of conservation concern; offset areas required to remedy residual negative impacts on habitat and flora may be sufficient to address the offset needs of fauna. Rare and undescribed plant and animal species may not be widespread and if not present in an offset, additional precautions to protect their populations in situ.

8.7. FRESHWATER ASSESSMENT


This section provides a description of the potential impacts the Project may have on surface water hydrology. The key receptors or resources considered are all affected sub-catchments and watercourses.

The main aquatic features within the wider study area consist of the Sout River System, a tributary of the lower Berg River, to the east of the site and the Langebaan Lagoon to the west of the site. The site occurs approximately 2km west of the watershed between these two larger freshwater features. Thus the surface water drainage is predominantly to the south west, towards Langebaan Lagoon. There are no seasonal or permanent wetlands in the immediate study area, only a poorly defined drainage channel that is orientated towards the south.

Impact Assessment

The only likely impact of the proposed mining activities on the surrounding freshwater features is that associated with the cumulative longer term impact of these activities on Langebaan Lagoon. This impact is deemed to be highly unlikely in terms of the distance between the proposed mining activities and given the fact that the

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activities will not entail any substantial consumptive use of water or pose any significant risk of water pollution to the resource. In addition, should there be any impact on the water resources in the area, it would be identified within the groundwater resources in the area long before becoming apparent in the lagoon. Given the distance between the proposed Elandsfontein Mine and the closest significant water resources, it should also be noted that there are many other activities within the immediate area that are far more likely to exert an impact on these freshwater features than the proposed mine and that establishing any cause and effect relationship between the mine's activities and any impact observed for these freshwater features would be extremely difficult.

Summary of Impact

Nature: Cumulative longer term impact of mining activities on Langebaan Lagoon - Loss of freshwater wetland areas associated with Langebaan Lagoon (predominantly <i>Typha</i> and <i>Phragmites</i> reed beds near Geelbek)		
	<i>Cumulative Impact without mitigation</i>	<i>Cumulative Impact with mitigation</i>
<i>Extent</i>	Localised longer term impacts	Localised longer term impacts
<i>Duration</i>	Long	Long
<i>Magnitude/Severity</i>	Very Low	Very Low
<i>Probability</i>	Improbable	Improbable
<i>Interpretation of the Impact Rating</i>	Very low to insignificant	Very low to insignificant
Mitigation: Monitor groundwater level and water quality between Elandsfontein site and Langebaan Lagoon to allow for early detection of any potential impact to this freshwater feature and allow for mitigation thereof prior to any possible impact on the lagoon; Longer term mapping and monitoring of the groundwater dependant ecosystems within Langebaan Lagoon (<i>Typha</i> and <i>Phragmites</i> reed beds near Geelbek) should be undertaken. This should form part of a wider monitoring programme such as the State of the Bay monitoring and assessment programme to evaluate the longer term and cumulative impacts of development of the Langebaan and Saldanha area.		

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8.8. GROUNDWATER IMPACT

Potential groundwater impacts from the Project will be associated with impacts on groundwater level changes associated with drawdown cones resulting from dewatering. Groundwater quality impacts may be anticipated as a result of possible contamination resulting from mining sources or activities.

Impact of Drawdown on the Groundwater Resource

Background

To determine the potential impact of pit dewatering and aquifer recharging, a number of production boreholes were established within the mine area.

These aquifer systems are defined by palaeo-channels that have been filled with gravels of the Elandsfontyn Formation and represent preferred groundwater flow paths. The Langebaan Road and Elandsfontein Aquifer Systems share a common recharge area, namely the dune field to the west of Hopefield. The Elandsfontein Aquifer System is also recharge by rain falling in the vicinity of Rietfontein to the south-east of the study area.

Pumping tests were conducted on the production boreholes and the impact on the adjacent exploration boreholes measured. The results indicate that they showed no response to the abstraction, meaning that the groundwater level did not change.

It is important to note that no groundwater will be used for processing.

DWA groundwater level data (see Appendix C for the Geohydrological Study) shows groundwater levels range from approximately 2 m to 28 meters below ground level (mbgl) for the Elandsfontein area. From the water level data obtained and measured it is evident that the water level ranges from 2 to 27 mbgl regionally. Within the proposed mining area the groundwater level is mostly between 10 and 20 mbgl (GEOSS, 2014).

To characterise the flow of the upper aquifer two boreholes were drilled to within the phosphate member and pumping tests were completed. The yield of the boreholes was approximately 2.5 l/s and 0.8 l/s respectively. During the pumping tests five exploration boreholes were monitored and they showed no response to the abstraction. See Figure 8-1 for the production borehole and exploration borehole locations. Due to the distance and results obtained from the test it is unlikely that any impact would extend to groundwater users outside of the project area.

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Figure 8-1: Location of production and exploration boreholes on Elandsfontein

When the proposed mine reaches its full size, approximately 23 ℓ/s will have to be removed from the mine on all four sides of the pit. It is strongly recommended that a numerical flow model be established to verify these findings and also to optimise the borehole design and configuration.

A 5 km hydrocensus needs to be completed in order to support the geohydrological report which must accompany the Water Use License Application. The hydrocensus and geohydrological report is to commence soon.

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Impact Assessment

Construction Phase Impact: During construction water from the existing Elandsfontein water borehole may be used, however, all contractors will be required to provide onsite mobile water storage tanks or truck in water with tankers.

It is anticipated that groundwater will be used during the construction phase which may result in localised groundwater level drawdown. This is, however, not expected to have noticeable impact on the groundwater resource. The significance rating is therefore NEGLIGIBLE.

Operational Phase Impact: The planned open pit mining operation will dewater the aquifer in the pit area, initial test results (see Appendix: Geohydrological Report) indicate that no response to abstraction was observed.

The impact magnitude is therefore rated as Low and the impact significance (post-mitigation) is Low. However, further studies such as a numerical flow model must be established to verify these findings and also to optimise the borehole design and configuration as well as a 5 km hydrocensus (see above).

Operational Phase Mitigation

A groundwater steering committee has been established by the Department of Water Affairs for this project and one of the recommendations is the establishment of a monitoring network both prior to and during operations. Groundwater level loggers should also be installed at monitoring borehole sites and they must also be designed so that accurate groundwater sampling can be carried out. A groundwater monitoring protocol must be developed for the proposed mine, including groundwater level monitoring.

Post-Closure Phase Impacts

It is expected that groundwater levels will recover after mine closure as the pit will be backfilled and the final mine platform level will be approximately 2m lower the current landform height.

The importance of the groundwater resource remains High as the resource is an important water supply and is currently used. The planned activity will not result in the loss of irreplaceable resource with regards to the groundwater resource.

No groundwater level change is expected and if any are expected to recover after mine closure The impact magnitude is therefore rated as Medium and the impact significance (post-mitigation) is Low.


Post-Closure Phase Mitigation

Groundwater monitoring data collected throughout the operational phase should be used for post-closure planning and to determine the extent and frequency of post closure groundwater level monitoring.

Residual Impact

As the tests have shown that abstraction from the pit will have no impact on groundwater level, the impact remains low.

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Impact on Groundwater Quality

The results of the leaching study on simulated softs stockpile and head assay results on the tailings composition indicated that:

- The tailings may have a composition similar to the original ore body. It must be noted that, the physical characteristics such as particle size, permeability and the pH in water may change and thus, it is important that a full characterisation is undertaken, e.g. of test samples and later in samples from the beneficiation plant to ensure that the environmental risks are the same.
- The test results indicate that the softs are a low risk to the environment with the exception of Sb (Antimony) in the borate leach. The results further indicate the presence of soluble salts because of the leachable calcium and possibly sulphate. Further detail is required as the salts could impact on the environment, this data is potentially important.

Impact Assessment

Construction Phase: Accidental spillage from construction equipment and chemicals storage areas.

The sensitivity and vulnerability of the groundwater resource to contamination is rated Medium.

It is anticipated that large volumes of chemicals, that have a potential to contaminate groundwater will be stored/used on site during the construction phase however the impact magnitude is small and it is not anticipated that the activity will result in the loss of an irreplaceable source. The impact significance (post mitigation) is Minor and the degree of confidence is Medium.

Construction Phase Mitigation

A construction environmental management plan (EMP) needs to be in place including, but not limited to:

- Adhere to best practice principles;
- Construction equipment should be up to standards and serviced regularly to prevent oil spills;
- A spill response plan should be in place and construction workers should be trained accordingly; and
- On-site storage areas for hydrocarbons and other chemicals should be constructed in a way that potential tank failures can be contained including bunds and surface hardstanding.


Operational Phase: Contaminated leachate from the Softs stockpile (SS). Spillage from mining equipment.

Although tailings may have a composition similar to the original ore body, it must be noted that, the physical characteristics such as particle size, permeability and the pH in water may change and thus, it is important that a full characterisation is undertaken, e.g. of test samples and later in samples from the beneficiation plant to ensure that the environmental risks are the same.

The test results indicate that the softs are a low risk to the environment with the exception of Sb (Antimony) in the borate leach. The results further indicate the presence of soluble salts because of the leachable calcium and possibly sulphate.

The Softs Stockpile is located to the west of the mine pit behind the Topsoil Stockpile. There is the potential of seepage from the SS into the pit. It is unlikely that water will be visible in the pit except following heavy rain events as all runoff will be directed to the stormwater dam where the water will be reused in the processing plant. The

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potential exists that due to the high evaporation rate, salts and other contaminants could accumulate in the pit and can be dissolved and mobilised during rain events. Pumped water from the pit following rain events could therefore be contaminated. Further, toe seepage is expected to occur at the base of the Softs Stockpile following rain events. Current test results on the softs indicate that it represents a low risk to the environment except for the SB in the borate leach.

Water quality impacts are expected to be limited in extent to the footprints of the Softs Stockpile and are therefore on-site and local in extent. The impact magnitude is rated as Medium and the impact significance (post-mitigation) is Moderate-Low. The degree of confidence in this assessment is medium.

Operational Phase Mitigation

In keeping with the mitigation hierarchy, the priority in mitigation is to apply mitigation measures to the source of the impact, main sources being the SS.

Mitigation measures required to reduce the impact on groundwater quality include the following:

Prior to construction of SS, the ground of the facility's footprint should be prepared to reduce the hydraulic conductivity of the material, i.e. through means of compaction, so that seepage water is forced out of the facility at ground level rather than infiltrating into groundwater.

Toe drains (interception trenches) along the base of SS to intercept drainage and convey to a stormwater dam. Toe seepage from these facilities may be contaminated and suitable management measures should be in place to prevent the release of this contaminated water into the environment. It is recommended to recycle as much water as possible and re-use it.

Management options specifically for the SS include the following:

- Short deposition cycles should be followed by regularly covering fresh tailings soon after deposition to prevent them oxidising on placement. Cladding the SS side slopes with softs material, concurrently with deposition, to minimise both oxygen ingress and sideslope erosion.
- Pumped water from the pit following heavy rain events may be contaminated and will need to be contained, or treated to applicable standards if it is to be released into the environment, in accordance with the water use licence requirements.
- It is further recommended that these mitigation measures be complemented with groundwater quality monitoring in the vicinity of contamination sources increasing distance from them. Monitoring should be carried out on a regular basis throughout the construction and operational phases.


Post Closure Phase: Contaminated leachate from the Softs stockpile (SS).

All softs stockpiles (i.e. overburden and dried tailings will be co-disposed on the SS) this will be used to backfill the pit. Initial results do not show any reason for concern why co-disposal may not occur and hence based on this it is predicted that groundwater quality will remain unchanged from its pre-mining state.

Additional concerns raised regarding the mining operation on groundwater include:

1. The impact on groundwater quality and indirect impact on the Langebaan Lagoon -Studies have shown that groundwater abstraction and recharge at Elandsfontein Mine will not affect this flow of fresh groundwater into the Langebaan Lagoon (GEOSS, 2014). Assessment of the groundwater flow directions

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of the area indicates that the flow into the lagoon is directly from the east of the Geelbek area (and not from the north-east where the Elandsfontein site is) from the Upper Aquifer Unit (Geoss, 2014). As such it is unlikely that the mining activity will affect the Langebaan Lagoon.

- Concerns were raised that extraction of water by the boreholes may affect soil moisture content. -Tests show that extraction of water from the boreholes did not influence the soil water content of the soils surrounding boreholes.

8.9. AIR QUALITY

Impact Assessment

Construction


During construction operations, dust is generated during land clearing and topsoil removal, road grading, material loading and hauling, travelling on unpaved roads and wind erosion from exposed areas.

The impact ratings for the construction phase are summarised in the table below. The overall impact rating for construction phase is moderate, With implementation of “good practice” mitigation measures, the impact rating will be reduced to low.

It should be noted that it was assumed that the “good practice” dust suppression measures indicated as essential in the recommendations section will be applied during construction.

Nature: During construction operations, dust is generated during land clearing and topsoil removal, road grading, material loading and hauling, travelling on unpaved roads and wind erosion from exposed areas.		
	<i>Without mitigation</i>	<i>With mitigation</i>
<i>Extent</i>	Site	Site
<i>Duration</i>	Temporary	Temporary
<i>Magnitude/Severity</i>	Low	Very Low
<i>Probability</i>	Highly Probable	Highly Probable
<i>Interpretation of the Impact Rating</i>	Moderate	Low
<i>Mitigation:</i>		
Emission Source	Recommended Control Methods	

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General construction	Wet suppression ^a Paving of permanent roads ^b Wind speed reduction screens ^b
Site preparation	Wet suppression ^a
Working face	Phasing operation management, in order to minimise the exposure of the working face to prevailing winds ^a Wind speed reduction screens ^b

Impact Assessment

Operational Phase

The operational phase of the Elandsfontein mine will last approximately 20 years. Dust together with PM₁₀ and PM_{2.5} are expected to be the main air emissions. The air quality impact during the operational phase of the Elandsfontein mine was quantified via dispersion modelling, and the cumulative effects of all emission sources were taken into consideration. The impact ratings for the operational phase of the mine are summarised below. It should be noted that the impacts estimated represent the worst-case scenario. The impacts for many years of the mining operation are expected to lower.


The main emission sources were the concentrate transportation trucks travelling on unpaved roads, the mining activities within the mining pit, the stockpiling of overburden and topsoil, as well as wind erosion at exposed areas and stockpiles. From the above-mentioned sources, the transportation trucks on the access road and the haul trucks were the main contributors to the total emissions. Therefore, during the operational phase the main effort in reducing the project's impact on the ambient air quality should be focused primarily on minimising the emissions from the access road, the haul roads and haul truck loading area. The essential mitigation measures for the operational phase are summarised in the emissions reduction recommendation section further below.

Based on the dispersion modelling results, the dust deposition and elevated PM₁₀ and PM_{2.5} levels will occur primarily within the mine and in close proximity to the access road. Therefore, the extent of the impact is considered local. The duration of the impact and the impact phase will be long term. The ambient air quality is likely to be negatively affected, with moderate severity and the impact occurrence highly probable. Based on the provided methodology rating system, the resulting overall impact rating for operational phase is high.

With additional mitigation, as described in the recommendation section, the severity is expected to be low, and the impact rating reduced to moderate.

Nature: Concentrate transportation trucks travelling on unpaved roads, the mining activities within the mining pit, the stockpiling of overburden and topsoil, as well as wind erosion at exposed areas and stockpiles.		
	<i>Without mitigation</i>	<i>With mitigation</i>
<i>Extent</i>	Local	Local

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Duration	Long-term	Long-term
Magnitude/Severity	Moderate	Low
Probability	Highly Probable	Highly Probable
Interpretation of the Impact Rating	High	Moderate
Mitigation:		
Emission Source	Recommended Control Methods	
Working face	Phasing operation management, in order to minimise the exposure of the working face to prevailing winds ^a Wind speed reduction screens ^b	
Materials handling and stockpiling	Wet suppression ^a Wind speed reduction screens ^b	
Truck transport and loading	Wet suppression of access roads ^a Wet suppression at haul truck loading area ^a Speed limit implementation (app. 30 km/hr) ^a Chemical stabilisation via chlorides, asphalt emulsions or petroleum resins ^b	

Recommendations


The main impacts on air quality due to proposed mine are expected to be as a result of the dust fallout and the PM₁₀ and PM_{2.5} emissions. The main factors that lead to dust problems are loose surface materials and strong winds generated by atmospheric pressure changes and vehicle movement.

Dust fallout monitoring should be conducted before and after the commencement of the project, in order to collect background data and verify modelling results. During the operational phase of the project, annual monitoring should take place for dust fallout at 4 selected locations around the site boundaries and 2 locations along the access road.

The performance targets for the monitoring should be set to a maximum total daily dust deposition (calculated from the monthly dust deposition) to be less than 600 mg/m²/day for residential areas, and the maximum annual average dust deposition within the site to be less than 1,200 mg/m²/day.

Along the access road, a reduction of speed is recommended in order to reduce the dust generation. The dust deposition levels at 2 locations along the road should be monitored, and if these exceed the limit then additional measures, such as chemical stabilisation, should be considered.

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8.10. SOCIO-ECONOMIC

The following impacts were identified as relevant for assessment based on the guidelines for social and economic specialist input (Department of Environmental Affairs and Development Planning) International Finance Corporation guidelines, Equator Principles, information from consultations with interested and affected parties (I&As) and the nature of the project and receiving environment: Impacts on the local economy and small, medium and micro enterprises.

- Impacts on key macro-economic variables focused on gross geographic product (GGP) and investment.
- Impact on tourism.

The sections below provide an assessment of each of the above mentioned impacts. This assessment is provided separately for the construction, operation and decommissioning phases of the Project.


8.10.1. IMPACTS LINKED TO PROJECT EXPENDITURE

The following table describes the impact characteristics of the construction and operational expenditure of the mine.

Summary	Construction	Operation	Decommissioning/ Post Closure
Project Aspect/ activity	This phase of the project would result in spending injections that would lead to increased economic activity best measured in terms of impacts on employment and associated incomes.	This phase of the project would result in spending injections that would lead to increased economic activity best measured in terms of impacts on employment and associated incomes.	This phase of the project would result in a withdrawal of spending injections that would lead to decreased economic activity relative to the operational phase.
Impact Type	Direct and indirect	Direct and indirect	Direct and indirect Direct and indirect beneficiaries of project expenditure
Stakeholders/ Receptors Affected	Direct and indirect beneficiaries of project expenditure	Direct and indirect beneficiaries of project expenditure	

Spending by EEM on both the construction and operation phases would be new spending as it would not displace or substitute for spending by other companies given that there are no other existing competing production facilities in the area. All expenditures would lead to linked direct, indirect and induced impacts on employment and incomes. Taking employment as an example, impacts would be direct where people are employed directly on

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the project in question (e.g. jobs such as construction workers), indirect - where the direct expenditure associated with a project leads to jobs and incomes in other sectors (e.g. purchasing building materials maintains jobs in that sector) and induced where jobs are created due to the expenditure of employees and other consumers that gained from the project.

Direct impacts are the most important of these three categories as they are the largest and more likely to be felt in the local area. Their estimation also involves the lowest level of uncertainty. The quantification of indirect and induced impacts is a far less certain exercise due to uncertainty surrounding accurate multipliers particularly at a local and regional level. This uncertainty makes it inadvisable to quantify indirect employment unless an in-depth analysis of this aspect is absolutely essential to decision making. Potential direct employment and income impacts are consequently quantified here and likely indirect impacts are borne in mind qualitatively when providing overall impact ratings.

The construction and operational phase of the project would result in spending injections that would lead to increased economic activity best measured in terms of impacts on employment and associated incomes focusing on the local area and region.

Construction Phase

Estimated Project Expenditure / Investment: USD120million

Duration: 12–15months (including access road)

Activity Description: The construction phase will involve earthworks (clearing and terracing), concrete works, sealing and proofing of concrete, piping and structural steel work, paving, metal work, buildings, plastering, plumbing, painting, mechanical equipment installation, roadworks, parking, water supply, sewerage system, assistance with construction and commissioning.

Direct Effects:

- Economic – employment in the area
- Environmental – limited noise, dust, disturbance of vegetation.
- Water – water required for construction.
- Increased traffic in area.

Indirect Effects (Suppliers/Vendors to mine):


- Economic – procurement from local businesses, employment in area.
- Social – improved quality of living, access to training, skills development.
- Tourism – mining and archaeological tourism plans, limited impact on current tourism since all mine access/traffic will be via R45.

Indirect Effects (suppliers of suppliers in value chain):

Possible suppliers include:

- Engineering works including structural steel and piping.
- Pump and valve supplier.
- Major mechanical equipment suppliers (20% of capex, typically beyond WCDM boundaries).
- Electrical and instrumentation contractors.
- Civil and earthworks contractors.
- Building (including painting, plastering, paving, plumbing, roofing, office equipment) suppliers.
- Transport contractors.
- Catering

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- Cleaning

Induced Effects:


- Due to the increased expenditures of households enabled by the increased incomes generated by the direct and indirect effects there will be increased economic benefit.
- Employment during construction: The estimated direct temporary employment during the peak construction period will be up to 800 people on site. The breakdown of people employed in terms of low skilled, semi-skilled and skilled are estimated at 40:40:20.
- Major contractors (civil, earthworks, SMPP, electrical) will be required to employ people from the local community. A recruitment mechanism will be required to assist in the process. The existing ward committee of Ward 7 in the Saldanha Bay municipal area, where the mine and the nearest community are located took a decision to conduct a skills audit of the Hopefield community. It was decided that the Ward Committee would facilitate the process of developing a skills register that would be used by the applicant and contractors for sourcing low skilled, semi- and skilled labour.
- Direct household income impacts during construction: Direct household income impacts would flow from all wages, estimated at USD10 – 15 million (including manufacturing labour) paid during construction. Approximately R80 million of this total would probably accrue to workers currently residing in Hopefield.
- Project construction expenditure / investment: Construction expenditure would constitute a positive injection of new investment. The applicant's preliminary estimates indicate that a total of approximately USD 120 million would be spent on all aspects of the construction phase over roughly 12-15 months.
- The project has the potential to have a significantly positive impact on commercial activity in the local area during construction given its size and the expenditure associated with it outlined above.
- Local economic sectors: During the construction phase the building construction, civil and other construction and specialist industrial machinery sectors would benefit substantially. The engineering, structural metal products, wholesale and retail trade, catering, housing, transport, waste management and construction materials sectors would also stand to gain due to indirect linkages.
- Small, medium and micro enterprises (SMME's): The project would provide a major injection for SMME's, contractors and workers in the local area, region and province leading to positive impacts.
- Skills Development: There will be opportunities for on the job training for low skilled and semi-skilled labour.
- Sourcing components, supplies and services: At least 75% (USD90 million) of components, supplies and services will be South African, with the imports comprising specialised machinery, equipment and spares and some electrical inputs that are not available in South Africa.
- Indirect opportunities during construction

In addition to the above direct employment and associated income opportunities, a significant number of temporary indirect opportunities would be associated with the project. These would stem primarily from expenditure by the proponent and contractors in the local area and region as well as expenditure by workers hired for the construction phase.

Construction Phase Mitigation

The objective of mitigation is to maximise economic benefit from jobs and expenditure particularly at a local and regional scale. The proponent's social and labour plan (SLP) should act as a departure point and take the lead when considering and enforcing benefit enhancement measures.

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The socio-economic study provides specific guidance on actions such as giving preference to local and historically disadvantaged individuals and companies. It was drawn up with care and in full consultation with all relevant stakeholders and as per the requirements of the Department of Mineral Resources.

Other mitigation measures that will be implemented during the construction phase include:

- All construction traffic to use R45 instead of R27 to mitigate impact on tourism
- Contractors will not be housed on site, but will stay in accommodation in Hopefield.
- Contractors will be bussed in to site to minimise the number of vehicles on the road.
- Dust suppression by use of water spray.
- No neighbouring communities in the area to be affected by noise.

Overall Impacts and Impact Significance

An assessment of the significance of the combined impacts of project-related expenditure based on the findings above is presented in the Box below.

Summary of Construction Phase Impact: Impacts linked to Construction Expenditure

NATURE	Expenditure on construction would result in a positive impact on the economy, increasing commercial activity, creating jobs and increasing incomes.
SENSITIVITY/VULNERABILITY/IMPORTANCE OF RESOURCE/RECEPTOR -	Low
IRREPLACEABILITY -	The impact will include some loss of irreplaceable resources. Construction access roads, will be rehabilitated if not required for the operational stage but water used during construction will be lost.
IMPACT MAGNITUDE -	High
	<ul style="list-style-type: none"> • <u>Extent</u>: The extent of the impact is national (though impacts would be proportionately greater at a regional and local scale). • <u>Duration</u>: The expected impact will be short-term (i.e. reversible). • <u>Scale</u>: The impact will result in a notable change to the receptor (i.e. the economy). • <u>Frequency</u>: The frequency of the impact will be once off but for the duration of construction. • <u>Likelihood</u>: Impacts from expenditure are a certainty in the economy.
IMPACT SIGNIFICANCE (PRE-MITIGATION) -	MODERATE
Degree of Confidence:	High degree of confidence.


Operational Phase

Estimated Project Expenditure / Investment: USD 800 million

Duration: 20 years

Activity Description: Mining, pumping, conveying, flotation, thickening, filtration, trucking, associated maintenance.

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Direct Effects:

- Economic – employment in area
- Environmental – limited noise, dust, disturbance of vegetation.
- Water – water required for processing.
- Increased traffic in area

Indirect Effects (Suppliers/Vendors to mine):

- Economic – procurement from local businesses, employment in area.
- Social – improved quality of living, access to training, skills development.
- Tourism – mining and archaeological tourism plans, limited impact on current tourism since all mine access/traffic will be via R45.

Indirect Effects (suppliers of suppliers in value chain):

Possible suppliers include:

- Engineering works including structural steel and piping.
- Pump and valve supplier.
- Major mechanical equipment suppliers (20% of capex, typically beyond WCDM boundaries).
- Electrical and instrumentation contractors.
- Civil and earthworks contractors.
- Building (including painting, plastering, paving, plumbing, roofing, office equipment) suppliers.
- Transport contractors
- Catering contractors
- Cleaning contractors

Induced Effects: due to the increased expenditures of households enabled by the increased incomes generated by the direct and indirect effects there will be increased economic benefit.

Employment during operational phase:

- The proposed new development will employ approximately 300 permanent employees with varying skills. Approximately 82 skilled and management and 218 low and semi-skilled. This implies an impact on the direct livelihood (direct workers and dependents) of approximately 1495 people. Indirect employment opportunities amount to 32,908 during the operational phase.


Direct household income impacts during operational phase:

- Direct household income impacts would flow from all salaries paid during operations. The average wage bill would be R430 million over 15 years.

Operational expenditure:

- The key operational phase impacts associated with the project would flow from expenditure on operations at the mine and plant.
- Local economic sectors: During the operational phase the industrial, engineering, housing, retail, catering, waste management and transport sectors would benefit substantially.

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- Small, medium and micro enterprises (SMME's): The project would provide a major injection for SMME's, contractors and workers in the local area, region and province leading to positive impacts.

Indirect opportunities during operational phase

- In addition to the above direct employment and associated income opportunities, a significant number of temporary indirect opportunities would be associated with the project. These would stem primarily from expenditure by the proponent and contractors in the local area and region as well as expenditure by workers hired during the operations phase.

Local Economic Development

It is the intention of the proponent to provide 5-Year local economic development (LED) plans that are supportive of municipal poverty alleviation and infrastructural development programmes. To this end the proponent has an agreement with the Saldanha Bay Municipality and SANParks to provide the following:

- The establishment of a Sustainable Science and Technology, Research, Education and Visitor Centre as a major attraction on the West Coast; and the development of a visitor centre at a Fossil site on the Elandsfontein Farm.
- A Farmer Support Programme.

Sustainable Science and Technology Research, Education, Production and Visitor Centre

Focus Area: Infrastructure, skills development and income generation


Sectoral Focus: Higher Education, Basic Education, Science & Technology, Manufacturing, Tourism

Socio-Economic Need to which project responds: Given the low skills base of the Saldanha Bay Municipality there is a huge need to generate the skills demanded within the economy locally. Current models in the region of privately funded Maths and Science Centres are not generating the required results. The aim of this project is to establish an interactive and production-orientated Science and Technology Centre focused on the economic demands of the region, such as: renewable energy (solar, wind, nuclear and waves) and sustainable service delivery; archaeology and paleontology; sustainable resource management such as rivers, biodiversity and marine environments; mining rehabilitation etc. The project will generate both short and long-term low and high-skills jobs for communities in the Saldanha Local Municipality and offer sustainable business opportunities for SMMEs. It would create a major regional economic infrastructure asset that would boost the tourism and related industries on a sustainable basis. The Elandsfontein Fossil site will be developed. The sustainability strategy of the Centre will be to develop a manufacturing plant for the production of fossil and skeleton models for the South African and African market.

Direct Community Benefit:

- 100 short-term construction jobs

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- 75 permanent job through the Research, Educator and Visitor components of the Centre
- At the production facility:
 - 27 unskilled/ semi-skilled labourers
 - 22 semi/skilled staff
- An asset that serves the entire West Coast region located within the SBM.
- Increased accessibility for the community of Hopefield – link to the R 27 and link to Elandsfontein and direct access to the West Coast National Park via Hopefield.
- SMME opportunities: restaurant offering West Coast cuisine; shop marketing West Coast arts and crafts and fossil & skeletal replicas; supplies and services required by the Centre.

Key Stakeholders: Primary stakeholders: Elandsfontein Mine, Saldanha Local Municipality, SANParks

New Farmer Support Programme in Hopefield

Focus Area: Infrastructure & income generation

Sectoral Focus: Agriculture

Socio-Economic Need to which project responds: Stimulating economic activity, in sectors such as agriculture is essential to generate jobs and increase economic participation. Of a total ward population of 7546, at least 41% of individuals have no monthly income. 40% earn between R1 -R3200 pm. The proposal is to develop small-scale farmer infrastructure and businesses (such as abattoirs and broilers) that could link into the commercial agricultural sector and contribute to job creation and regional food security.

Direct Community Benefit:

The proponent will engage indirectly through existing structures and networks with CASIDRA and WC Dept of Agriculture during the first 5-year cycle of the Elandsfontein SLP to assess the needs of small farmers. It shall provide professional planning support to small farmers and will develop a strategy, and identify projects to form part of the MOU among the mine, organs of state and small farmer stakeholders. It will be implemented during the 2nd cycle of the 5-year SLP.

The mining SLP contributions will promote small farmer Investment in:

- Economic infrastructure for small farmers, such as: broiler houses, fencing, road upgrading, vehicles and irrigation.
- Skills development in farming, financial management and accounting.


Funds will be transferred from the mine to a Small Farmer Support Fund which will be managed by a partnership between the community, the Mine, CASIDRA and the Western Cape Department of Agriculture.

Key Stakeholders: Elandsfontein Mine, Department of Agriculture (Western Cape), CASIDRA, Saldanha Local Municipality, Small Farmers.

Operational Phase Mitigation

The objective of mitigation is to: maximise economic benefit from jobs and expenditure particularly at a local and regional scale.

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Mitigation measures would be the same as for the construction phase focused on local employment and procurement as outlined in more detail in the construction phase mitigation section.

Other mitigation measures that will be implemented during the operational phase include:

- Mining method selected for lowest possible environmental impact, to minimise surface waste rock dumps and allow early rehabilitation of mined strips (rehabilitation will start in Year 4).
- Rehabilitation will be completed by a professional team
- Processing method does not require main stream crushing or milling, thus reducing energy consumption, noise and dust.
- Transport of concentrate will be along main access road instead of using a dedicated concentrate transport route.
- Labourers will be bussed into the property to reduce number of vehicles on the property.
- Processing plant and associated plant footprint will be minimised.
- Where possible, infrastructure will be built on least sensitive vegetation.

Overall Impacts and Impact Significance

An assessment of the significance of the combined impacts of project-related expenditure based on the findings above is presented in the Box below.


Summary of Operational Phase Impact: Impacts linked to Operational Expenditure

NATURE	Expenditure on operations would result in a positive impact on the economy, increasing commercial activity, creating jobs and increasing incomes.
SENSITIVITY/VULNERABILITY/IMPORTANCE OF RESOURCE/RECEPTOR	- Low
IRREPLACEABILITY	- The impact will not include the loss of irreplaceable resources.
IMPACT MAGNITUDE	- High
	<ul style="list-style-type: none"> • <u>Extent</u>: The extent of the impact is national (though impacts would be proportionately greater at a regional and local scale). • <u>Duration</u>: The expected impact will be long-term for the life of the mine (i.e. reversible). • <u>Scale</u>: The impact will result in a notable change to the receptor (i.e. the economy). • <u>Frequency</u>: The frequency of the impact will be periodic with a very high high frequency making it virtually constant for the period of operations as expenditure will flow on an ongoing basis. • <u>Likelihood</u>: Impacts from expenditure are a certainty in the economy.
IMPACT SIGNIFICANCE (PRE-MITIGATION)	- MODERATE
Degree of Confidence:	High degree of confidence.

Decommissioning and Post Closure Phase Impacts

Decommissioning and closure would essentially result in no more operational expenditure or jobs associated with the project which would result in negative impacts as the project is withdrawn from the economy. The impacts of this withdrawal could be mitigated somewhat with careful planning and a focus on supporting the creation of sustainable businesses while the mine is operational. A highly significant decrease in economic activity in the area would, however, not be avoidable given the large size of the project.

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Summary of Decommissioning Phase Impact: Impact linked to Withdrawal of Expenditure

NATURE	Decommissioning and closure would essentially result in no more operational expenditure or jobs associated with the project which would result in negative impacts as the project is withdrawn from the economy.
SENSITIVITY/VULNERABILITY/IMPORTANCE OF RESOURCE/RECEPTOR -	Medium
IRREPLACEABILITY -	The impact include the loss of mine expenditure in the area which would be irreplaceable to a degree.
IMPACT MAGNITUDE -	High
	<ul style="list-style-type: none"> <u>Extent</u>: The extent of the impact is national (though impacts would be proportionately greater at a regional and local scale). <u>Duration</u>: The expected impact will be permanent (i.e. irreversible). <u>Scale</u>: The impact will result in a notable change to the receptor (i.e. the economy). <u>Frequency</u>: The frequency of the impact will be once-off. <u>Likelihood</u>: Impacts from expenditure are a certainty in the economy.
IMPACT SIGNIFICANCE (PRE-MITIGATION) -	MAJOR
Degree of Confidence:	Degree of confidence is medium.

Decommissioning Phase Mitigation

The objective of mitigation is to: minimise the negative impacts of the withdrawal of project expenditure from the local area and region. Mitigation measures will have to be developed and refined with time as part of the proponent's SLP. These will in all likelihood include training and assistance with the establishment of local businesses that can continue to provide opportunities post-mining (i.e. businesses that do not rely on mining directly or indirectly through their customers being Elandsfontein Mining and Exploration or its employees).

Furthermore, the mining infrastructure that is left behind will be able to be converted into social and economic infrastructure to the benefit of the local community and the region as a whole.

Residual Impact


The implementation of the above mitigation measures would increase the positive construction phase impacts from Moderate to Major significance and the operation phase impacts from Moderate to Major. The implementation of the decommissioning phase mitigation measures would probably reduce the significance of negative impacts from Major to moderate if they are particularly well resourced and executed.

Impact on Tourism

Impact Description and Assessment

Impact Characteristics: Impacts on Tourism

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Summary	Construction	Operation	Decommissioning/ Post Closure
Project Aspect/ activity	All project aspects and activities that could impact on characteristics of the area which support tourism (i.e. visual quality, air quality, biodiversity,	All project aspects and activities that could impact on characteristics of the area which support tourism (i.e. visual quality, air quality, biodiversity, noise,	Closure and rehabilitation of project aspects and activities that could impact on characteristics of the area which support tourism (i.e. visual quality, air quality, biodiversity, noise, etc.) Direct and indirect
Impact Type	Direct and indirect	Direct and indirect	
Stakeholders/ Receptors Affected	Tourists and those that rely on them for their livelihoods.	Tourists and those that rely on them for their livelihoods.	

As was outlined in the overall economic context section, tourism plays an important role in the economy of the wider area and has the potential to play an increasingly prominent role as a driver of economic development. It is thus important to consider the potential impacts of the proposed development on this sector.

In order to assess tourism impacts discussions were held with the Saldanha Bay Tourism Organisation and South African National Parks (SANPARKS). The Saldanha Bay Tourism organisation is an executive and coordinating organisation for the promotion of sustainable tourism and tourism development in the municipal region and the representative body, by means of membership, for all private tourism businesses. SANParks manages a national system of parks which represents the indigenous fauna, flora, landscapes and associated cultural heritage.

Where possible, a distinction has been made between impacts on tourism in the vicinity of the project site (i.e. primarily on neighbouring properties and within close proximity to the site) and on tourism in the wider area recognising that impacts at these scales overlap substantially.

Sources of positive impacts would stem from increased potential business- related visitors to the project.

The Tourism Development Context


The provincial, district and local municipality Integrated Development Plans (IDPs), Spatial Development Frameworks (SDFs) and Local Economic Development strategies (LED's) all point out the importance of tourism in the wider area and focus on its future potential. Specifically at a local level, the Saldanha Bay Municipality's Medium Term Economic Development Strategy (2013: p 10) highlights the expansion of differentiated tourism product range to extend stays in the locality as a one of its strategic result areas.

The concern raised by the Saldanha Bay Tourism Organisation was that the mine would potentially damage the tourism brand strategy that seeks to position Saldanha Bay as a destination of "nature, tranquility, culture, adventure and cuisine." The view from SANParks was that there would be no impact on the West Coast national park as the proposed mine is close to the eastern border of the park which has no tourism activity.

Key tourism attractions near the proposed mining site

1. Fossil Exhibition and Tourism Bureau
2. Langrietvlei National Monument

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Impacts on specific tourism facilities and key tourism areas would be limited, however, given the project's location relative to these.

Construction and Operational Phase Mitigation

Impacts on tourism are primarily dependent on how the proponents operations are designed, constructed and operated to minimise negative biophysical and social impacts and enhance positive ones. The measures recommended in other specialist studies to minimise negative impacts (primarily visual, air quality, noise, traffic and botanical measures) and enhance positive impacts would thus also reduce impacts on tourism and should be implemented. These measures are not repeated here. With pro-active planning there may be possibilities to allow controlled eco- tourism activities on the bio-diversity offset site. An investigation of appropriate options in this regard should ideally form part of offset selection and planning.

Decommissioning and Post Closure Impacts


Decommissioning would essentially result in the reduction or removal of tourism risks as project elements are closed. The eventual significance of impacts will be highly dependent on rigorous rehabilitation of the project site.

Decommissioning Phase Mitigation

If one takes a sample of mines throughout South Africa it is clear that the rehabilitation effort and the success associated with it can be highly variable even if all mines are required to abide by the same rules. This variability can be seen when comparing both operating and closed mines. It therefore stands to reason that, with regards to minimising impacts, much will depend on how the proponents EMP is conceived and implemented in partnership with the DMR and other local stakeholders. If rehabilitation is rigorously applied and well-funded both concurrently and at closure to avoid visual scarring along with air pollution control measures, impacts are likely to be significantly less than the case of the proponent simply doing the minimum to satisfy DMR requirements.

The implementation of the above mitigation measures would decrease the negative construction phase impacts from Moderate to Minor significance and the operation phase impacts from Moderate/Major to Moderate. The implementation of the decommissioning phase mitigation measures would probably introduce positive impacts of a Moderate significance if they are particularly well resourced and executed.

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9. ENVIRONMENTAL MANAGEMENT PROGRAMME

(In compliance with Section 39(3)(d) of the MPRDA Act, read together with Regulation 50(e), (f) and (i) and Regulation 51(b)(i) and (ii) and Section 39(4)(a)(iii) of the MPRDA Act).

This section provides specifications which must be implemented as part of the design, construction and operational and decommissioning phase. It outlines the roles and responsibilities for the implementation of the control and monitoring.

9.1. OBJECTIVES OF THE EMPR


The aim of an EMPr is to facilitate appropriate bio-physical and socio- economic environmental controls during all phases of the project. To achieve this, the EMPr must make recommendations for the planning and design (pre-construction/design phase), specify the limitations the contractor must abide by during construction, detail the issues that should be taken cognisance of and indicate specific actions that must be undertaken so as to mitigate all impacts identified and assessed in the ESIA. The EMPr thus specifies the framework within which the contractor(s) must carry out the construction activities. An operational and decommissioning phase management plan is also included in the EMPr and specifies the framework within which the developer must carry out the operations during the life of mine and during the decommissioning phases of the development.

In addition, the EMPr provides a clear indication of the environmental and social management requirements of each of the role players involved during the construction, operational and decommissioning phases of the Project. Guidance for the implementation of the EMPr is provided, including the management of method statements which are required to be implemented to achieve compliance with the Environmental Specifications. Corrective actions in the event of non-compliance with the EMPr are also defined.

The EMPr is required in order to:

- assist in ensuring continuing compliance with South African legislation and international good practice;
- provide a mechanism for ensuring that measures identified in the this Report designed to mitigate potentially adverse impacts, are implemented;
- provide a framework for mitigating impacts that may be unforeseen or unidentified until construction is underway;
- provide assurance to regulators and stakeholders that their requirements with respect to environmental and socio-economic performance will be met; and
- provide a framework for compliance auditing and inspection programs. The EMPr will remain a draft document until it has been updated with the conditions stipulated in the environmental authorisation. From then onwards
- it is intended to be a living document that The overall EMPr contains sections that specifically deal with the design and planning phase, the construction phase (Construction EMPr), the operational phase (Operational EMPr) and decommissioning and closure plans. This document will address both bio-physical and socio-economic aspects, and present these within the various phases of the Project.

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9.2. ROLES AND RESPONSIBILITIES

The key role-players during the construction phase of the Project, for the purposes of environmental management on site, include but are not limited to: the Developer (EEM), the Engineer, the main Contractors (direct appointments including civil works contractor, building contractor, landscape contractor etc.), the Environmental Control Officer, and representatives of the relevant Authority/ies.

Details of the responsibilities of each of the key role-players have been provided below. For the purposes of this section it has been written in line with the DEA&DP requirements for construction environmental management plans.

The Developer

For the purpose of this document, “the Developer” and its appointed facilitators refers to those to whom permission has been granted to proceed with the Project (i.e. EEM), and who is thus ultimately responsible for compliance with all conditions of approval of the Development or any aspect thereof by any authority.

With respect to the pre-construction phase of the Development, the Developer is to:

- Implement the recommendations outlined in the pre-construction EMP; and
- Implement as many recommendations as possible that will lessen the total environmental impact of the proposed Development from the design stage, through to construction and ultimately the operational phase.

With respect to the construction phase of the Development, the Developer is to:

- Ensure that all relevant approvals and permits have been obtained prior to the start of construction activities on site;
- Ensure that the EMP has been approved by DMR prior to the start of construction activities on site;
- Ensure that all conditions of approval have been complied with;
- Appoint all the required specialists to make input into the pre-construction/design phase ;
- Appoint a suitably qualified and experienced ECO prior to the start of construction activities on site, and for the duration of the construction phase.

With respect to the operational phase of the Development, the developer is to:


- Ensure that operation of the phosphate mine is undertaken in line with the requirements of the operational phase EMP; and
- Continuously seek to improve any negative environmental impacts which result from the operational phase.

Site Engineer

For the purposes of this document, “Site Engineer” refers to the engineer for the Development, or any other person authorised by the Developer, to be responsible for the technical and contractual implementation of the works to be undertaken.

The responsibilities of the Site Engineer are to:

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- Ensure that the requirements as set out in this EMPr and by the relevant Authorities are adhered to and implemented;
- Assist the ECO in ensuring that the conditions of the Construction EMPr are being adhered to and promptly issuing instructions requested by the ECO, to the Contractor. All site instructions relating to environmental matters issued by the Engineer are to be copied to the ECO;
- Assist the ECO in making decisions and finding solutions to environmental problems that may arise during the construction phase;
- Review and approve construction method statements with input from the ECO;
- Order the removal of person(s) and/or equipment not complying with the specifications (as required by the ECO or otherwise); and
- Provide input into the ECO's ongoing internal review of the EMPr.

The Contractor

For the purposes of this document "The Contractor" refers to any directly appointed (by the Developer) company or individual undertaking the implementation of the works.

The Contractor is to:


- Ensure implementation of all applicable Environmental Specifications, including all additional requirements related to approve method statements, during all works on site.
- Ensure that all of its sub-contractors', employees, suppliers, agents etc. are fully aware of the environmental requirements detailed in the Environmental Specifications;
- Liaise closely with the Engineer and the ECO and ensure that the works on site are conducted in an environmentally controlled manner;
- Inform the Engineer as well as the ECO should environmental conditions on site deteriorate, e.g. dumping, pollution, littering and damage to vegetation; and
- Carry out instructions issued by the Engineer, on request of the ECO, required to fulfil his/her compliance with the Construction EMPr.

Environmental Control Officer

During the construction phase of the project, the ECO is to:

- Ensure that the Contractor has a copy of the Construction EMPr and all agreed method statements;
- Undertake weekly site inspections (frequency may change as required, depending on the activity) to audit compliance of all parties with the requirements of the Construction EMPr;
- Advise/recommend on actions or issues impacting on the environment to the Engineer, who shall issue any required Site Instructions to the Contractor;
- Environmentally educate and raise the awareness of the Contractor and his/her staff as to the sensitivity of the site and to facilitate the spread of the correct attitude during works on site;
- Review and approve construction/landscape method statements together with the Engineer/Landscaper (when applicable);
- Assist the Contractor in finding environmentally responsible solutions to problems;

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- Recommend to the Engineer the removal of person(s) and/or equipment not complying with the Specifications;
- Undertake photographic monitoring of the construction site;
- Keep records of all activities/ incidents concerning the environment on site in a Site Diary;
- Complete temporary and permanent site closure checklists;
- Compile and maintain a complaints register;
- Take immediate action on site to stop works where significant and irreparable damage is being inflicted on the environment, and to inform the Engineer, EEM and relevant authorities immediately of the occurrence and action taken; and
- Undertake a continual internal review of the EMPr and make recommendations regarding its updating to the Engineer and Developer.

The ECO has the authority to recommend to DEA&DP that works be stopped, if in his/her opinion serious harm to, or impact on the environment is imminent, is likely to occur or has occurred and such actual or potential harm or impact is in contravention of the EMPr, and which is, or may be, caused by construction or related works.

Upon failure by the Contractor or Contractor's employee to show adequate consideration to the environmental aspects of this contract, the ECO may recommend to the Engineer and the project management team to have the Contractor's representative or any employee(s) removed from the site or work suspended until the matter is remedied. No extension of time will be considered in the case of such suspensions and all costs will be borne by the Contractor.

The ECO shall keep a Site Diary in which events and concerns of environmental significance are to be recorded. The ECO will compile a monthly report of such events, concerns, public complaints and general compliance of the Contractor with the construction phase of the EMPr. This report will be submitted to the Engineer and if required, to DEA&DP, DMR and the Namakwa District Municipality. The ECO is also required to attend regular site meetings of the project management team to report on environmental issues and to minute the requirements that emerge.


The ECO will be responsible for the compilation of a final completion checklist for the project, completed when all construction works related to the project have terminated and the site has been cleared of all construction related debris, materials or equipment not forming part of the permanent works. This checklist will audit the Contractor's compliance with the construction phase of the EMPr throughout the duration of the construction phase and, together with a final written report, will be submitted to DEA&DP, DEA, DMR and the Saldanha Bay Municipality in order to achieve "environmental closure" for the construction phase of the project.

Upon finalization of the specialist studies all relevant mitigation and management comment as prescribed by their reports (where feasible and practical) in accordance to the specific activity that will be undertaken during the different phases of the Elandsfontein Mine Project.

9.3. CONSTRUCTION ENVIRONMENTAL MANAGEMENT PROGRAMME (CEMPR)

This Specification covers the requirements for controlling the impact on the environment of all construction activities for the Project. All construction activities shall observe the requirements of this specification as well as any relevant environmental legislation and in so doing shall be undertaken in such a manner as to minimise impacts on the natural and social environment.

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The construction period is expected to last for 12-18 months.

9.3.1. APPLICATION

This Specification contains clauses that are generally applicable to the undertaking of civil engineering works in areas where it is necessary to impose pro-active controls on the extent to which the construction activities impact on the environment. The roles and responsibilities in terms of the application and implementation of this Specification have been outlined in above.

9.3.2. METHOD STATEMENTS

Any Method Statement required by the Engineer or the Environmental Specification shall be produced within such reasonable time as the Engineer shall specify or as required by the Specification. The Contractor shall not commence the activity until the Method Statement has been approved and shall, except in the case of emergency activities, allow a period of two weeks for approval of the Method Statement by the Engineer. Such approval shall not unreasonably be withheld.


The Engineer or ECO may request a Method Statement for any activity they believe may impact on the environment. The Engineer in consultation with the ECO may also require changes to a Method Statement if the proposal does not comply with the Specification or, if in the reasonable opinion of the Engineer, the proposal may result in, or carry a greater than reasonable risk of, damage to the environment in excess of that permitted by the Specifications. Approved Method Statements shall be readily available on the site and shall be communicated to all relevant personnel. The Contractor shall carry out the Works in accordance with the approved Method Statement. Approval of the Method Statement shall not absolve the Contractor from any of his/her obligations or responsibilities in terms of the Contract.

The following Method Statements shall be provided by the Contractor and submitted to the Engineer and ECO at least 7 working days before site establishment. The content of the Method Statement must be agreed to with the ECO and site engineer.

Logistics for the environmental awareness course for all the Contractors employees.

- Emergency procedures for fire, accidental leaks and spillages of hazardous materials including:
 - who shall be notified in the event of an emergency, including contact numbers for the relevant local authority,
 - where and how any hazardous spills will be disposed of,
 - the size of spillage which the emergency procedures could contain,
 - location of all emergency equipment and an indication of how regularly the emergency equipment will be checked to ensure that it is working properly.
- Location and layout of the construction camp in the form of a plan showing offices, stores for fuels, hazardous substances, vehicle parking, access point, equipment cleaning areas and staff toilet placement.

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- Location, layout and preparation of cement / concrete batching facilities including the methods employed for the mixing of concrete and the management of runoff water for such areas. An indication shall be given of how concrete spoil will be minimised and cleared.
- Method of undertaking earthworks, including spoil management, erosion.
- Measures for the suppression of dust and noise emissions.
- Method statement for the establishment of no-go areas, specifically with regard to the manner in which sensitive ecological habitat will be avoided.
- Location of stormwater management measures and visual representation of mechanisms to manage clean and dirty water separation.
- Management measures to be undertaken in instances where traffic flows may be interrupted.
- Extent of areas to be cleared, the method of clearing and the preparation for this clearing so as to ensure minimisation of exposed areas.
- Measures to be put in place during temporary closure periods, e.g. December holidays.
- Note that the contractor may only commence with any activity if a Method Statement which has been approved by the ECO and site engineer is in place.

9.3.3. ENVIRONMENTAL AWARENESS TRAINING

The logistics for the environmental awareness training course, together with the subject matter, would need to be outlined into a method statement. This will include, *inter alia*, the number of attendees, material to be distributed and procedures to record and verify attendance.

9.3.4. TEMPORARY CONSTRUCTION CAMP AND SITE DIVISION

The location, layout and method of establishment of the temporary contractor camp (including all buildings, offices, lay down yards, vehicle washing areas, fuel storage areas, batching areas and other infrastructure required for the construction of the project).

9.3.5. VEGETATION CLEARING

Method of vegetation clearing during site establishment and disposal procedure for cleared material.


9.3.6. ACCESS/HAUL ROUTES

Details, including a drawing, showing where and how the access points and routes will be located and managed, including traffic safety measures.

9.3.7. FUEL STORAGE AND USE

The design, location and construction of the fuel storage area, for the filling and dispensing from storage tanks and management of drip trays.

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9.3.8. SOLID WASTE MANAGEMENT

Expected solid waste types, quantities, methods of recycling to be employed, monitoring and record keeping procedures, staff responsible for the oversight of waste management and recycling and frequency of collection and disposal of the non-recycled component, as well as location of disposal sites.

9.3.9. CONTAMINATED WATER

Methods of minimising, controlling, collecting and disposing of contaminated water, including stormwater run-off.

9.3.10. HAZARDOUS SUBSTANCES

Details of any hazardous substances / materials to be used, together with the transport, storage, handling and disposal procedures for the substances.

9.3.11. CEMENT AND CONCRETE BATCHING

Location, layout and preparation of cement/ concrete mixing areas including the methods employed for the mixing of concrete, and particularly the containment of runoff water from such areas, as well as the method of transportation of concrete.

Batching to be undertaken on a smooth, impermeable surface and which is sloped towards a sump collection point. All wastewater generated from the batching area shall be collected and disposed of via the contaminated wastewater management system.


9.3.12. EMERGENCY PROCEDURES AND EQUIPMENT

Emergency procedures for fire, accidental leaks and spillages of hazardous substances (including fuel and oil). Include details of risk reduction measures to be implemented, such as fire fighting equipment, fire prevention procedures and spill kits (materials and compounds used to reduce the extent of spills and to breakdown or encapsulate hydrocarbons). The contractor will also outline the type of emergency equipment required on site, as well as the servicing requirements to ensure correctly functioning equipment.

Other Method Statements required by the Engineer and ECO during the course of construction are to be provided by the Contractor a minimum of 14 working days prior to commencement of the works or activities to which they apply (these activities may not commence on site before these Method Statements have been approved except in the case of emergency activities).

9.3.13. EROSION AND SEDIMENTATION CONTROL

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The proposed methods of sedimentation and erosion control for bulk earthworks in particular and the remainder of the construction period, in order to ensure the prevention of sedimentation of water courses and storm- water infrastructure.

9.3.14. TRAFFIC MANAGEMENT

The contractor must compile a method statement for the transportation of abnormal loads, or transport related activities that will impact on surrounding traffic flows. The method statement must indicate timing of potential disruption/ road closures, means of notification of surrounding road users, proof of correspondence from the relevant traffic authorities and drawings of any potential changes to the existing road layout.

9.3.15. SITE ESTABLISHMENT

9.3.15.1. SITE DIVISION

The Contractor shall restrict all his activities, materials, equipment and personnel to within the area specified, and shall restrict his activities to only those areas that are necessary to undertake the works.

A Method Statement detailing the layout and method of establishment of the temporary construction camp, all buildings, offices, lay down areas, fuel storage areas, batching areas and other infrastructure required for the running of the project shall be submitted.

Disturbed areas rather than pristine or intact landscape areas should preferably be used for the temporary construction camp.

9.3.15.2. SITE DEMARCATION


The Contractor shall erect and maintain permanent and/ or temporary fences of the type and in the locations directed by the Engineer. Such fences shall, if so specified, be erected before undertaking designated activities. The temporary construction camp, material stores and lay-down areas should be screened and sited as far away as possible from the local roads.

9.3.15.3. SITE CLEARANCE

Topsoil

Ideally, only about the top 30cm should be used. In some situations this generates too little to redistribute effectively afterwards, and a little more is taken, but this has a negative effect on the recovery achieved when it is reapplied. Also, the biological activity of stored topsoil declines over time and it should not be stored for more than a few months and the benefit of putting it aside declines substantially after about 6 months. However if stored for an extended period of time no natural regeneration from the soil-stored seed bank can be expected. Due to the arid nature of the impacted environment, topsoil will not be retained for re-use during the construction phase of the Project.

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9.3.16. ACCESS ROUTES/ HAUL ROADS

The Contractor shall control the movement of all vehicles including that of his suppliers so that they remain on designated routes, are distributed so as not to cause an undue concentration of traffic and that all relevant laws are complied with. In addition, such vehicles shall be so routed and operated as to minimise disruption to regular users of the routes not on the site. The vehicles of the Contractor and his suppliers shall not exceed a speed of 30 km/h on gravel or earth roads on site and within 500 m of the site.

During construction, arrangements and routes for abnormal loads (if required) must be agreed in advance with the relevant authorities and the appropriate permit must be obtained for the use of public roads. Lastly, dust suppression measures must be applied to all gravel roads, especially during period of strong winds.

9.3.17. GENERAL REQUIREMENTS

9.3.17.1. MATERIALS HANDLING, USE AND STORAGE

The Contractor shall ensure that any delivery drivers are informed of all procedures and restrictions (including "no go" areas) required to comply with the Specifications. The Contractor shall ensure that these delivery drivers are supervised during off loading, by someone with an adequate understanding of the requirements of the Specifications.

Materials shall be appropriately secured to ensure safe passage between destinations. Loads including, but not limited to, sand, stone chips, fine vegetation, refuse, paper and cement, shall have appropriate cover to prevent them spilling from the vehicle during transit. The Contractor shall be responsible for any clean-up resulting from the failure by his employees or suppliers to properly secure transported materials.


All manufactured and/ or imported material shall be stored within the Contractor's temporary construction camp. All lay down areas outside of the temporary construction camp shall be subject to the Engineer's approval. All building materials should be stored at least 50 m away from aquatic ecosystems and the areas bounded appropriately such that there will be no runoff from these areas towards aquatic systems. All building materials should be removed after construction.

9.3.18. FUEL (PETROL AND DIESEL) AND OILS (HEAVY FUEL OILS INCLUDED)

All fuel is to be stored within a demarcated area in the Contractor's temporary construction camp. No refuelling of vehicles or machinery is to take place outside of this demarcated area unless authorised by the Engineer. The Engineer shall be advised of the area that the Contractor intends using for the storage of fuel.

The Contractor shall ensure that all liquid fuels (petrol and diesel) are stored in tanks with lids, which are kept firmly shut. Only empty and externally clean tanks may be stored on the bare ground. All empty and externally dirty tanks shall be sealed and stored in an area where the ground has been protected.

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Tanks containing fuels shall be situated on a smooth impermeable surface (plastic or concrete) base with a bund (if plastic, it must have sand on top to prevent perishing) to contain any possible spills and prevent infiltration of fuel into the ground. The impermeable lining shall extend to the crest of the bund and the volume inside the bund shall make up 110 percent of the total capacity of all the storage tanks.

The floor of the bund shall be sloped towards an oil trap or sump to enable any spilled fuel to be removed. An Enretech or similar hydrocarbon absorption/remediation product approved by the ECO shall be installed in the sump to reduce the risk of pollution. Bulk fuel storage and bunded areas shall have overhead cover to prevent rain from entering the bunded area. The Contractor shall keep fuel under lock and key at all times.

If fuel is dispensed from 210 litre drums, the proper dispensing equipment shall be used, and the drum shall not be tipped in order to dispense fuel. The dispensing mechanism used to dispense fuel from the drums shall be stored in a waterproof container when not in use.

During fuel tanker delivery, the tanker driver must be present at all times during offloading of product. An emergency cut-off switch must be installed to immediately stop fuel delivery should an accident occur. An anti-flash nozzle must be installed at the end of the vent pipe with a fuel dispenser equipped with an automatic cut-off switch to prevent fuel tank overfills.


No smoking shall be allowed in the vicinity of the stores. Symbolic safety signs depicting "No Smoking", "No Naked Lights" and "Danger" are to be provided, and are to conform to the requirement of SABS 1186. The volume capacity of the tank shall be displayed. The product contained within the tank shall be clearly identified using the emergency information system detailed in SABS 0232 Part 1. Any electrical or petrol-driven pump shall be equipped and positioned so as not to cause any danger of ignition of the product.

Areas for storage of fuels and other flammable materials shall comply with standard fire safety regulations and may require the approval of the Municipal Fire Prevention Officer.

The Contractor shall ensure that there is adequate fire-fighting equipment at the fuel stores.

Where reasonably practical, vehicles and equipment shall be refuelled at a designated re-fuelling area or at the workshop as applicable. If it is not reasonably practical then the surface under the temporary refuelling area shall be protected against pollution and drip trays used to the reasonable satisfaction of the Engineer prior to any refuelling activities. The Contractor shall ensure that there is always a supply of appropriate material readily available to absorb/ breakdown and where possible be designed to encapsulate minor hydrocarbon spillage. The quantity of such materials shall be able to handle a minimum of 210 litre of hydrocarbon liquid spill. This material must be approved by the Engineer prior to any refuelling or maintenance activities.

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9.3.19. SOLID WASTE MANAGEMENT

For the purposes of these Environmental Specifications, solid waste includes all debris and waste (e.g. litter, food waste, hardware discards, vegetation and tree stumps, building rubble, etc.), including hazardous waste (e.g. oils) resulting from any construction activities on site.

The Contractor shall be responsible for the establishment of a waste control system (Waste Management Plan) that is acceptable to the Engineer and ECO, and a method statement is required in this regard. The contractor shall keep detailed records of all waste removed from site. The waste management hierarchy (see section on Waste Management) must be adopted, when managing waste produced onsite.

The contractor must then provide proof of recycling or legal disposal at a registered landfill site (disposal certificates). No refuse or waste material will be disposed of by burying on site. The specific disposal requirements of wastes will be informed by the relevant hazard rating, as this will determine the landfill requirements.

Refuse Control

The Contractor shall provide labourers to clean up the Contractor's temporary construction camp and working areas on a daily basis.

Litter and waste materials (excluding rubble and hazardous waste materials) shall be disposed of into scavenger- and weather-proof bins. The Contractor shall provide sufficient bins with lids on site to store the waste produced on a daily basis. In order to facilitate recycling it is recommended that a number of bins be provided at each location, and that such bins be clearly marked according to the category of waste being recycled (e.g. paper, metals, plastics, glass, etc.) Bins shall not be allowed to become overfull and shall be emptied a minimum of once daily. The waste may be temporarily stored on site in a central waste area that is weatherproof and scavenger-proof, and which the Engineer has approved. The Contractor shall then remove the refuse collected from the Site at least once a week. Any refuse not being re-cycled must be disposed of at a registered waste disposal facility. The Contractor shall ensure that waste and surplus food, food packaging and organic waste are not deposited by employees anywhere on the site except in refuse bins.


Empty Cement Bags

Empty cement bags must be collected from the construction area by the end of every day and before rain events and shall be stored in bins that are either placed under cover or fitted with lids. This prevents the bags getting wet and the cement powder leaching into the environment.

Hazardous Waste

Petroleum, chemicals, and other harmful and hazardous wastes are to be stored in enclosed and bunded areas. The location of these sites is to be approved by the Engineer and the ECO. These wastes shall be disposed of at a registered hazardous waste disposal site. The Contractor shall submit copies of receipts from such waste disposal sites to the Engineer and ECO as proof of proper disposal. The storage, handling and disposal of hazardous waste

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are also controlled through other relevant legislation which must be complied with, e.g. the Occupational Health & Safety Act.

Builders rubble

The Contractor shall provide labourers to clean up the Contractor's camp and working areas of rubble generated in the course of construction work, at least once a week.

Rubble shall be temporarily stockpiled in a waste skip or a central stockpile. Any rubble not being recycled (e.g. sent for crushing) or reused shall be removed from site and disposed of at an approved landfill site as soon as it constitutes a practical load for removal and before temporary closure of the site (e.g. over builders holidays). No plastics, shrink wrap, paint buckets or any other debris that does not constitute clean building rubble, shall be stored at such stockpile sites.

9.3.20. ABLUTION FACILITIES

Washing, whether of the person or of personal effects, and acts of excretion and urination are strictly prohibited other than at the facilities provided. Latrine and ablution facilities and first-aid services shall comply with the regulations of the local authority concerned and shall be maintained in a clean and sanitary condition to the satisfaction of the Engineer.

The Contractor shall provide suitable sanitary arrangements at the Contractor's temporary construction camp and approved points around the designated work area to allow easy access for all employees on site. Project staff are not permitted to commence with work on a site without suitable toilet facilities available for them.


Sanitary facilities shall be located within 100 m from any point of work, but not closer than 50 m to any water body. One chemical toilet is to be provided on site for every 15 contract personnel at each working area. These toilets must have doors and locks and shall be secured to prevent them blowing over. Toilet paper shall be provided.

The Contractor shall ensure that suitable sanitation facilities are provided for or by all his sub-contractors on site.

Toilets are to be emptied prior to builders' holidays. The contractor shall ensure that no spillage occurs when the toilets are cleaned or emptied and that the contents are removed from site. Discharge of waste from toilets into the environment and burial of waste is strictly prohibited.

The Contractor shall keep the toilets in a clean, neat and hygienic condition. If the Contractor fails to provide and/or maintain all site sanitation facilities in a clean and hygienic condition, the Engineer may order the Contractor to suspend any or all work on the site until these requirements are met. No payment shall be made for any delays or disruption of the Works caused thereby nor shall extensions of time be granted for such delays.

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9.3.21. EATING AREAS

The Contractor shall designate eating areas to the approval of the Engineer, which shall be clearly demarcated. Sufficient bins shall be present in this area. Any cooking on site shall be done on well-maintained gas cookers with fire extinguishers present.

9.3.22. DRINKING WATER

The Contractor shall ensure that drinking water is available for all staff on site. If no potable water source is available on site, then the Contractor shall import drinking water to the site.

9.3.23. CONTAMINATED WATER

Potential pollutants of any kind and in any form shall be kept, stored, and used in such a manner that any escape can be contained and the water table not endangered. Water containing such pollutants as cements, concrete, lime, chemicals, fuels and hydrocarbons shall be contained and discharged into an impermeable storage facility for removal from the site or for recycling. This particularly applies to water emanating from concrete batching plants and concrete swills, and to runoff from fuel depots, workshops and truck washing areas.

Wash down areas shall be placed and constructed in such a manner so as to ensure that the surrounding areas are not polluted. The Contractor shall notify the Engineer immediately of any pollution incidents on Site. If construction areas are to be dewatered (e.g. after rains), this water must first be pumped into a settlement area, and not directly into a natural ecosystem.

A Method Statement shall be required for all wash areas where hydrocarbon and hazardous materials or other pollutants are expected to be used. This includes, but is not limited to, vehicle washing, workshop wash bays and paint equipment cleaning. Wash areas for domestic use shall ensure that the disposal of contaminated "grey" water is sanctioned by the Engineer.


9.3.24. HAZARDOUS SUBSTANCES

Hazardous chemical substances (as defined in the Regulations for Hazardous Chemical Substances) used during construction shall be stored in secondary containers. The relevant Material Safety Data Sheets (MSDS) shall be available on Site. Procedures detailed in the MSDS shall be followed in the event of an emergency situation.

If potentially hazardous substances are to be stored on site, the Contractor shall provide a Method Statement detailing the substances/ materials to be used, together with the storage, handling and disposal procedures of the materials.

No paint products and chemical additives and cleaners such as thinners and turpentine, may be disposed of on Site. Brush / roller washing facilities shall be established to the satisfaction of the Engineer. A Method Statement, approved by the Engineer, is required for such washing activities.

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9.3.25. SITE STRUCTURES

The Contractor shall supply and maintain adequate and suitable sheds for the storage of materials (mobile containers). Sheds for the storage of materials that may deteriorate or corrode if exposed to the weather shall be weatherproof, adequately ventilated and provided with raised floors.

All site establishment components (as well as equipment) shall be positioned to limit visual intrusion on neighbours and the size of the area disturbed. The type and colour of roofing and cladding materials comprising the Contractor's temporary structures shall be selected to reduce reflection. The Contractor's camp shall be fenced with a fence of at least 1.8 m high, and the camp area shall be screened via the attachment of shade cloth to the fence surrounding the site camp.

9.3.26. LIGHTS

The Contractor shall ensure that any lighting installed on site for related activities does not interfere/impact with road traffic or cause a reasonably avoidable disturbance to the surrounding road users or community members.

9.3.27. WORKSHOP, EQUIPMENT MAINTENANCE AND STORAGE

Where practical, all maintenance of plant on Site shall be performed in the workshop. If it is necessary to do maintenance outside of the workshop area, the Contractor shall obtain the approval of the Engineer prior to commencing activities.


The Contractor shall ensure that in his workshop and other plant maintenance facilities, including those areas where, after obtaining the Engineer's approval, the Contractor carries out emergency plant maintenance, there is no contamination of the soil or vegetation. The workshop shall have a smooth impermeable floor either constructed of concrete or thick plastic covered with sufficient sand to protect the plastic from damage. If constructed of concrete the floor shall be bunded and sloped towards an oil trap or sump to contain any spillages of substances (e.g. oil). A Method Statement detailing the design and construction of the workshop must be submitted.

When servicing equipment, drip trays shall be used to collect the waste oil and other lubricants. Drip trays shall also be provided in construction areas for stationary plant (such as compressors) and for "parked" plant (such as scrapers, loaders, vehicles). All wastes collected into the drip trays shall be collected in a bunded area and disposed of into a hazardous waste facility, as and when required.

All vehicles and equipment shall be kept in good working order and serviced regularly. Leaking equipment shall be repaired immediately or be removed from the Site.

The washing of equipment shall be restricted to preventative maintenance requirements only. All washing shall be undertaken in wash bays within the workshop or maintenance areas, and these areas must be equipped

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with a suitable impermeable floor and sump/oil trap. The use of detergents for washing shall be restricted to low phosphate and nitrate containing and low sudsing-type detergents.

9.3.28. NOISE

The Contractor shall limit noise levels (e.g. install and maintain silencers/mufflers on machinery). When working in any areas within audible distance of residents, the Contractor shall provide and use suitable and effective silencing devices for pneumatic tools and other plant that would otherwise cause a noise level exceeding 85 dB(A) during excavations and other work.

Appropriate directional and intensity settings are to be maintained on all hooters and sirens.

No amplified music shall be allowed on site. The use of radios, tape recorders, compact disc players, television sets, etc., shall not be permitted unless the volume is kept sufficiently low as to avoid any intrusion on members of the public within range. The Contractor shall not use sound amplification equipment on Site unless in emergency situations.

The Contractor's attention is drawn to the Noise Regulations as promulgated in terms of the Environment Conservation Act, relevant Local Authority bylaws and South African National Standards 10103 and Occupational Health and Safety requirements.


9.3.29. ENVIRONMENTAL AWARENESS TRAINING

Environmental awareness training sessions shall be run for all personnel on site. Two types of course shall be run, one for the Contractor's and Subcontractor's management and one for all site staff and labourers. Courses shall be run in the morning during normal working hours at a suitable venue provided by the Contractor. All attendees shall remain for the duration of the course and sign an attendance register on completion that clearly indicates participant's names, a copy of which shall be handed to the Engineer.

All staff is to attend an initial presentation of approximately 45 minutes, and approximately half an hour a month thereafter for the duration of the contract shall be allowed for employees to attend any follow-up lectures, should such follow-up lectures be deemed necessary by the ECO. If staff goes on an extended period of absence, the environmental awareness training course must be undertaken, upon their return. In addition, all new staff and sub- contractors as well as employees that spend more than one day a week or four days in a month, to attend the environmental education session prior to commencement of work on site. The Contractor shall supply the ECO with a monthly report indicating the number of employees that will be present on site during the following month and any changes in this number that may occur during the month.

No more than 30 people shall attend each course and the cost, venue and logistics for this/ these course/s shall be for the Developer's responsibility. The ECO shall keep a register of all personnel attending the Environmental awareness training sessions.

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Notwithstanding the specific provisions of this clause, it is incumbent upon the Contractor to convey the sentiments of the EMPr to all personnel involved with the works.

Training for management and foremen

The environmental awareness training session for management shall include all management and foremen. The session, which will be presented by the ECO, will be of approximately one-hour duration. The initial session shall be undertaken not less than seven days prior to commencement of work on site. Subsequent sessions shall be held as and when required.

Training course for site staff and labour

The environmental awareness training session for site staff and labour shall be presented by the ECO. The course will be approximately 45 minutes long. The course shall be run not more than seven days after commencement of work on site with sufficient sessions to accommodate all available personnel. Subsequent sessions shall be held as and when required.

9.3.30. CONTRACTOR'S ENVIRONMENTAL OFFICER

The Contractor shall designate a permanent onsite employee as the Environmental Officer who shall be responsible for undertaking a daily site inspection to monitor compliance with this Specification. The Contractor shall submit the name of the Contractor's Environmental Officer to the Engineer and ECO for approval seven days prior to the date of the environmental awareness training course.

9.3.31. "NO GO" AREAS

The demarcated buffer areas around the heritage sites, pans on site and other identified ecological sensitive areas are to be "no go" areas. The Contractor shall ensure that, insofar as he has the authority, no person, machinery, equipment or material enters the "no go" areas at any time.


9.3.32. CONSTRUCTION PERSONNEL INFORMATION POSTERS

The Contractor shall erect and maintain information posters for the information of his employees depicting actions to be taken to ensure compliance with aspects of the Specifications. Such posters shall be erected at the eating areas and any other locations specified by the Engineer.

9.3.33. FIRE CONTROL

No fires may be lit on site. Any fires which occur, shall be reported to the Engineer immediately. Smoking shall not be permitted in those areas where it is a fire hazard. Such areas shall include the workshop and fuel storage areas and any areas where the vegetation or other material is such as to make viable the rapid spread of an initial flame. In terms of the National Environmental Management: Air Quality Act (39 of 2004), burning is not permitted as a disposal method, unless authorised by the DEA&DP: Air Quality Directorate responsible for the

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implementation of the National Environmental Management: Air Quality Act. The Contractor shall appoint a Fire Officer who shall be responsible for ensuring immediate and appropriate actions in the event of a fire and shall ensure that employees are aware of the procedure to be followed. The Contractor shall forward the name of the Fire Officer to the Engineer for his approval seven days prior to the date of the environmental awareness training course.

The Contractor shall ensure that there is basic fire fighting equipment available on Site at all times.

9.3.34. CONCRETE AND CEMENT WORK

Cement powder has a high pH value. Spillage of dry cement powder and concrete slurry will affect both soil and water pH adversely. Careless handling of cement products resulting in spillage can have detrimental effects on the surrounding environment.

The location of the batching area (including the location of cement stores and sand and aggregate stockpiles) shall be indicated on the Site layout plan and approved by the ECO. A Method Statement indicating the layout and preparation of this facility is required in this regard.

Cement is to be stored in a secure weatherproof location to avoid contamination of the environment and wastage.

All runoff from batching areas shall be strictly controlled so that contaminated water does not enter storm water, or groundwater. Plastering boards and mixing trays should be used at all mixing and supply points. Cleaning of equipment and flushing of mixers shall not result in pollution of the surrounding environment.

Suitable screening and containment shall be in place to prevent windblown contamination associated with bulk cement silos, loading and batching.

All visible remains of excess concrete shall be physically removed to an approved waste site on completion of the plaster or concrete pour section and disposed of.


9.3.35. EMERGENCY PROCEDURES

The Contractor shall submit Method Statements covering the procedures for the following emergencies:

Fire

The Contractor shall advise the relevant authority of a fire as soon as one starts and shall not wait until he can no longer control it. The Contractor shall ensure that his employees are aware of the procedure to be followed in the event of a fire.

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Accidental leaks and spillages

The Contractor shall ensure that his employees are aware of the procedure to be followed for dealing with spills and leaks, which shall include notifying the Engineer and the relevant authorities. The Contractor shall ensure that the necessary materials and equipment for dealing with spills and leaks is available on Site at all times. Treatment and remediation of the spill areas shall be undertaken to the reasonable satisfaction of the Engineer. In the event of a spill, the source of the spillage shall be isolated, and the spillage contained, provided it is safe to do so. The area shall be cordoned off and secured.

9.3.36. SAFETY

The Contractor shall at all times observe proper and adequate safety precautions on the Site. Telephone numbers of emergency services, including the local fire fighting service, shall be posted conspicuously in the Contractor's office near the telephone. Detailed emergency procedures must be kept on-site and all staff must be subject to the necessary training.

No unauthorised firearms are permitted on Site.

The Occupational Health and Safety Act (No 85 of 1993) and in particular the requirements of the Construction Regulations issued in July 2003, must be complied with.

9.3.37. SECURITY

With the possible exception of any security staff who may be required to be present overnight at the Contractor's temporary construction camp, no personnel will be permitted to live on the mine. Security staff must be provided with heating and cooking facilities (in order that they do not need to light fires), and access to toilet facilities and communication equipment.


Any security lighting at the Contractor's temporary construction camp is to be placed in such a way as to not cause a nuisance to residents of the area and traffic on adjacent roads.

9.3.38. COMMUNITY RELATIONS

The Contractor shall erect and maintain information boards in the position, quantity, design and dimensions specified. Such boards shall include contact details which members of the public can use to register complaints, in accordance with details provided by the Engineer.

All interactions with the surrounding community shall be undertaken in terms of the Community Engagement Plan to be developed by EEM.

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The Contractor shall keep a "Complaints Register" on Site. The Register shall contain all contact details of the person who made the complaint, and information regarding the complaint itself. All grievances raised shall be dealt with in accordance with the EEM Grievance Procedure.

9.3.39. PROTECTION OF NATURAL FEATURES

The Contractor shall not deface, paint, damage or mark any natural features (e.g. rock formations) situated in or around the Site for survey or other purposes unless agreed beforehand with the Engineer. Any features affected by the Contractor in contravention of this clause shall be restored/ rehabilitated to the satisfaction of the Engineer.

The Contractor shall not permit his employees to make use of any natural water sources (e.g. springs, streams and open water bodies) for the purposes of swimming, personal washing and the washing of machinery or clothes.

9.3.40. PROTECTION OF FLORA AND FAUNA

Except to the extent necessary for the carrying out of the Works, flora shall not be removed, damaged or disturbed nor shall any vegetation be planted. Trapping, poisoning and/ or shooting of animals is strictly forbidden. No domestic pets or livestock are permitted on the mining license area during the construction phase. Where the use of herbicides, pesticides and other poisonous substances has been specified, the Contractor shall submit a Method Statement.


9.3.41. EROSION AND SEDIMENTATION CONTROL

The Contractor shall take all reasonable measures to limit erosion and sedimentation due to the construction activities. Where erosion and/or sedimentation, whether on or off the Site, occurs despite the Contractor complying with the foregoing, rectification shall be carried out in accordance with details specified by the Engineer. Where erosion and/or sedimentation occur due to the fault of the Contractor, rectification shall be carried out to the reasonable requirements of the Engineer.

Any runnels or erosion channels developed during the construction period or during the maintenance period shall be backfilled and compacted. Stabilisation to prevent and control erosion of cleared areas shall be actively managed. Consideration and provision shall be made for various methods, namely, brush-cut packing, mulch or chip cover, straw stabilising (at a rate of one bale/square metre and rotorvated into the top 100 mm of the completed earthworks), watering, soil binders and anti-erosion compounds, mechanical cover or packing structures (e.g. hessian cover).

Traffic and movement over stabilised areas shall be restricted and controlled, and damage to any stabilised area shall be repaired and maintained to the satisfaction of the Engineer.

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9.3.42. AESTHETICS

The Contractor shall take reasonable measures to ensure that construction activities do not have an unreasonable impact on the aesthetics of the area. Waste facilities shall be enclosed and not visible to road users of the R45 and R27.

9.3.43. DUST CONTROL

The Contractor shall take all reasonable measures to minimise the generation of dust as a result of construction activities to the satisfaction of the Engineer and ECO. Dust control measures may include the stabilisation of disturbed areas via the rotorvation of straw into the soil surface. In extreme instances, the use of specific chemical dust suppressant additives such as “*Dustex*” may be necessary in order to limit dust generation from haul roads.

During high wind conditions, the Contractor shall comply with the Engineer’s instructions regarding dust-suppression measures. The Engineer may request the temporary cessation of all construction activities where wind speeds are unacceptably high, and until such time as wind speeds return to acceptable levels.

9.3.44. POLLUTION

The Contractor shall take all reasonable measures to minimise any dust nuisance, pollution of streams and inconvenience to or interference with the public (or others) as a result of the execution of the Works. A method statement may be required in this regard as determined by the Engineer and ECO.

If in emergency situations as mentioned above washing of vehicles and machinery is required on site, this should not take place within 50 m from any watercourse. All machinery should be regularly checked for leaks. No runoff shall enter any watercourse.


9.3.45. WORKING HOURS

Working hours in terms of the planning approval shall be adhered to. If works are to take place outside of normal working hours, the ECO, Engineer and adjacent landowners are to be notified and disturbance to the surrounding residents or land users is to be prevented. The Engineer will, where required, in turn notify the Local Authority of work done outside of normal working hours.

9.3.46. EXCAVATION AND TRENCHING

During excavation and trenching activities, care is to be taken to ensure that the stockpiling of top material is kept separate from sub-soils. Top material thus saved is to be replaced as top material and is to be the final layer when back-filling. The Contractor shall reinstate all working areas to the satisfaction of the Engineer.

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Areas opened for trenching should be restricted to the minimum required to be worked in and closed up in a working day or as dictated by technical requirements such as length of pipe or cable, in order to prevent them from posing safety hazards to people, traffic and animals and to prevent rainwater erosion. Trenches left exposed for more than one day shall be barricaded, subject to approval by the site engineer and ECO. Trenches shall be re-filled to the same level as (or slightly higher, to allow for settlement) the surrounding land surface to minimise erosion. Excess soil shall be stockpiled in an appropriate manner. No stockpiling must occur within 50 m of a water course.

In the event of material removed during trenching being excessive after backfilling or being unsuitable as overburden, the excess material must be removed from the construction site to a site agreed upon by the Engineer and, where applicable, the Local Authority

9.3.47. STOCKPILING

The engineer will identify suitable areas for stockpiling of all materials. Each stockpile may not exceed 2 m in height and cover a minimum footprint. The required precautions must be taken to prevent erosion or compaction of stockpiles. The top materials shall not be left for a period exceeding 6 months. If unavoidable, the topsoil must be analysed and if necessary, upgraded before placement.

9.3.48. TEMPORARY SITE CLOSURE

If the Site is closed for a period exceeding one week, a checklist procedure shall be carried out by the Contractor in consultation with the ECO. Contractor's Safety Officers (in terms of the Occupational Health and Safety Act) are to check the Site and report to the Engineer regarding the following:


- Fuels / flammables / hazardous materials stores:
- Ensure fuel stores are as low in volume as possible;
- No leaks;
- Outlet secure / locked;
- Bund empty;
- Fire extinguisher serviced and accessible;
- Secure area from accidental damage, e.g. vehicle collision;
- Emergency and Management telephone numbers to be available and displayed; and
- Adequate ventilation.

Other:

All trenches and manholes secured;

- Fencing and barriers in place per the Occupational Health and Safety Act (No 85 of 1993);
- Notice boards applicable and secured;
- Security persons briefed and have facility for contact;
- Night hazards checked, e.g. reflectors, lighting, traffic signage;
- Fire hazards identified – local authority notified of any potential threats, e.g. large brush stockpiles, fuels etc.;

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- Pipe stockpile wedged / secured;
- Scaffolds secure; and
- Inspection schedule and log by security or contracts staff.

The ECO is to check and report to the Engineer regarding the following issues:

- Wind and dust mitigation in place, e.g. straw, brush packs, irrigation;
- Slopes and stockpiles at stable angle;
- Landscape areas watering schedules and supply secured;
- Fuels/hazardous substances stores secure;
- Cement and materials stores secured;
- Toilets empty and secured;
- Refuse bins empty and lids secured;
- Bunding clean and treated, e.g. Spill Sorb or Enretech #1 powder;
- Drip trays empty and secure; and
- Structures vulnerable to high winds secure.

The Contractor is to ensure that all temporary closure requirements are met before leaving the Site.

9.3.49. SITE CLEAN UP AND REHABILITATION


9.3.49.1. SITE CLEAN UP

The Contractor shall ensure that all temporary structures, equipment, materials, waste and facilities used for construction purposes are removed upon completion of the project. The site clean-up shall be to the satisfaction of the Engineer and the ECO.

9.3.49.2. REHABILITATION

Where appropriate, the Contractor shall employ a suitably qualified person (a botanist) to suggest and implement rehabilitation measures for areas damaged by construction activities but that will not be utilised during the operational level. The Contractor shall be responsible for rehabilitating areas identified by the ECO and the Engineer, or recommended by the aforementioned botanist. The Contractor's procedure for rehabilitation shall be approved by the ECO and the Engineer and, where required, the Local Authority's environmental representative.

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9.3.50. TOLERANCES

Environmental management is concerned not only with the final results of the Contractor's operations to carry out the Works but also with the control of how those operations are carried out. Tolerance with respect to environmental matters applies not only to the finished product but also to the standard of the day-to-day operations required to complete the Works.

It is thus required that the Contractor shall comply with the environmental requirements on an ongoing basis and any failure on his part to do so will entitle the Engineer to certify the imposition of a fine subject to the details set out in the Environmental Specification.

9.3.51. MEASUREMENT AND PAYMENT


9.3.52. BASIC PRINCIPLES

Except as noted below and as per the Scheduled Items, no separate measurement and payment will be made to cover the costs of complying with the provisions of this Specification and such costs shall be deemed to be covered by the rates tendered for the items as contained in the Schedule of Quantities, as completed by the Contractor when submitting his tender.

Some of the important cost items have been listed below to assist the Contractor in making provision for implementation of the Specifications:

- Protection of stock piles from blowing or washing away: The spraying or covering of stockpiles, including the supply of the spray or cover material or vegetation, as required.
- Storage of fuel and oils: The supply, construction, installation, transport, upkeep and removal of all facilities required for storage and management of fuel and oils.
- Cement-laden water management: The supply, construction, installation, transport, upkeep and removal of all facilities required for the management of wastewater from concrete operations.
- Contaminated water management: The supply, construction, installation, transport, upkeep and removal of all facilities required for managing contaminated water.
- Storm water and flood management: The supply, construction, installation, transport, upkeep and removal of all facilities required for managing storm water run-off from the site and protection of works from flooding.
- Bunding and management of run-off from workshop areas and supply of drip trays for stationary and "parked" plant: The supply, construction, installation, transport, upkeep and removal of all facilities required for bunding and managing the run-off from workshop areas as well as all drip trays required.
- Dust management: The supply, application, transport, upkeep and removal of all materials required to ensure that dust is adequately controlled.
- Solid waste management: The supply, application, transport, upkeep and removal of all materials required to ensure that solid waste is adequately controlled in accordance with the specification (including the recycling program).
- Fire Control: The supply, transport, upkeep and removal of all material required for fire control.

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- Eating areas: The supply, construction, installation, transport, upkeep and removal at the end of the construction of all eating areas structures.
- Ablutions: The supply, maintenance, regular emptying and removal of toilets.
- Site demarcation: The supply, installation and removal at the end of the construction of all temporary fences.
- Vegetation protection: The supply, installation and removal at the end of the construction of all vegetation protection fences.

9.3.53. SCHEDULED ITEMS

- Provision of venue and staff attendance at the environmental awareness training courses: The provision of a venue and attendance at the environmental training courses will be measured as a lump sum. The sum shall cover all costs incurred by the Contractor in providing the venue and facilities and in ensuring the attendance of all relevant employees and sub-contractors at the training.
- Method Statements: Additional Work: No separate measurement and payment will be made for the provision of Method Statements where the Engineer requires a change on the basis of his opinion that the proposal may result in, or carry a greater than warranted risk of, damage to the environment, in excess of that warranted by the Specifications.

A stated sum is provided in the Schedule of Quantities to cover payment for such additional work.


9.3.54. CONSTRUCTION PHASE COMPLIANCE: SUMMARY TABLES

Each individual Construction EMPr outlines proposed management strategies in accordance with proposed performance criteria for specified acceptable levels of environmental and social performance. The construction EMPr identifies:

Project activities that result in environmental impacts;

- potential impacts on environmental and social values;
- mitigation strategies;
- relevant monitoring;
- appropriate indicators and performance criteria;
- reporting requirements;
- appropriate corrective actions should an undesirable impact or unforeseen levels of impact occur; and
- responsible person/s for corrective actions and way forward.


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9.3.55. AIR QUALITY AND DUST

Management of Air Quality	
Activity and Element	Construction activities, including pre-stripping, establishment of roads, contractor areas and excavation will result in the generation of dust.
Policy	The aim is to minimise dust impacts to surrounding sensitive habitats and human receptors.
Performance Criteria	<ul style="list-style-type: none"> Remain within the applicable air quality standards (i.e. SANS 1929 residential guidelines of 600 mg/m²/ day and South African National Ambient Air Quality Standards) for dust deposition, at the time of construction. Respond to complaints received from adjacent landowners and road users of the R45 and R27.
Implementation Strategy	<ul style="list-style-type: none"> Regular maintenance of vehicles to reduce emission levels. Consult with and advise any residents or landowners who may likely be impacted by temporary dust emissions before activities start. Activity sites and access roads shall be watered or dust suppressant applied as required to minimise the potential for nuisance due to dust. Watering frequency will be increased during periods of high risk (e.g. high winds). A “no burning” policy will be implemented. Visual inspection will be undertaken to confirm no dust plumes over the R45 during high wind conditions or dust generating activities. Should visible dust plumes cross the R45, the Environmental Control Officer (ECO), together with the site Visual inspection will be undertaken to confirm no dust plumes over the R45 during high wind conditions or dust generating activities. Should visible dust plumes cross the R45, the Environmental Control Officer (ECO), together with the site Dust fallout monitoring should be conducted before and after the commencement of the project, in order to collect background data and verify modelling results. During the operational phase of the project, annual monitoring should take place for dust fallout at 4 selected locations around the site boundaries and 2 locations along the access road. The performance targets for the monitoring should be set to a maximum total daily dust deposition (calculated from the monthly dust deposition) to be less than 600 mg/m²/day for residential areas, and the maximum annual average dust deposition within the site to be less than 1,200 mg/m²/day.
Monitoring and Auditing	<ul style="list-style-type: none"> Vehicles maintenance records must be kept. Record will be kept of air quality related complaints received. Ambient dust monitoring must be undertaken at a frequency in- line with the dust monitoring plan and biodiversity monitoring plan. Based on results from dust monitoring, mitigation measures must be refined and adapted to respond to climatic conditions and complaints received. This will be reached in agreement with the ECO and site engineer. Botanical and air quality specialist input may be brought in, as and when required. The ECO must record all instances of non-compliance with on-site burning policy and record in the monthly ECO report. Any visual confirmation of dust plumes over the R45 must be recorded in the monthly ECO Report.

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Reporting and Corrective Action	<ul style="list-style-type: none"> Records of all monitoring and auditing activities will be kept, with results included into the Monthly ECO Report, which must be submitted to the Department of Environment and Nature Conservation (DEA&DP). Recommendations and corrective actions arising from ECO inspections and reviews will be agreed to with the site engineer, before proceeding. Non-compliance and incident reports will be reviewed and closed out by the ECO and site engineer. All non-compliances to be submitted to DEA&DP for their records.
Responsibility	EEM is responsible for the appointment of the ECO and requirements outlined above. These requirements must be fulfilled by the ECO, together with the site engineer and input from EEM.

9.3.56. HYDROLOGY

Management of Hydrology	
Activity and Element	The construction of Project related infrastructure would result in the diversion of water courses, changes to sediment load and potential deterioration to water quality.
Policy	To prevent the potential impacts associated with erosion and to prevent the release of contaminants that may adversely affect surface water quality.
Performance Criteria	<ul style="list-style-type: none"> Avoidance of release of contaminants or unacceptable sediment release to surface waters features. Any disturbances or crossings of to watercourses must be aligned with the water use license issued by the Department of Water Affairs.
Implementation Strategy	<ul style="list-style-type: none"> Implement dust suppression plan and stormwater management plan. During construction, the surface water runoff from the dirty areas must be captured, and wherever possible reused, in the construction process. Pollution control dams must be utilised and dirty runoff should be directed towards these dams through a well-designed system of berms and channels. The dams should be designed to avoid sediment deposition through the use of silt traps. All areas where hydrocarbons, such as oils and petroleum fuels are handled or stored should be bunded and strictly controlled to minimise the risk of accidental spillages. All relevant personnel trained in appropriate handling of spill materials and spill prevention. The construction process must remain outside of set-aside areas indicated as no-go areas. Installation of temporary drainage works (channels and bunds) where required for sediment and erosion control and around construction sites. Use of pumps to maintain dry working conditions in temporary excavations, rather than constructing temporary open channels for gravity drainage of temporary excavations where gravity channelling is not acceptable. In cases where traversing a watercourse is unavoidable, the clearance path will, where practical, be designed in order to limit the extent of disturbance. Works in the vicinity of a watercourse or drainage line will be subject to a method statement, layout/design plan approved by the ECO and site engineer before


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	<p>works commence. Upon completion of construction, the bed and banks of the affected watercourse must be reinstated.</p> <ul style="list-style-type: none"> • Keep the work area to a minimum to limit ground disturbance. • Where appropriate, install temporary sediment basins to capture sediment laden runoff from site. • Provide bunding around stockpiles to prevent the material from being washed away, where required. • Inspect, and if required, reinstate all existing erosion-control structures after storm/heavy rain events.
Monitoring and Auditing	<ul style="list-style-type: none"> • Weekly monitoring of construction activities to ensure that no watercourses are impacted/ disturbed. • The integrity of storage facilities for hazardous substances, dangerous goods and waste holding areas will be controlled by sealed or bunded areas that will be routinely inspected by the ECO. • Conduct weekly inspections of all erosion control structures to ensure they are operating efficiently. Additional inspections should be conducted after storm events.
Reporting and Corrective Action	<ul style="list-style-type: none"> • Records of all monitoring and auditing activities will be kept, with results included into the Monthly ECO Report, which is to be submitted to the DEA&DP and Department of Water Affairs (DWA). • Recommendations and corrective actions arising from ECO inspections and reviews will be agreed to with the site engineer, before proceeding. • Complaints relating to water quality or quantity from downstream users will be responded to and reported to DEA&DP and DWA, if required. This will be recorded within the monthly ECO Report. • Non-compliance and incident reports will be reviewed and closed out by the ECO and site engineer.
Monitoring and Auditing	<ul style="list-style-type: none"> • Weekly monitoring of construction activities to ensure that no watercourses are unnecessarily impacted/ disturbed. • Rehabilitated watercourses will be monitored by the ECO to ensure no erosion or sediment deposition is occurring. • The integrity of storage facilities for hazardous substances, dangerous goods and waste holding areas will be controlled by sealed or bunded areas that will be routinely inspected by the ECO. • Conduct weekly inspections of all erosion control structures to ensure they are operating efficiently. Additional inspections should be conducted after storm events. The ECO must notify DWA of any deviations from the conditions of the water use license.
Responsibility	EEM is responsible for the appointment of the ECO and requirements outlined above. These requirements must be fulfilled by the ECO, together with the site engineer and input from EEM.

9.3.57. HYDROGEOLOGY


Management of Hydrogeology	
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Activity	Construction activities may result in the contamination of land that may impact groundwater quality.
Policy	To minimise impacts to groundwater quality and quantity.
Performance Criteria	<ul style="list-style-type: none"> To limit impacts to groundwater quality to within the mining license area. To avoid negatively impacting on groundwater levels of surrounding users. Remain in alignment with the water use license issued by the DWA.
Implementation Strategy	<ul style="list-style-type: none"> Implement groundwater monitoring plan (i.e. this should be the continuation of the groundwater monitoring undertaken prior to construction, at receptor locations recommended by a hydrogeologist). Develop and implement a grievance procedure to address and respond to groundwater related grievances in a timely manner so that the receptors are never without a reliable water source. Ensure that the storage of all hazardous substances and dangerous good (including hydrocarbons) are stored in bunded areas, to prevent run-off and infiltration during tank failures. Construction equipment is to be serviced regularly, to prevent oil spills. A spill response plan must be in place, and employees must be trained accordingly. All vehicle servicing must be undertaken in a bunded area.
Monitoring and Auditing	<ul style="list-style-type: none"> Records and reports related to the implementation of the groundwater monitoring plan will be kept and findings recorded in the Monthly ECO Report, if available. All complaints received must be responded to and impacts to surrounding groundwater users and corrective actions must be agreed to with the landowner and EEM. Should agreement not be reached, the matter must be referred to the DWA for consideration. All conditions outlined in the water use license must be adhered to.
Reporting and Corrective Action	<ul style="list-style-type: none"> Records of monitoring and auditing activities will be stored on-site, with results included into the Monthly ECO Report. Recommendations and corrective actions arising from ECO inspections and reviews will be agreed to with the site engineer, before proceeding. Complaints relating to groundwater quality or quantity from surrounding users will be responded to and further investigations carried out and reported to the DEA&DP and DWA, if required. This will be recorded within the monthly ECO Report as well. Non-compliance and incident and DWA for their records reports will be reviewed and closed out by the ECO and site engineer. All non-compliances with regard to hydrogeology to be submitted to DEA&DP.
Responsibility	EEM is responsible for the appointment of the ECO and requirements outlined above. These requirements must be fulfilled by the ECO, together with the site engineer and input from EEM.


9.3.58. FLORA, FAUNA AND AVIFAUNA

Management of Flora, Fauna and Avifauna	
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Activity	Establishing the mine infrastructure, particularly excavation of the pit, and processing ore would result in the loss of biodiversity.
Policy	Aim of mitigation is to conserve all forms of biodiversity with an emphasis on irreplaceable habitats, threatened and rare species through reducing the residual impact. This must be aligned with Vedanta Biodiversity Policy, thus improving conservation and minimising biodiversity impacts.
Performance Criteria	Objectives of the mitigation are to facilitate development of a Biodiversity Management Plan (BMP) and reduce the impacts of loss and fragmentation of habitats, reduction of species diversity and spread of alien and invasive species. These mitigation measures must be implemented, in conjunction with a botanical and faunal specialist.
Implementation Strategy	<ul style="list-style-type: none"> • A detailed Biodiversity Management Plan (BMP) will be developed to ensure that the proposed onsite (excluding offsets) avoidance, minimisation and rehabilitation measures associated with mine construction, operation and closure are consolidated for effective implementation and subsequent auditing. The plan will, in broad terms, include: • Optimal approach to management of the mine property and mine controlled areas including setting aside a large conservation area within these areas; • Approach towards implementing controlled access to the mine property and mine controlled areas; • Management measures to ensure protection and appropriate management of the biodiversity features on the mine property and mine controlled areas involving: • Avoidance of any forms of fire within the area; • Wildlife management plan focused on management of the medium to large faunal species and their habitat requirements to avoid habitat destruction through overgrazing; • Flora and fauna translocation plan from areas prior to disturbance when appropriate; • An ecological rehabilitation programme for impacted areas; • Independent monitoring and ongoing inventory development of the mine property's biological and physical environments to inform adaptive management measures and/or corrective action as required; • Alien and invasive species control program; • General awareness training will be done as part of the mine induction to inform all staff and contractors of the sensitivities of the biodiversity aspects of the mine and surrounds and appropriate environmental workplace etiquette; • The BMP will consider means of avoiding and mitigating "foot print" creep. • Measures to manage emergency, accident or upset conditions where biodiversity may be adversely affected. • The following activities will be prohibited by staff and contractors: • Hunting of wildlife within the mine property or mine controlled areas; • Purchase, sale or transport of any wildlife products from local communities or passing traders; • Collection of any plants or animals or products thereof for consumption,

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	<p>medicinal use, cultivation or keeping as pets;</p> <ul style="list-style-type: none"> • Keeping pets within the mine property, either domestic animals such as cats or dogs, or native wildlife; • Intentional killing of any animals including snakes, lizards, birds or other animals; • All forms of off-road driving. • There will be no grazing of livestock within the set aside conservation area. • Occasional patrolling of the mine property and mine controlled areas will be conducted by the mine security to watch for evidence of prohibited activities. • Mine Footprint related measures • Clearly demarcate areas of high conservation with appropriate barriers and signage to ensure no unnecessary encroachment occurs. • Any infringements or encroachment will be reported and appropriate penalties are to be enforced on the staff member or contractor. • The footprint of short-duration activities during construction, operation and decommissioning phases of the mine and the projects outside of the EEM mine concession will be minimised. • Linear infrastructure (e.g. roads, powerlines and pipelines) should be grouped where possible to follow the same route adjacent to one another. • Design and construct the southern approach road within the available flat surface, cutting of the slope should be limited to areas where the available surface does not allow for the required surface width. Berms should be constructed with materials cut from the slope and rocks rolling down the slope are to be kept to a minimum. • No access of personnel to areas outside the disturbed areas, unless prior approval gained from the relevant manager or ECO. • Groundwater drawdown related measures • The following approaches will be implemented: • Habitat fragmentation related measures • Small areas of natural vegetation will be maintained wherever possible as islands for the refuge of species within the mine footprint to facilitate the movement of species through disturbed areas. • Fencing of the set aside conservation area will be maintained in a good state in the form of livestock fences that allow unrestricted movement of small and medium-sized wildlife. • Gates will be locked gates and no entry signs prominently displayed. • Locally indigenous plant species will be used in landscaping projects around offices and mine facilities. • Recommendations for protecting or enhancing species diversity • Annual monitoring of the vegetation around the project area needs to be undertaken, and in particular in the areas where windblown dust may be an issue, where the drawdown cones caused by the dewatering boreholes around the pit may impact on the natural vegetation outside the pit, and where the surplus water is reintroduced into the upper aquifer. This would probably be best undertaken by suitably qualified members of the vegetation rehabilitation team, or otherwise by a botanical consultant. Particular attention should be paid to floristic and structural changes, and to any plant mortality. • Search and Rescue of plants of the only two commonly recorded and
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	<p>translocatable SCC from within the mine footprint (<i>Caesia sabulosa</i> and <i>Lampranthus densifolius</i>) should be undertaken prior to each strip being cleared. These plants should be translocated to areas in need of rehabilitation, which will mean that plants from the first strip will need to be maintained in a nursery until they can be planted out.</p> <ul style="list-style-type: none"> • It may be necessary to erect wind fences around strip mined areas and stockpiles in order to limit windblown dust. This should be assessed by the rehabilitation consultant every six months during life of mine, and if it proves necessary these should be put in place within one month of these audits. • Topsoil harvesting should include as much topsoil as possible, and must be 500mm deep as a minimum, as numerous plants have corms, tubers and bulbs that extend very deep (much deeper than 10cm). Topsoil should ideally be used to immediately surface all available backfilled and mined areas in need of rehabilitation, or failing this should be stockpiled for no more than three months before being used. • All aspects of vegetation rehabilitation should be undertaken according to the best available practice developed by Vula Environmental Services, based on their rehabilitation work undertaken at the nearby Foskor mine, and adapted to the specific needs at this site. The detailed vegetation rehabilitation methodology is contained in a specialist report produced by Vula Environmental Services. • The Hopefield Sand Fynbos portions of the greater study area that border the project footprint (southeast corner of pit) need to be burnt in the next ten years, and will not need a fire again during the Life of Mine. The planning for this should be part of a Fire Management Plan that is drawn up in conjunction with SANParks and the rehabilitation consultants. • Trenches and pits that are excavated for pipelines, cabling etc will be backfilled as soon as practically possible to avoid acting as a trap for small fauna. • Artificial barriers to species movements will be minimized and avoided where possible, and measures taken to reduce their fragmentation impacts. • Night lighting for the plant and security purposes will be kept to a minimum and both inward and downward facing to minimise the disturbance to the movement of nocturnal species. • It is recommended that low pressure sodium vapour lights/or LED lights should be used with wavelengths of limited attractiveness to insects. • Escape routes for fauna will be provided within pitfall features and concreted drainage lines, and potentially dangerous situations inspected regularly to save trapped species. • Check trenches for trapped fauna before backfilling. • All new power line infrastructure will be bird-friendly in configuration and adequately insulated to minimise the loss of raptors and other large birds. • Speed restrictions as per applicable standards will be enforced on all roads within the mine properties and mine controlled areas to minimise the incidence of faunal road kills. • Driver training will be provided to sensitise them to the importance of avoiding faunal road kills and the mine site, within the mine properties and on public roads. • Trained mine personnel with capacity to safely capture and translocate
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	<p>dangerous snakes will be available at all times.</p> <ul style="list-style-type: none"> • Efforts will be supported to promote an appreciation of biodiversity features of the mine property and mine controlled areas among staff, contractors and their dependents. • Alien control measures • Only approved indigenous species will be used for all workplace landscaping projects. • The introduction of foreign plant species onto the mine site and associated projects will be controlled. • Presence of alien fauna, such as feral dogs and cats that threaten the local ecology will be monitored. Ethical control measures will be implemented if an increase in their presence is detected. • Routine monitoring conducted to identify any new incidence of weed infestation. Provision of information for personnel on the identification of declared weeds • Stockpile areas and haul roads required will be clearly defined, so that weed establishment and the potential spread of plant diseases may be contained. Stockpiles will be developed in previously cleared areas, with adequate open-spaces buffers, where possible. • A suitable and appropriate biodiversity offset must be drawn up and implemented within one year of any project approval, and this offset must significantly expand the area of the West Coast National Park and should incorporate priority natural habitat as identified by a specialist. The implementation of this offset is the primary means of reducing the residual Medium negative botanical impact to a more acceptable Low negative level. For further details see the specialist biodiversity offset report by M. Botha. • Appoint appropriate specialist to conduct a survey to determine the breeding status of Black Harrier on the proposed development site and surrounding area.
Monitoring, Auditing and further studies	<p>Monitoring of ecological dust impacts</p> <ul style="list-style-type: none"> • Dust monitoring of sensitive habitat must be undertaken in alignment with the air quality monitoring requirements, outlined above. • Monitoring of sensitive ecological receptors (particularly in response to dust) will be implemented and include the following considerations: • A competent botanist will be contracted to oversee the monitoring programme; • Monitoring will be conducted monthly.
Reporting and Corrective Action	<p>General</p> <ul style="list-style-type: none"> • Records of all monitoring and auditing activities will be kept, with results included into the Monthly ECO Report, which is to be submitted to the DEA&DP. • Recommendations and corrective actions arising from ECO inspections and reviews will be agreed to with the site engineer, before proceeding. • Biodiversity related complaints from surrounding users will be responded to with further investigations carried out and reporting to the DEA&DP and DWA, as required. This will be recorded within the monthly ECO Report as well. • Non-compliance and incident reports will be reviewed and closed out by the ECO and site engineer. All non-compliances with regard to

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	hydrogeology to be submitted to DEA&DP and DWA for their records.
Responsibility	EEM is responsible for the appointment of the ECO and requirements outlined above. These requirements must be fulfilled by the ECO, together with the site engineer and input from EEM.

9.3.59. NOISE

Management of Noise	
Activity	The construction phase would result in the generation of noise heavy duty equipment.
Policy	To construct in a manner that minimises the impact of noise and vibrations on surrounding properties.
Performance Criteria	<ul style="list-style-type: none"> No exceedence of SAN 10103 of noise at sensitive receptors. Respond to noise and vibration related complaints received from residents and landholders and implement mitigation measures. Consultation with potentially affected sensitive receptors, prior to commencement of construction. Respond to all complaints.
Implementation Strategy	<ul style="list-style-type: none"> Implement environmental noise and vibration monitoring along site boundaries and at four selected locations within farm houses closest to the mine and the Loop 10 road on an annual basis with more frequent targeted monitoring at sensitive receptors, if required. Ensure all noise complaints are responded to and recorded by the ECO. Ensure that all machinery and equipment is well maintained in good working order. Regular maintenance of vehicle servicing is required. The intervals will vary based on the vehicle and approved by the site engineer.
Monitoring and Auditing	<ul style="list-style-type: none"> ECO to review vehicle servicing records. Public or neighbours' complaints relating to noise and vibration will be recorded and responded to. Record noise and vibration monitoring results.
Reporting and Corrective Action	<ul style="list-style-type: none"> Complaints relating to noise will be addressed promptly, with further investigations and reporting to the ECO and site engineer, if required. Routine work reports with maintenance records will be recorded and reviewed by each supervisor or manager. All works that deviate from normal operating conditions will be reported and action initiated (including reporting to relevant agencies where this is warranted/required) to prevent a recurrence of the incident. Non-compliance and incident reports will be reviewed and closed out by senior management. Regular reviews, recommendations and corrective actions shall be implemented.

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Responsibility	EEM is responsible for the appointment of the ECO and requirements outlined above. These requirements must be fulfilled by the ECO, together with the site engineer and input from EEM.
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9.3.60. SOCIO-ECONOMIC

Management of Socio-economic impacts	
Activity	The construction phase of the project will result in increased expenditure/investment, net foreign exchange and tax earnings outflows while negative impacts resulting from the Project may be associated with tourism potential, impact adjacent land values and increase strain on municipal services.
Policy	The aim is to minimise the negative impacts on tourism potential of the area, reduce impacts associated with reduction in adjacent land values and reduce demand/dependency on municipal services while enhancing the economic benefits associated with the Project.
Performance Criteria	<ul style="list-style-type: none"> To enhance potential employment opportunities in the local communities associated with the construction phase of the Project. Increase the potential for the use of local contractors and suppliers. To reduce the impacts of dust, lighting, visibility of project infrastructure and loss of conservation worthy vegetation. Reduce demand (from Project employees) on municipal services.
Implementation Strategy	<ul style="list-style-type: none"> Early notification to surrounding landowners and the nearby communities of Hopefield, Saldanha, Langebaan and Vredenburg of the commencement of construction. Implement employment equity plan, recruitment and procurement policy and local contractor and supplier policy. Provide training prior to construction, to maximise employees from local communities. Work in collaboration with Local and District Municipality to align local economic development initiatives and mine opportunities, as well as reduce increased demand on municipal services through joint efforts to meet the requirements of the mine and associated employees. Early notification to surrounding landowners and the nearby communities of Hopefield, Saldanha, Langebaan and Vredenburg of the commencement of construction.
Monitoring and Auditing	<ul style="list-style-type: none"> Copy of employment equity plan, recruitment and procurement policy and local contractor and supplier policy to be kept on-site. Contractual documents will be used to verify level of local employment. Proof of notifications to stakeholders to be kept on-site.
Reporting and Corrective Action	<ul style="list-style-type: none"> EEM must submit verification of the use of local employees, suppliers and contractors (including if targets have been met) to DMR. If targets have not been met, a detailed motivation must be provided. Proof of notification and on the job training must be included into the

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	<p>monthly ECO Report.</p> <ul style="list-style-type: none"> EEM must distribute minutes of meeting of the employment forum, once every three months.
Responsibility	EEM is responsible for the appointment of the ECO and requirements outlined above. These requirements must be fulfilled by the ECO, together with the site engineer and input from EEM.
Monitoring and Auditing	<ul style="list-style-type: none"> Copy of employment equity plan, recruitment and procurement policy and local contractor and supplier policy to be kept on-site. Contractual documents will be used to verify level of local employment. Proof of notifications to stakeholders to be kept on-site.

9.3.61. HERITAGE, ARCHAEOLOGY AND PALAEONTOLOGY

Management of Heritage, Archaeology And Palaeontology	
Activity	Construction activities related to excavation and utilisation of heavy duty equipment will result in the destruction of artefacts of heritage, archaeological and paleontological value. Areas of sensitivity are contained below.
Policy	Avoid or mitigate impacts on indigenous cultural/ heritage values, or artefacts of archaeological and paleontological value.
Performance Criteria	<ul style="list-style-type: none"> Preventing the loss of artefacts of importance. Implementing effective mitigation for the salvage of artefacts of importance. Compliance with policies and procedures set out in the Record of Decision issued by Heritage Western Cape
Implementation Strategy	<ul style="list-style-type: none"> Minimise the development footprint to only what is actually needed. The fossil site (dune field) is to be considered as “no-go” areas, and are to be cordoned off to avoid any direct impacts. A suitably qualified archaeologist must be appointed to assist with delineating the sensitive areas to ensure avoidance. Restrict all construction activities to designated working areas with all work areas and access areas clearly marked and signposted. Immediately report any heritage trace that may come to light during the construction phase. Physical salvage of sites would need to take place before commencement of the construction phases. <p>Compile a heritage management plan with an awareness education component for all contractors and labourers to make them aware of what fossils and artefacts look like so they know when to stop the operation) and that they alert the archaeologist/paleontologist (ECO) who is on the site</p> <p>Access: Members of the heritage management team (archaeologist/paleontologist) should be able to access all parts of the mining operation at all times. They should have a clear line of communication with the mining operation so that they can access any part of the mine in the</p>

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	<p>event materials are recovered. The mining company should provide means of access in particular situations when access to the active parts of the mine is difficult.</p> <p>Training: The resident archaeologist/paleontologist should have regular access to training seminars whereby they can update all members of the mining operation about identification, documentation and recovery of fossil remains. It is critical that all aspects of the mining operation are aware of the potential risks to heritage resources.</p> <p>Communication: It is important that the heritage management team has an open line of dialogue with the operation of the mine. Specialists should be made aware of potential finds and any concerns about the impact on heritage materials at all times. The importance of contextual information in association with the fossils means that a specialist needs to see the location of a fossil or artifact find as soon after the recovery as possible. An active and open dialogue regarding the mining process is critical for successful mitigation.</p> <p>Documentation: In the event that fossils and artefacts are recovered it is of utmost importance that the heritage managers have the space necessary to properly analyze, curate and identify the materials recovered. The mining operation should provide the infrastructure to allow adequate analysis of these materials and the cost of this operation should be the responsibility of the mining operation.</p> <p>Fence Around The Active Dune Zone</p>
Monitoring and Auditing	<ul style="list-style-type: none"> During construction phase, all excavated areas must be monitored for presence of any artefacts of cultural/ heritage, archaeological or paleontological value. The ECO must inspect newly opened trenches for potential presence of artefacts. Weekly visual inspections required to ensure that no heritage resources are not impacted during construction.
Reporting and Corrective Action	<ul style="list-style-type: none"> The ECO must record all instances of artefacts of importance identified in the monthly audit report. If any traces of heritage, archaeological or paleontological value are revealed, HWC must be notified, a suitably qualified archaeologist/paleontologist must be appointed. All construction work around the area in question must cease, until approved by HWC to proceed. If significant fossils are found, an appropriately qualified palaeontologist will investigate, and if required, a permit will be obtained to recover and preserve the paleontological resources for scientific purposes before work can be commenced again.
Responsibility	EEM is responsible for the appointment of the ECO and requirements outlined above. These requirements must be fulfilled by the ECO, together with the site engineer and input from EEM.

9.3.62. VISUAL


Management of Visual Aspects	
Activity	The construction phase will result in a change to the visual landscape through the generation of dust, physical activities, project infrastructure and lighting.

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Policy	<ul style="list-style-type: none"> To minimise impacts on visual impacts associated with the Project and associated infrastructure. To reduce as much as practicable lighting impacts on sensitive receptors, including adjacent landowners and R45 and R27 road users.
Performance Criteria	<ul style="list-style-type: none"> Respond to all complaints regarding visual amenity and lighting and, where feasible, implement mitigation measures. Consultation with potentially affected sensitive receptors, prior to construction. Dust suppression measures will be implemented in line with the air quality recommendations.
Implementation Strategy	<p><u>Construction of plant and associated infrastructure</u></p> <ul style="list-style-type: none"> It is proposed that as little vegetation as possible be removed from building and infrastructure areas. Paint buildings and structures with colours that reflect and compliment the natural colours of the surrounding landscape. To further reduce the potential of glare, the external surfaces of buildings and structures should be articulated or textured to create an interplay of light and shade. Minimise amount of vegetation and topsoil should be removed from the Project area. Ensure that conveyor belts are designed to follow the natural contours of the land to avoid extensive cut or fill areas, as far as possible. The negative effect of night lighting, glare and spotlight effects can be mitigated using the following methods, as far as technical safe: Install light fixtures that provide precisely directed illumination to reduce light 'spillage' beyond the immediate surrounds of the project structures and activities. Avoid high pole top flood and security lighting around the support infrastructure and areas of activity e.g. roads. To reduce the amount of glare, external surfaces of buildings and other structures should be articulated or textured to increase the interplay of light and shade. <p><u>Landscaping</u></p> <ul style="list-style-type: none"> Natural vegetation should be retained as far as possible, keeping clearing of vegetation as close as possible to the footprint of structures and activities. An ecological approach to landscaping is recommended <p><u>Access and Haul Roads</u></p> <ul style="list-style-type: none"> Utilise existing roads and tracks to the extent possible. Where new roads are required, they should be gravel roads, maintained to prevent dust plumes and erosion. Surfacing of roads in locally sourced material would ensure that the colour is appropriate Route is proclaimed and not directly affecting sensitive receptors. Junction standards with R45 must reflect eventual frequency of heavy and light vehicles with good sightlines; road to be regularly cleaned

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Monitoring and Auditing	<ul style="list-style-type: none"> Lighting will be monitored to ensure that it meets the aim of reducing excessive leakage. Review of the complaints received. Monitoring dust generation and cleanliness of site.
Reporting and Corrective Action	<ul style="list-style-type: none"> All complaints received will be addressed. Any complaints received, together with the suggested mitigation measures must be recorded in the ECO monthly audit report.
Responsibility	<ul style="list-style-type: none"> EEM is responsible for the appointment of the ECO and requirements outlined above. These requirements must be fulfilled by the ECO, together with the site engineer and input from EEM.

9.3.63. TRAFFIC AND TRANSPORT


Activity	The construction phase would result in the generation of traffic on the R45, R27 and access road to the surrounding towns.
Policy	To reduce traffic impacts to surrounding landowners and road users, during the construction phase.
Performance Criteria	<ul style="list-style-type: none"> Minimal traffic-related complaints and incidents. To minimise impacts on road pavements, or where this is not practicable, to negotiate appropriate contributions or upgrades to road pavement impacts with relevant authorities.
Implementation Strategy	<ul style="list-style-type: none"> Obtain relevant approval/s from PGWC: Roads prior to commencement of construction. Implement traffic management plan. Prepare the intersection of the R45 and the access to the site with the appropriate construction warning signs and road markings. Restrict all construction activities to designated working areas with all work areas and access areas clearly marked and signposted. Car pooling and bus services will be implemented where possible to minimise worker journeys. Dangerous goods will be transported along preferred routes in accordance with relevant legislation. The transport of oversize loads will be restricted to non-peak periods, in line with traffic authority requirements. Clear signs and signals will be installed on-site and at all entrance/exit points to the mine to guide traffic movement and increase traffic safety. Vehicles will observe on-site traffic regulations. Impacts and subsequent rehabilitation requirements on road pavements will be negotiated with the relevant authorities. Where necessary, and in consultation with the relevant authorities, road sections (e.g. intersections) may be upgraded. Construction in road reserves will be planned to minimise disruption and maximise safety of road users.
Monitoring and Auditing	<ul style="list-style-type: none"> The number of incidents or complaints received in relation to project traffic will be monitored. Visual inspection of road quality at the entrance to the proposed access road

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	and R45.
Reporting and Corrective Action	<ul style="list-style-type: none"> • The occurrence of any traffic incidents or complaints will be recorded by the relevant ECO monthly audit report and reported to the site engineer. • All traffic incidents involving Project personnel will be reported to the ECO and site engineer and must be thoroughly investigated. • In the event of a complaint/incident or failure to comply with requirements, relevant corrective action will be taken.
Responsibility	EEM is responsible for the appointment of the ECO and requirements outlined above. These requirements must be fulfilled by the ECO, together with the site engineer and input from EEM.

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9.4. OPERATIONAL ENVIRONMENTAL MANAGEMENT PROGRAMME (OEMPr)

9.4.1. SCOPE

This Specification covers the requirements for controlling the impact on the environment of operational activities.

9.4.2. AIM AND PURPOSE OF THE OEMPr

This Operational EMPr aims to provide EEM with the necessary tools to ensure that the potential impacts on the environment during the operation of the Project are minimised. Moreover, it aims to ensure that the infrastructure is operated and maintained according to Good Practice. The Operational EMPr is a working document that may be amended to enhance its effectiveness for environmental control.

9.4.3. APPLICATION


The application and implementation of the Operational EMPr shall be the responsibility of EEM. EEM is to appoint an Environmental Site Manager (ESM) to ensure that relevant requirements of the EMPr document are implemented, and that the site is suitably managed. EEM may appoint a suitably qualified and experienced person from within the existing staff to fulfil the role of ESM. EEM may also form an Environmental Liaison Committee (ELC) to facilitate the implementation of the Operational EMPr. If the ELC is formed, many of the responsibilities of EEM may be delegated to the ELC. The ELC should consist of at the very least the following:

- Representative of EEM;
- Representative of SANParks;
- Representative of DEA&DP, DEA, DWA and DMR;
- Environmental Site Manager; and
- Representative of the local and authority.

Other members may include an independent environmental control officer or representatives from community based organisations or environmental groups.

Should EEM sub-contract the running of the Project to a third party, the Operational EMPr must be part of the contract and must be binding.

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9.4.4. ENVIRONMENTAL LIAISON COMMITTEE (ELC)

Prior to the Operational Phase, EEM may establish an Environmental Liaison Committee (ELC). The ELC would serve to provide strategic oversight on the Project, during the Operational Phase. The ELC, will play an advisory role, and provide a forum for democratic decisions regarding EMPr implementation, as well as periodically reviewing the EMPr in terms of its applicability to management requirements on site. They are to meet quarterly (i.e. every 3 months) to receive a report back on environmental management at an operational level. This frequency may need to be reviewed following the first year of operation, but should not be less than twice a year.

All members of the ELC will be expected to attend the meetings, and are to provide the chairperson of the committee with a written apology if unable to attend. In such a case, the member will receive minutes of the meeting, and may be expected to respond to certain issues.

The ELC must be comprised of, but not limited to, representatives from SANParks, WCBR, SBM, DEA&DP, DWA, DMR and EEM. EEM will be responsible for the compilation and distribution of the meeting agenda and ELC Progress Report, two weeks prior to the meeting date. The Progress Report must provide detailed feedback on, *inter alia*, on-going monitoring efforts (i.e. air quality, groundwater quality and quantity), and incidences of non-compliance and complaints received together with the agreed resolution.

9.4.5. ELANDSFONTEIN EXPLORATION AND MINING

The implementation of the EMPr, as well as the adherence to any conditions within the applicable authorisations for this project is the responsibility of EEM. EEM will appoint an Environmental Site Manager and various specialists as required to ensure that the specifications of this document as they relate to general site management and maintenance, as well as environmental audits, are suitably implemented on site.

The roles and responsibilities of each of the above-mentioned environmental management bodies have been detailed below:


9.4.6. ENVIRONMENTAL SITE MANAGER (ESM)

A suitably qualified and trained individual appointed by EEM prior to the operation of the mine, will fulfil the role of the Environmental Site Manager.

The primary roles and responsibilities of the ESM will be: to oversee the implementation of the EMPr on site;

- to visit the site on a monthly basis and advise on areas of environmental management, or compliance with the EMPr, requiring attention;
- to visit the site more regularly during the first three months of operation, during which more frequent monitoring may be required for the establishment of certain programmes or aspects of environmental management;

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- to be called to site in the case of any emergency situation which may impact on the local environment;
- to liaise with various specialists and the local authorities if required, regarding issues relating to environmental management;
- to report on compliance with the EMPr specifications to the ELC/EEM;
- to facilitate environmental audits and ensure that they are undertaken, as required;
- to keep a comprehensive record of environmental management, issues of non-compliance and minutes of ELC meetings for audit purposes; and
- to undertake any other tasks outlined in this document, on the behalf of EEM.
- It is recommended that the ECO appointment, extend three months into operation, to ensure an effective transfer of environmental management responsibilities to the EEM Operational Environmental Manager.

9.4.7. INDEPENDENT ENVIRONMENTAL AUDITOR

EEM should make provision for a Environmental Manager to be an internal EEM appointment, EEM must contract an independent Environmental Auditor with a post graduate degree in environmental studies and a minimum of five years relevant experience to act as the independent environmental auditor for the site. The auditor is to be contracted upon completion of the first year of operation, and is to perform an annual formal audit on the management plan, and its implementation by the relevant parties for the duration for the operational phase of the project. The findings of these yearly audits must be submitted to the ELC, for review and consideration.

9.5. FINANCING FOR ENVIRONMENTAL MANAGEMENT


The budget for the implementation of the EMPr shall come out of EEM's operational budget. EEM must review the EMPr and allocate the requisite funds to facilitate compliance. Since many of the items addressed in the EMPr relate to required preventative maintenance, operator legal compliance, and responsible environmental management, the costs have been accounted for.

9.5.1. DETAILED OPERATIONAL ENVIRONMENTAL SPECIFICATIONS

9.5.1.1. LITTER AND WASTE MANAGEMENT

A litter and waste management system must be established by EEM. Litter and waste management should address the following:

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Recycling

It is recommended that a recycling program be established for the site as a whole, but specifically for the administration and maintenance buildings and all site residences. This may be achieved via an agreement with the waste management contractor for the site. EEM must make adequate staff resources available to implement and manage the recycling program. Waste separation is best conducted at source, and the recycling waste storage area must as a minimum separate waste into the following categories:

- Paper products;
- Cardboard;
- Glass;
- Plastics; and
- Metals.

Recycling will involve greater effort, but offers the reward of environmentally sustainable practices and potential employment opportunities. The EEM should establish what recycling facilities are available within the broader area and determine a recycling program that can support any community efforts already underway.

Solid waste

A distinction should be made between dry solid waste and wet solid waste. These should be separated and collected in different containers for storage at a central waste depot before removal to a registered waste facility.

All waste storage areas are to be kept in a clean and hygienic condition to prevent odours, spreading of litter, and scavengers.

The frequency of collection must be determined and specified by the ELC/ EEM in this EMPr.

Refuse and litter management is to be monitored visually by the ESM. Findings are to inform changes in the waste management procedures to eliminate litter problems.


Hazardous Waste

Hazardous waste generated by the Project, must be disposed of at a registered hazardous waste facility and any health and safety requirements for the storage, transport and disposal of hazardous waste must be adhered to.

9.5.1.2. MAINTENANCE OF DEVELOPMENT

This section refers to both on-site and off-site maintenance of the operation.

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- EEM must notify the ESM of any external maintenance to be undertaken. Any significant structural maintenance should require compliance with the EMPr.
- The ESM must specify any additional environmental procedures necessary to prevent contamination of the environment.
- EEM is responsible for notifying the maintenance contractor of the conditions under which maintenance is to be done.

9.5.1.3. EMERGENCY PROCEDURES

An appropriate and timeous response to emergency situations will ensure that the environmental consequences of such situations are managed and curtailed.

Emergency contact details

A list of emergency services contact numbers shall be posted on site. As a minimum, the following emergency services shall be included on the list:

Fire Department:	10111
Disaster Management:	107
Ambulance Services:	10177
South African Police Services:	10111

9.5.2. OPERATIONAL EMPR REVIEW AND AUDIT

Operational EMPr Review


A schedule for the review of the EMPr should be established by the ELC/EEM. It is recommended that the effectiveness of the EMPr be reviewed on an annual basis, and possibly bi-annually in the first year of operation.

Operational EMPr Audit

Audits of the EMPr implementation in the Development should be undertaken on a regular basis. Internal audits (by the ESM) should be done on a quarterly basis with an external audit conducted by an independent consultant undertaken as specified below.

An independent environmental auditor is to be employed after the first year of operation, and annually thereafter, to perform a formal audit on the management plan, and its implementation by the relevant parties. Each audit is to be based on site visits by the auditor as well as a review of any records of environmental management to be kept by the ESM. The audit must also determine whether the EMPr is adequately dealing with the range of environmental impacts on the site, i.e. whether the plan is still appropriate, or whether it needs to be extended.

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The audit report is to include recommendations of changes required to the EMPr document and management practices to improve environmental management of the site. The results of this audit are to be submitted to the district and local environmental authority, and to DEA&DP, DMR and, DWA.

9.5.3. SUMMARY OF OPERATIONAL ENVIRONMENTAL SPECIFICATIONS

In this section of the document, specifications for environmental management on site have been summarised, to facilitate easy reference and implementation.


This section clearly lays out the management requirements, who is responsible for undertaking the required actions, time frames within which they are required, as well as requirements for monitoring, or where applicable, approval of the required action. Relevant references to these details have been provided in the tables below.

Where EEM has been identified as the responsible party, this should be read as EEM, or a suitable individual/organisation employed by them to undertake such task. Where another party has been identified as responsible for undertaking a management action, they are to fulfil this requirement, although EEM will ultimately be held responsible for any requirements or specifications of this document which are not fulfilled.

9.5.3.1. AIR QUALITY AND DUST


Activity and Element	Mining operations including hauling and ore processing as well as material handling and stockpiles.
Policy	To operate in a manner that minimises dust impacts on sensitive habitat and sensitive receptors.
Performance Criteria	<ul style="list-style-type: none"> No exceedance of applicable air quality standards at sensitive human receptors. Respond to complaints on air quality.
Implementation Strategy	<ul style="list-style-type: none"> Develop a detailed dust monitoring plan targeting areas in the vicinity of sensitive habitats on site (with a suitably qualified ecologist), and in addition at the site boundary and at four locations around the site and 2 locations along the road. This must be done prior to commencement and after. Regular maintenance of vehicles to reduce exhaust emissions. Wet suppression or chemical dust suppressants will be used at the crusher, on

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	<p>haul roads, during blasting, at materials handling and stockpile areas to reduce dust emission at source, as required.</p> <ul style="list-style-type: none"> • Watering frequency will be increased during periods of high risk (e.g. high winds). • Adherence to speed limits on public and internal roads. • The performance targets for the monitoring should be set to a maximum total daily dust deposition (calculated from the monthly dust deposition) to be less than 600 mg/m²/day for residential areas, and the maximum annual average dust deposition within the site to be less than 1,200 mg/m²/day.
Monitoring and Auditing	<ul style="list-style-type: none"> • Record all air quality related complaints received. • Monitor dust deposition in line with the dust monitoring plan. • Record dust monitoring results monthly, findings to be included in the annual environmental audit report.
Reporting and Corrective Action	<ul style="list-style-type: none"> • Records of all monitoring and auditing activities will be kept, with results reported by the Environmental Manager to DEA&DP, annually. • Recommendations and corrective actions arising from audits, inspections and reviews will be implemented. • All activities that deviate from normal operating conditions will be reported and corrective action initiated (including reporting to DEA&DP or delegated authority where this is warranted/required) to prevent a recurrence of the incident. • Complaints relating to air and dust emissions will be addressed promptly, with further investigations carried out and reporting to the Environmental Manager, if required. • Non-compliance and incident reports will be reviewed and closed out by the Environmental Manager.
Responsibility	Environmental Manager


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9.5.3.2. HYDROLOGY

Activity and Element	The operation of the Project may result in changes to an existing drainage line located within the pit area.
Policy	To prevent the potential impacts associated with erosion and to prevent the release of contaminants that may adversely affect downstream surface water quality.
Performance Criteria	<ul style="list-style-type: none"> No release of contaminants to surface waters outside the boundary of the mining license area. Avoid unnecessary diversion of watercourses on-site.
Implementation Strategy	<p>Develop a comprehensive Storm Water Management Plan (SWMP).</p> <ul style="list-style-type: none"> Adhere to inspection procedures stipulated in the SWMP and keep records. Only a poorly defined drainage channel that is orientated towards the south (represented by the blue lines in the Google Earth image). It is unlikely that there is any significant surface water flow in the channel and that the movement of water within the channel is relatively insignificant and is as subsurface flow. There is no visible aquatic ecosystem associated with the channel. It can therefore be said that there are no aquatic ecosystems of any significance identified within the proposed mining development site. No freshwater mitigation measures would be required on site. Water quality and flows will be monitored once a month in accordance with the SWMP. Values obtained should be incorporated in the water and salt balance for the mine and could serve as early warning indicators of potential malfunctions or mismanagement. Regular water management training will be provided by the mine. Surface water runoff from the dirty areas (eg process plant, softs stockpile) will be captured via berms and channeled to a stormwater dam and reused in the mining process. All areas where dangerous goods and hazardous substances, such as oils and petroleum fuels are handled (i.e. workshops and fuel storage facilities) will be bunded and strictly controlled to minimise the risk of accidental spillages. All relevant personnel trained in appropriate handling of spill materials and spill prevention. Place erosion control structures such as diversion drains, silt fences or traps at key locations (stormwater pit inlets, around stockpiles) to capture the suspended sediment. Provide bunding around stockpiles to prevent the material from being washed away. The height of the bund depends on the site location, the volume and type of material being stockpiled, as well as the topography.

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	<p><i>Sewage Package Plant</i></p> <ul style="list-style-type: none"> A thorough, regular inspection and maintenance regime should be implemented by EEM or its appointed operator. An emergency response unit should be established to undertake
Monitoring and Auditing	None required.
Reporting and Corrective Action	<ul style="list-style-type: none"> Records of all monitoring and auditing activities will be kept, with results reported by the Environmental Manager to DWA and DEA&DP, annually. Recommendations and corrective actions arising from audits, inspections and reviews will be implemented. Non-compliance and incident reports will be reviewed and closed out by the Environmental Manager.
Responsibility	Environmental Manager

9.5.3.3. HYDROGEOLOGY


Activity and Element	The Project may generate contaminated leachate from the Softs Stockpile, potential spillages from mining equipment, fuel and chemical storage facilities.
Policy	To minimise impacts to groundwater quality and quantity and avoid risk to human health and ecological receptors.
Performance Criteria	Groundwater users not to be impacted by drawdown or impacts associated with deterioration of groundwater quality.
Implementation Strategy	<ul style="list-style-type: none"> Implement the groundwater monitoring plan which will include monitoring of strategically located and correctly installed boreholes/monitoring wells (on- and off-site). Develop a grievance procedure to address and respond to water related grievances in a timely manner. The grievance procedure (including response times) will be developed prior to construction and in consultation with surrounding groundwater users. The grievance procedure will apply and be adapted, as required, for the construction, operation, decommissioning and after mine closure. EEM should establish a Groundwater Monitoring Committee, for the presentation and sharing of all groundwater monitoring data, as a risk management measure to the mine. The Committee may comprise of the management of the mine, regulatory bodies (DWA/DEA/catchment management agency), local groundwater users, and any other Interested and Affected Parties. It is recommended that the Committee meet at least quarterly initially, which could be relaxed to 6-monthly depending on monitoring

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	<p>results.</p> <ul style="list-style-type: none"> • Validate and update the groundwater model using the monitoring data. This will be used as a management tool throughout the operational phase (i.e. update predicted impacts in order to be proactive) and for planning of the post-closure phase. • Inspect and ensure toe drains(interception trenches) along the base of the SS are in working order and conveying water to pollution control dams for recycling and re-use and ensure maintenance activities are undertaken as and when required. • Short deposition cycles of softs will be followed by regularly covering fresh tailings soon after deposition, to prevent them oxidising on placement. • Cladding TSF side slopes with overburden, concurrently with deposition, to minimise oxygen ingress and side-slope erosion. • <i>Handling of Dangerous Goods</i> <ul style="list-style-type: none"> • Ensure storage of all hazardous substances and dangerous good (including hydrocarbons) in bunded areas, to prevent run-off and infiltration during tank failures. • Construction equipment is to be serviced regularly, to prevent oil spills. • A spill response plan must be in place, and employees must be trained accordingly. • All vehicle servicing must be undertaken in a bunded area.
Monitoring and Auditing	<ul style="list-style-type: none"> • Record all groundwater quality related complaints received. • Routinely monitor groundwater monitoring wells and boreholes for water level and contaminants in accordance with the groundwater monitoring plan. • Record monitoring results, findings to be included in the annual environmental audit report.
Reporting and Corrective Action	<ul style="list-style-type: none"> • Records of all monitoring and auditing activities will be kept, with results reported by the Environmental Manager to DWA and DEA&DP, annually. • Recommendations and corrective actions arising from audits, inspections and reviews will be implemented. • Complaints relating groundwater issues will be attended to promptly, with further investigations carried out and reporting to the Environmental Manager, if required.
Responsibility	Environmental Management

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9.5.3.4. FLORA, FAUNA AND AVIFAUNA MANAGEMENT

Activity and Element	Operation of mine infrastructure, particularly excavation of the pit of the ore.
Policy	Aim of mitigation is to conserve biodiversity with an emphasis on rare and indigenous species through reducing the residual impact.
Performance Criteria	Objectives of the mitigation are to facilitate development of a BMP and reduce the impacts of loss and fragmentation of habitats, reduction of species diversity and spread of alien and invasive species.
Implementation Strategy	<ul style="list-style-type: none"> • A Biodiversity Management Plan will be implemented cross-cutting all mine activities as appropriate. • <i>Mine Footprint related measures</i> • Clearly demarcate areas of high conservation importance with appropriate barriers and signage to ensure no unnecessary encroachment occurs. • No access of personnel to areas outside the disturbed areas, unless prior approval gained from the relevant manager. • Establish a nursery on site to cultivate indigenous vegetation from seeds or genetic material collected within the area, and used in landscaping projects around the mine offices and other facilities. • Habitat fragmentation related measures • Fencing of the set aside conservation area will be maintained in a good state in the form of livestock fences that allow unrestricted movement of small and medium-sized wildlife. • Gates will be locked gates and no entry signs prominently displayed. • Locally indigenous plant species will be used in landscaping projects around offices and mine facilities. • Measures for protecting or enhancing species diversity • Speed restrictions will be enforced on all roads within the mine properties and mine controlled areas to minimise the incidence of faunal road kills. • Driver training will be provided to sensitise employees to the importance of avoiding faunal road kills and the mine site, within the mine properties and on public roads. • Trained mine personnel with capacity to safely capture and translocate dangerous snakes will be available at all times. • Efforts will be supported to promote an appreciation of biodiversity features of the mine property and mine controlled areas among staff, contractors and their dependents. • Alien control measures • Controls will be implemented to reduce introduction of foreign plant species onto the mine site and associated projects. • Presence of alien fauna, such as feral dogs and cats that threaten the
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	<p>local ecology will be monitored. Ethical control measures will be implemented if an increase in their presence is detected.</p> <ul style="list-style-type: none"> • Routine monitoring conducted to identify any new incidences of weed infestation. • Provision of information for personnel on the identification of declared weeds. This will facilitate alien removal at the site. • Stockpile areas and haul roads required will be clearly defined, so that weed establishment and the potential spread of plant diseases may be contained. Stockpiles will be developed in previously cleared areas, with adequate open-space buffers, where possible. • Search and Rescue of plants of the only two commonly recorded and translocatable SCC from within the mine footprint (<i>Caesia sabulosa</i> and <i>Lampranthus densifolius</i>) should be undertaken prior to each strip being cleared. These plants should be translocated to areas in need of rehabilitation, which will mean that plants from the first strip will need to be maintained in a nursery until they can be planted out. • The Hopefield Sand Fynbos portions of the greater study area that border the project footprint (southeast corner of pit) need to be burnt in the next ten years, and will not need a fire again during the Life of Mine. The planning for this should be part of a Fire Management Plan that is drawn up in conjunction with SANParks and the rehabilitation consultants. • A suitable and appropriate biodiversity offset must be drawn up and implemented within one year of any project approval, and this offset must significantly expand the area of the West Coast National Park and should incorporate priority natural habitat as identified by a specialist. The implementation of this offset is the primary means of reducing the residual Medium negative botanical impact to a more acceptable Low negative level. For further details see the specialist biodiversity offset report by M. Botha. <ul style="list-style-type: none"> ○ It may be necessary to erect wind fences around strip mined areas and stockpiles in order to limit windblown dust. This should be assessed by the rehabilitation consultant every six months during life of mine, and if it proves necessary these should be put in place within one month of these audits. ○ Topsoil harvesting should include as much topsoil as possible, and must be 500mm deep as a minimum, as numerous plants have corms, tubers and bulbs that extend very deep (much deeper than 10cm). Topsoil should ideally be used to immediately surface all available backfilled and mined areas in need of rehabilitation, or failing this should be stockpiled for no more than three months before being used. ○ All aspects of vegetation rehabilitation should be undertaken according to the best available practice developed by Vula Environmental Services, based on their
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	<p>rehabilitation work undertaken at the nearby Foskor mine, and adapted to the specific needs at this site. The detailed vegetation rehabilitation methodology is contained in a specialist report produced by Vula Environmental Services.</p> <ul style="list-style-type: none"> Annual monitoring of the vegetation around the project area needs to be undertaken, and in particular in the areas where windblown dust may be an issue, where the drawdown cones caused by the dewatering boreholes around the pit may impact on the natural vegetation outside the pit, and where the surplus water is reintroduced into the upper aquifer. This would probably be best undertaken by suitably qualified members of the vegetation rehabilitation team, or otherwise by a botanical consultant. Particular attention should be paid to floristic and structural changes, and to any plant mortality. Within one year of any project approval the applicant must develop a scientifically valid and independently verified environmental monitoring program as part of any EMP for the site. This should include dust and windblown sand monitoring, monitoring of the success of any Search and Rescue undertaken, monitoring of dewatering drawdown cone areas, monitoring of water re-introduction areas, monitoring of alien invasive vegetation and monitoring of rehabilitation methodology and success (which needs to be measured against pre-mining baseline vegetation data).
Monitoring and Auditing	<p>Monitoring of ecological dust impacts</p> <p>Monitoring of sensitive ecological receptors (particularly in response to dust) will be implemented and include the following considerations wherever possible:</p> <ul style="list-style-type: none"> A competent botanist will be contracted to oversee the monitoring programme; Monitoring of faunal presence and loss Routine monthly inspections of undisturbed areas by the ECO to identify any evidence of habitat disturbance. Road kills will be monitored daily in areas of irreplaceable and constrained habitats and response strategies (e.g. reduced speed zones) will be developed where required. Records will be maintained of fauna casualties including species, date, location and cause. Monitoring of vegetation clearing and habitat loss The ECO will monitor site clearing whenever this occurs to ensure that: <ul style="list-style-type: none"> Vegetation areas and flora species to be cleared are well defined There is no unauthorised disturbance of the surrounding habitat area. Weed and pest monitoring

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	<p>The ECO will monitor occurrence of alien plant (weed) species on a monthly basis.</p> <ul style="list-style-type: none"> Regular surveys, through visual inspections or other means, of potential weeds and pest species will be conducted by qualified personnel. Monitor disturbed areas for signs of pest invasions. Regular inspections and weed hygiene logs will be maintained for vehicles and machinery. Further studies EEM will collaborate with academic institutions to conduct ongoing development of an inventory of species diversity within the mine sites.
Reporting and Corrective Action	<ul style="list-style-type: none"> Results from monitoring of ecological dust impacts The appointed botanist will compile an annual report following each survey which shall be submitted to the ECO and the DEA&DP. <p>Corrective actions to be taken if pre-determined thresholds are exceeded:</p> <ul style="list-style-type: none"> Additional measures to minimise dust will be implemented; Corresponding increases in terms of the Offset metrics will need to be implemented by the mine, and reported to the competent authority. Results from monitoring of faunal presence and loss, vegetation clearing and habitat loss Results of monitoring will be reported by the ECO on a monthly basis proposing adaptive management measures to improve mitigation where appropriate, and success from implementation of previous actions. Results of monitoring and recommendations will be reviewed by a competent ecologist on a six monthly basis, or more frequently as appropriate. Results from monitoring of weed and pest presence Results of monitoring will be reported by the ECO on a monthly basis proposing adaptive management measures to improve mitigation where appropriate, and success from implementation of previous actions. Priority areas for alien control and required actions, resources and safety procedures will be determined in advance. Results of monitoring and recommendations will be reviewed by a competent botanist on a six monthly basis, or more frequently as appropriate. Results from further studies Organisations contracted to conduct further studies will present reports on an annual basis to the ECO and DEA&DP. Assessment of knowledge gaps and suggestions for addressing these gaps will be included in the report. General Records of all monitoring and auditing activities will be kept, with results included into the annual auditing report, which is to be submitted to the DEA&DP. Recommendations and corrective actions arising from ECO inspections

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	<p>and reviews will be agreed to with the site engineer, before proceeding.</p> <ul style="list-style-type: none"> Biodiversity related complaints from surrounding users will be responded to, with further investigations carried out and reporting to the DEA&DP and DWA, if required. Non-compliance and incident reports will be reviewed and closed out by the ECO and site engineer.
Responsibility	The person primarily responsible for implementation of mitigation and subsequent monitoring is the appointed Environmental Site Manager (ESM).

9.5.3.5. NOISE

Activity and Element	Mining operations, including hauling, and ore processing will generate noise (but it excludes heavy noise making activities such as milling, blasting, etc).
Policy	To operate in a manner that minimises the impact of noise and vibrations on sensitive receptors.
Performance Criteria	<p>No exceedance of noise guideline levels at sensitive receptors.</p> <ul style="list-style-type: none"> Record and respond to noise-related complaints. Consultation with potentially affected sensitive receptors
Implementation Strategy	<ul style="list-style-type: none"> Undertake equipment noise audits at commissioning to construct reference database which can be used to check equipment performance, detect noise level increases and deterioration. On-going monitoring will be required against noise specifications contained in the relevant brochures. Implement environmental noise and vibration monitoring along site boundaries and at four selected locations within farm houses closest to the mine and the Loop 10 road on an annual basis with more frequent targeted monitoring at sensitive receptors, if required. Ensure all noise complaints are recorded and addressed. Ensure that all machinery and equipment is well maintained in good working order
Monitoring and Auditing	Complaints relating to noise and vibration will be recorded and closed out by the Environmental Manager or delegate.
Reporting and Corrective Action	<ul style="list-style-type: none"> Complaints relating to noise will be addressed promptly, with further investigations and reporting to the Environmental Manager and site manager, if required. Routine work reports with maintenance records will be recorded and reviewed by each supervisor or manager. All works that deviate from normal operating conditions will be reported and action initiated (including reporting to relevant agencies where this is warranted/required) to prevent a recurrence of the incident. Non-compliance and incident reports will be reviewed and closed out by senior management. Regular reviews, recommendations and corrective actions shall be

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	implemented.
Responsibility	Environmental Site Manager

9.5.3.6. SOCIO-ECONOMIC MITIGATION ENHANCEMENT AND MANAGEMENT


Activity and Element	Operation of the mine infrastructure, particularly human resource development and local economic development.
Policy	To operate in a manner that promotes sustainable development.
Performance Criteria	Objectives of the mitigation and enhancement measures are to limit socio-economic impacts and enhance benefits associated with the operation of the Project.
Implementation Strategy	<ul style="list-style-type: none"> EEM will implement a grievance procedure that is easily accessible to stakeholders, through which complaints related to contractor or employee road use infringements (e.g. speeding, accidents) can be lodged and responded to. EEM will respond to all such complaints. Key steps of the grievance mechanism include: <ul style="list-style-type: none"> Circulation of contact details of 'grievance officer' or other key contact; Awareness raising among local communities (including all directly affected and neighbouring farmers) regarding the grievance procedure and how it works; and Establishment of a grievance register to be updated by EEM, including all responses and response times. EEM, in partnership with the local municipality, local education will develop a Training Plan that enhances skills in the area in line with the Project's Social and Labour Plan. The Plan should: <ul style="list-style-type: none"> Identify the skills gaps (between existing skills and Project needs) and initiate mechanisms to train local people to meet the Project's needs; Identify the particular needs of the youth and women, based on feedback from stakeholders; and Prioritise the youth and women for training programs. EEM will develop and implement a detailed Stakeholder Consultation and Engagement Plan (SCEP) that identifies all defines responsibility for these activities. This plan should be updated on an annual basis. EEM and its appointed contractors are to develop an induction programme and a Code of Conduct for all workers directly or indirectly employed by the Project. The Code of Conduct is to form part of induction of all employees related to the Project. All employees and sub-contractors will adhere to the Code of Conduct. If workers are found to be in contravention of the Code of Conduct, which they have signed, they will face disciplinary procedures. If the breach of the code of conduct warrants

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	<p>a dismissal, the dismissal must comply with the South African labour legislation. The Code of Conduct should be available in all relevant languages and at a minimum, English, Afrikaans and Setswana. The Code of Conduct should address the following aspects, as a minimum:</p> <ul style="list-style-type: none"> • respect for local residents; • respect for farm infrastructure and agricultural activities; • no unauthorised taking of natural resources; • respect for the natural environment and no littering or illegal dumping; • zero tolerance of illegal activities by Project related employees including: soliciting prostitutes; illegal sale and purchase of alcohol; sale, purchase or consume drugs; illegal gambling or fighting; and engaging in sexual acts with minors; • compliance with the traffic regulations on site and all road traffic regulations; and • description of disciplinary measures for infringement of the Code of Conduct and company rules. • Implement all mitigation measures stipulated to enhance the levels of employment, skills development and procurement in the LM and NDM, giving priority to vulnerable groups such as women, and ensuring that the youth are empowered to maximise these opportunities. • Employment • Implement provisions set out in terms of the prescribed recruitment and human resources management policy for the Project. • Posting of employment opportunities; • Compilation of a database of the local labour force (skilled, semi-skilled and skilled); and • Providing basic training (including labour laws and financial management training). The training course will be targeted mainly to people from the SBM (Hopefield area). • EEM will endeavour to ensure that contractor's recruitment and human resources management policies are in alignment with EEM's policies. • EEM will provide all its local workers with induction/orientation. • Training and Skills Development • EEM will implement a skills and development training programme; • All capacity building and skills development initiatives and commitments for core and non-core mining skills (including sustainable alternative livelihoods) will be defined as commitments in the Mine's Social and Labour Plan (SLP). • EEM will support the development of literacy enhancement programmes for the local community, in coordination with the local authorities, as part of the community development plans. • EEM will provide local and national scholarships throughout the life of the project to recognised public and private universities for courses that are related to both core and non-core mining skills. • EEM will implement a bursary scheme aimed at members from the local community.
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	<ul style="list-style-type: none"> On-the-job performance and training will be monitored through performance reviews. Training needs will be identified and provided on an on-going basis to foster continuous learning during the operation phase. Procurement and Services EEM will assist with building supplier capability in line with either commitments in their SLP. This may entail the following: <ul style="list-style-type: none"> Audit of suppliers in the SBM and WCDM; Identify skills gaps and development needs; Develop a supplier training programme; and Target vulnerable groups to benefit from the supplier training initiative. As part of the tendering process, EEM will encourage large companies to demonstrate how they will partner with local or regional companies to jointly supply a service if it is not possible to split a contract. EEM will keep the communities regularly informed of on-going Project activities through the ward councillors and community leaders. Method and frequency of communications to be defined in the above-mentioned SCEP. Concerns regarding jobs and other expectations will be addressed in accordance with the grievance procedure. Maximise local employment and procurement. EEM will identify appropriate Local Economic Development (LED) projects in accordance with their Social and Labour Plan (SLP).
Monitoring and Auditing	Monitoring to ensure operational activities adhere to conditions set out in the Social Labour Plan.
Reporting and Corrective Action	Records of all monitoring and auditing activities will be kept, with results reported by the Environmental Manager to the DEA&DP annually. Recommendations and corrective actions arising from audits, inspections and reviews will be implemented. Non-compliance and incident reports will be reviewed and closed out by the Environmental Manager.
Responsibility	Environmental Manager

9.5.3.7. ECONOMIC MITIGATION AND ENHANCEMENT MEASURES

Activity and Element	The operational phase of the project will result in increased expenditure/investment, net foreign exchange and tax earnings outflows while negative impacts resulting from the Project may be associated with tourism potential, impact adjacent land values and increase strain on municipal services.
Policy	The aim is to minimise the negative impacts on tourism potential of the area, reduce impacts associated with reduction in adjacent land values and reduce demand/ dependency on municipal services while enhancing the economic

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	benefits associated with the Project.
Performance Criteria	<ul style="list-style-type: none"> To enhance potential employment opportunities in the local communities associated with the construction phase of the Project. Increase the potential for the use of local contractors and suppliers. Reduce demand (from Project employees) on municipal services.
Implementation Strategy	<ul style="list-style-type: none"> Implement employment equity plan, recruitment and procurement policy and local contractor and supplier policy. Provide on the job training to maximise employment opportunities of local community members. Establish a target percentage of local employees and contractors/suppliers utilised in the Project.
Monitoring and Auditing	<ul style="list-style-type: none"> Review signed copies of proof of on the job training. Copy of employment equity plan, recruitment and procurement policy and local contractor and supplier policy to be kept on-site. Contractual documents will be used to verify level of local employment.
Reporting and Corrective Action	<ul style="list-style-type: none"> Records of all monitoring and auditing activities will be kept, with results reported by the Environmental Manager to the DEA&DP and DMR, annually. Recommendations and corrective actions arising from audits, inspections and reviews will be implemented. Non-compliance and incident reports will be reviewed and closed out by the Environmental Manager
Responsibility	Environmental Manager


9.5.3.8. CULTURAL HERITAGE, ARCHAEOLOGY AND PALAEOLOGY

Activity and Element	Loss of heritage resources through landscape/site disturbance. Management of heritage resources relative to operation of the mine and associated infrastructure
Policy	Avoid or mitigate impacts on archaeological, paleontological or cultural heritage resources.
Performance Criteria	Compliance with conditions set out in the Record of Decision from HWC.
Implementation Strategy	<ul style="list-style-type: none"> Cultural Heritage Minimise the development footprint to only what is actually needed. Restrict all construction activities to designated working areas with all work areas and access areas clearly marked and signposted. Immediately report any cultural heritage trace that may come to light during the operational phase. Physical salvage of sites would need to take place before commencement of the construction and operational phases.

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	<ul style="list-style-type: none"> • Restrict operational activities to designated working areas with all work areas and access areas clearly marked and signposted. • Immediately report any cultural heritage trace that may come to light during the operation phase. • Archaeology • Minimise the development footprint to only what is actually needed. • Restrict operational activities to designated working areas with all work areas and access areas clearly marked and signposted. • Palaeontology • The environmental manager responsible for the development must remain aware that all sedimentary deposits have the potential to contain fossils and he/she should thus monitor all substantial excavations into sedimentary bedrock for fossil remains. If any fossils are found during construction and operation, HNC and SAHRA should be notified immediately. • If significant fossils are found, an appropriately qualified palaeontologist will investigate, and if required, a permit will be obtained to recover and preserve the paleontological resources for scientific purposes before work can be commenced again. • A Heritage Management Plan must be implemented as part of the Heritage Impact Assessment Application Process with Heritage Western Cape. • Access: Members of the heritage management team (archaeologist/paleontologist) should be able to access all parts of the mining operation at all times. They should have a clear line of communication with the mining operation so that they can access any part of the mine in the event materials are recovered. The mining company should provide means of access in particular situations when access to the active parts of the mine is difficult. • Training: The resident archaeologist/paleontologist should have regular access to training seminars whereby they can update all members of the mining operation about identification, documentation and recovery of fossil remains. It is critical that all aspects of the mining operation are aware of the potential risks to heritage resources. • Communication: It is important that the heritage management team has an open line of dialogue with the operation of the mine. Specialists should be made aware of potential finds and any concerns about the impact on heritage materials at all times. The importance of contextual information in association with the fossils means that a specialist needs to see the location of a fossil or artifact find as soon after the recovery as possible. An active and open dialogue regarding the mining process is critical for successful mitigation. • Documentation: In the event that fossils and artefacts are recovered it is of utmost importance that the heritage managers have the space necessary to properly analyze, curate and identify the materials recovered. The mining operation should provide the infrastructure to
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	<p>allow adequate analysis of these materials and the cost of this operation should be the responsibility of the mining operation.</p> <ul style="list-style-type: none"> Costs: The mining operation needs to be prepared to cover the costs associated with the recovery, curation, and analysis of the materials. An outside consultant should review the methods and approaches for this on a semi-regular basis. The costs of subsequent study of these materials are the responsibility mining operation in association with the relevant scientific organizations. In the event of a large-scale recovery of fossils (>300 specimens in a 2m² area) it will be necessary to mitigate the fossils with professional excavation procedures. If these types of recoveries happen numerous specialists should be contacted so that the proper recovery techniques can be undertaken. The current heritage agreement that has been signed by Heritage Western Cape and the mining operation should be amended and updated as the mining operation continues. Action Items Prior To The Development of the Mine <ul style="list-style-type: none"> Establish a fence around the active Dune Zone Remove Alien Vegetation Species Expand Community Interaction
Monitoring and Auditing	Monitoring to ensure operational activities adhere to conditions set out in the permits obtained from HWC and the Heritage Management Plan to be prepared by EEM.
Reporting and Corrective Action	<ul style="list-style-type: none"> Records of all monitoring and auditing activities will be kept, with results reported by the Environmental Manager to the heritage authorities and DEA&DP, annually. Recommendations and corrective actions arising from audits, inspections and reviews will be implemented. Non-compliance and incident reports will be reviewed and closed out by the Environmental Manager.
Responsibility	Environmental Site Manager

9.5.3.9. TRAFFIC AND TRANSPORT


Activity and Element	The operational phase will result in the generation of additional traffic on the road to the Port as well as on the R27, R45.
Policy	To reduce traffic impacts on surrounding landowners and road users, during the operational phase.
Performance Criteria	Minimal traffic-related complaints and incidents.
Implementation Strategy	<ul style="list-style-type: none"> Ensure that a traffic and transportation management plan is in place for the operational phase of the project. The transport of fuels on public roads is governed by the National Road Traffic Act and as such vehicles and drivers must meet stringent safety controls.

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	<ul style="list-style-type: none"> • Bulk road tankers must undergo regular maintenance/servicing inspections to ensure that they remain in good working condition. • Adequate road signage and warning lights indicating working and turning areas should be provided at and near the site. • Public transport facilities will be provided (bus stops and mini-bus taxi stops within the site) for contractors and employees, to promote public transport use. • Sidewalks to the site should be provided and made wide enough to safely accommodate cyclists and pedestrians. Furthermore, the use of non-motorised modes of transport (i.e. bicycles and walking) should be promoted. In this regard, employees living in close proximity to the site should be encouraged to use non-motorised transport instead of using private vehicles. • All company vehicles will be regularly checked and maintained, including tyre wear. • Contact details will be displayed on project vehicles to allow other road users to report bad driving at any time. • All project drivers will be sensitised about potential accident risks to local users and will be periodically checked for alcohol consumption. • EEM will ensure that vehicles are correctly and safely loaded to avoid accidents, and all loads are secured and covered where they pose a risk of windblown dust or material spillage. • EEM will work in conjunction with PGWC:Roads to erect appropriate road traffic signage and road markings at the intersections of the access road with the R45. • Movement of heavy vehicles through or close to residential areas in Saldanha will be avoided or minimised to reduce potential impact on local residents, specifically children. • EEM to monitor the impact on the road quality en route to the Port and roads within the Project area.
Monitoring and Auditing	<p>The number of incidents or complaints received in relation to project traffic will be monitored.</p> <p>Visual inspection of road quality at the mine access and R45.</p>
Reporting and Corrective Action	<ul style="list-style-type: none"> • The occurrence of any traffic incidents or complaints will be reported to the Environmental Manager. • All traffic incidents involving Project personnel will be reported to the Environmental Manager and/or site manager and must be thoroughly investigated. • In the event of a complaint/incident or failure to comply with requirements, relevant corrective action will be taken.
Responsibility	Environmental Site Manager


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9.5.3.10. VISUAL AMENITY AND LIGHTING

Activity and Element	The Project will result in a change to the visual landscape, through the generation of dust, physical activities, project infrastructure and lighting
Policy	To minimise impacts on visual impacts associated with the Project and associated infrastructure. To reduce as much as practicable lighting impacts on sensitive receptors, including adjacent landowners and R27 and R45.
Performance Criteria	Respond to all complaints regarding visual amenity and lighting and, where feasible, implement mitigation measures. Dust suppression measures will be implemented in line with the air quality recommendations.
Implementation Strategy	<p>Lighting</p> <p>The negative effect of night lighting, glare and spotlight effects can be mitigated using the following methods:</p> <ul style="list-style-type: none"> • Install light fixtures that provide precisely directed illumination to reduce light 'spillage' beyond the immediate surrounds of the project structures and activities. • Avoid high pole top flood and security lighting around the support infrastructure and areas of activity e.g. roads. <p>Softs Stockpile</p> <ul style="list-style-type: none"> • Steep engineered slopes should be avoided as these could impose an additional impact on the landscape by contrasting with the form of the existing topography. • Final shaping and dumping should be implemented in such a way that the final horizon of the dumps simulates the existing profile of the landscape and that the sides of the dumps are articulated in a fashion which resembles the existing topography. <p>Landscaping</p> <ul style="list-style-type: none"> • Natural vegetation should be retained as far as possible, keeping clearing of vegetation as close as possible to the footprint of structures and activities. • An ecological approach to landscaping is recommended. Should plants be introduced into the project site, plant selection should be guided by ecological rather than horticultural principles. (i.e. ecological communities of plants provide more bio-diversity and habitat opportunities and would blend with the natural vegetation). <p>Access and Haul Roads</p> <ul style="list-style-type: none"> • Access roads and haul roads will require an effective dust suppression management programme, such as the application of non-polluting dust suppressing agents or water. • Where paved surfaces are required, use paving materials with a colour that would complement the natural colours (black or brown) and textures of the area.

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Monitoring and Auditing	<ul style="list-style-type: none"> • Lighting will be monitored to ensure that it meets the aim of reducing excessive leakage. • Review of the complaints received. • Monitoring dust generation and cleanliness of site.
Reporting and Corrective Action	All complaints will be responded to and recorded.
Responsibility	Environmental Site Manager

9.6. DECOMMISSIONING, POST CLOSURE AND REHABILITATION

9.6.1. SCOPE

This Specification covers the requirements for controlling the impact on the environment of decommissioning activities. The Project is expected to have a total duration of 19 years. However, it is anticipated that the production levels will slow down during the last year of operation and therefore decommissioning phase will commence. Note that although this EMPr provides a summary of the proposed decommission and post closure process, a report outlining the decommissioning and closure is attached as Appendix C.

The planning for closure and rehabilitation is an on-going process, which will be adapted and updated during the operational phase of the Project. Based on the current level of engineering design available and understanding of DMR requirements, a Draft Conceptual Closure Plan will be developed. During the operational phase, the closure criteria will need to be refined further, together with the associated costing to develop a preliminary closure and rehabilitation plan.


As the Project approaches the end of the life of mine, a final closure and rehabilitation plan will need to be compiled, based on further refinements of the above iterations, and submitted to the DMR for final approval. The final closure plan will include an updated financial breakdown and allocation for closure, as well as approved suggestions for post mining land use (based on further engagement with surrounding landowners and key stakeholders).

9.6.2. CLOSURE VISION

Global targets for the restoration of natural capital are relatively clear and simple and include the prevention of further global warming, reduction of species loss and retarding desertification. On a local scale, (such as at Elandsfontein), these priorities are more diverse and driven by legislation as well as community expectations. Elements such as habitat and species loss, aesthetics, and the limitation of long term local changes in the ecological functionality are considered of great importance (Milton et al., 2007)

Ecological restoration, according to the Society for Ecological Restoration (SER), is the process of assisting the recovery of a degraded, damaged or destroyed ecosystem with the goal of creating a resilient self-sustaining ecosystem with respect to structure, species composition and function. (Arson et al, 2007).

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The vision to restore the post mining environment is best served by integrating operational and closure objectives, exploiting synergies that exist in order to improve cost effectiveness of the rehabilitation process.

Elandsfontein is the first opportunity on the West Coast to plan an opencast phosphate mine of this magnitude with the potential to rehabilitate and re-integrate the post mining environment into the natural system. The Langebaanweg rehabilitation example illustrated that post operational rehabilitation is hampered by unsuitable landforms and lack of substrate to support growth. At Elandsfontein, the integration of the rehabilitation process with the mining operation will however yield a suitable post mining topography. This and judicious topsoil management is the key in ensuring that the vision of leaving an integrated functional ecosystem behind that can function as an extension of the West Coast National Park.

9.6.3. CLOSURE OBJECTIVES

Obtaining a closure certificate from the Regulator within the shortest possible timeframe subsequent to the end of the mining operations is in essence the concrete objective of the mine rehabilitation plan. This requires compliance with all aspects finally entrenched in the EMPR that in turn must ensure adherence to all stipulations laid down in the regulations sited

9.6.4. CLOSURE PLAN

Within the geographical context of the mine, the locality and the proximity of the West Coast National Park, the Elandsfontein Fossil deposit, and the land that will be transferred to the West Coast national Park as proposed offset and part of the mitigation of the impact of mining, clearly dictates the post mining land use. Rehabilitation of the mine footprint would result in a land unit that can be integrated into the larger conservation framework.

The post-mining environment will be similar in appearance to the pre-mining state and this will result in a manageable and sustainable portion of land that will be added to the mosaic that forms the extended West Coast National Park. The consideration of the increased land area that will be added to the core of the West Coast Biosphere is also significant.


Financial provisions are calculated for the rehabilitation of operational mine blocks as well as the removal and rehabilitation of all associated infrastructure in the event of cessation of activities. (Annexure B) Monitoring and maintenance is allowed for until the rehabilitation has reached a level of self sustainability estimated at two winter seasons following the final rehabilitation.

Pre-mining search and rescue, alien vegetation control and ongoing rehabilitation as part of the operational phase of the mining has also been calculated.

9.6.5. CLOSURE ASSUMPTIONS

There are many examples of open cast mines that relied on autogenic recovery as a default method of rehabilitation. Chemfos is a case in point where overburden dumps, tailings and evaporation ponds as well as

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the mine floor was inadequately prepared and treated. These mistakes had to be rectified in order to achieve closure status of the mine. (van Eeden 2010)

There are a great number of examples in the Namaqualand lowland that although different in many respects, have proven that the notion of spontaneous rehabilitation of a post mining environment is extremely unlikely (Carrick & Kruger, 2007)

The primary assumption made in compiling this rehabilitation plan is development and retention of intellectual capital and continuity in the ongoing rehabilitation that must co-inside with but follow behind active mining. The high level of entrenched knowledge that is developed on any specific site has to be retained throughout the rehabilitation process that is the last activity that will still take place before closure is achieved. (van Eeden et al., 2007).

The planned continues rehabilitation, starting 33 months after the commencement of mining will use freshly stripped topsoil placed on top of profiled overburden and tailings used to backfill old mine blocks and will result in a relatively small-scale operation to be conducted after the operational life of the mine.

The complete removal of all operational infrastructure including the dam and stockpile footprint will be undertaken during the post operational phase of the mine. Adequate provision for funding and material will be made to ensure successful and complete rehabilitation. (Annexure B and C)

9.6.6. MINING METHODS

Large-scale surface disturbance is inherent in open cast mining. Minimizing the footprint of the surface area exposed by mining at any given time, limits the impacts of wind erosion and dust pollution. It can however pose challenges to operational aspects associated with mining.


The proposed strip mining technique will offer the opportunity to maximize the benefit associated with the use of newly harvested topsoil as the primary rehabilitation strategy. The depth of the ore deposit necessitates the use of several strip terraces

Elandsfontein offers a unique opportunity to integrate the rehabilitation on an ongoing basis during the operational phase. Relying partly on techniques developed in recent years on the nearby open cast mine at Langebaanweg. The opportunity to manage the single most valuable commodity that was not available at Chemfos namely topsoil, provides an opportunity to greatly reduce cost and increase efficiencies.

In order to implement phased and systematic rehabilitation that follows the mine path, initial long term preservation of topsoil will be required for the topsoil generated by the clearing of the initial operational footprint. This material will then be used at the end of the mines life span to rehabilitate the last mining blocks as well as the footprint of the de-commissioned infrastructure. The ongoing rehabilitation also provides opportunity to increase the effectiveness of maintenance thus curtailing the cost to a minimum.

The proposed topsoil stockpile footprint will be close to 14 ha and will contain topsoil harvested from Phase 1 of the strip mining area generated during the first 33 months (68.5 ha) as well as the topsoil from the footprints of the stockpile and the buildings and related infrastructure .

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It is not proposed that the topsoil harvested from the road reserved be stockpiled since the road transects a variety of soil and thus vegetation types. The

The following activities that form part of the rehabilitation plan will take place before and during the mining operation:

9.6.6.1. SEARCH AND RESCUE

Initial search and rescue will cover the areas demarcated for development of all infrastructure including roads buildings, initial stockpile areas for short and long-term topsoil placement and the first mine block footprint must be surveyed.

All plant species of Significant Conservation Concern should be marked and then relocated or propagated at the first appropriate opportunity according to the prescribed methods. All plants of SCC along the road and powerline corridors that can be transplanted must be relocated to the nearest protected habitat similar to its origin. In addition to the transplanting individual plants, propagation of each species should be done by the appropriate means in the designated rehabilitation nursery. The resulting plant material can be re-integrated into the areas surrounding the mine site as the required soil conditions are quite specific. Additional propagation can be done of plants that occur in the Saldanha Flats Strandveld, Saldanha Limestone Strandveld and Langebaan Dune Strandveld as listed in Annexure A. These species could possibly be successfully established in the rehabilitated areas of the mine once initial vegetation cover has been achieved

All fauna should be relocated to the outside of the mine fence in consultation with the WCNP authorities.


A comprehensive vegetation search and rescue of the areas will yield many useful plants that cannot be used or stored until the commencement of the mine rehabilitation process due to practical limitations and cost effectiveness. It could however be of use to other landowners in the area that may require selected species for their own rehabilitation. A mechanism for making the material available should be explored.

Once the succession process is in place, selected plants that readily transplant cost effectively can be relocated during winter to the post-mining rehabilitation blocks in addition to the relocation of the geophytes. Seed must be harvested from the areas during spring and summer and the seed collection can be augmented with seeds from the surrounding areas if required.

Direct transplants of selected species can only be done after about three years so it is recommended that only geophytes be collected during the first years and to establish these in an onsite nursery. Once the rehabilitation succession process is in place, plants that readily transplant cost effectively can be relocated during winter to the post-mining rehabilitation blocks in addition to the relocation of the geophytes.

9.6.6.2. TOPSOIL MANAGEMENT

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Optimal timing for topsoil harvesting would be the end of summer as the seed loading is the highest at that time. Topsoil handling between May en August should be avoided as much damage is done to propagules at this time of year.

Double handling of topsoil must be avoided as far as possible and topsoil stripping and placement to the new rehabilitation block should be one operation. This will however be impossible to achieve during the initial ground breaking phase of the operation as all topsoil must be harvested from all areas that will be disturbed for infrastructure development with no rehabilitation blocks being ready. The topsoil stockpile will be located to the west of the pit between the Softs Stockpile and the pit, with an extent of 1.4ha.

The establishment of a long-term topsoil stockpile area is proposed. In this area, stripped vegetation and topsoil from infrastructure footprint can be placed up to 1.2 meters thick and this can be protected against wind erosion by the installation of 750mm high wind nets at 5 meter spacing. The area must be hydro seeded with a local seed mixture @ 10 kg of pioneer seeds per ha during April to allow the soil to bind and recover and re-establish to a natural state that will protect it till it is finally re-used at the end of the mining contract to rehabilitate the infrastructure footprint.

The same process needs to be followed for the stripping and safekeeping of the topsoil of the first two mining blocks. This material will likewise be used in the rehabilitation of the very last mining blocks.


9.6.6.3. POST MINING BACKFILLING OF MINE BLOCKS

The proposed backfilling of the mined out mine blocks with de-watered slimes, tailings and overburden will render the new land form created approximately two meters below the average level of the current landscape. The in-situ placement and shaping of this land form will assist in re-creating a varied topography that is free draining and that can be rehabilitated. Placement of freshly harvested topsoil on the formed substrate will be the initial steps in the rehabilitation process. The mine path will largely ignore the subtle variations in the current topography. It is however important to retain the diversity of structure in the landscape that ranges from sand dunes to exposed calcrete that supports the diversity of plant and animal life. It is therefore proposed that the different substrates be harvested judiciously and that the placement will be done with skill under guidance of an expert in field of landscape scale rehabilitation in order to re-create a post mining environment very similar to the pre-mining condition. Allowance for final shaping or landscaping the topsoil (and calcrete in selected areas) is included in the cost estimate (Annexure C)

9.6.6.4. TEMPORARY WIND EROSION PREVENTION

The backfilling of the mine blocks will be a continuous operation. The de-watered slimes, tailings and overburden should be blended prior to placement and this will render it moist that should limit initial wind erosion. Once dry, this mixture will be very prone to wind erosion that will result in dust and unfavorable working conditions. Managing the erosion is most cost effective using custom nets that are 750 mm high and installed on metal droppers in rows no more than 5 meters apart, installed perpendicular to the prevailing summer winds. The nets will require continuous maintenance but this will extend the life span of the nets.

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Nets will only be required to be in position for one summer after the first seeding of the area and can then be removed for re-use in the newer rehabilitation blocks.

Short term and continuous dust suppression may also be required at in the area directly behind the mining operations. Wind nets, Brush packing and Dustex (Pine bark resin) can be used for this purpose. It will be extremely important to manage windblown sand and to prevent the form impacting on newly rehabilitated areas. This is particularly important, as mining will progress in a generally southern direction into the summer winds. It is expected that this will result in a substantial negative edge effect on any rehabilitation that is being conducted downwind unless addressed during the operations as part of due care and diligence.

9.6.6.5. ESTABLISHMENT OF VEGETATION

The vegetation as well as 300 mm of topsoil will be harvested ahead of the mine path. This material will be spread over the shaped and prepared mine block to be rehabilitated. Detail shaping of the topsoil will result in a more varied micro topography that will inurn support greater species richness than a homogeneously prepared surface. Wherever possible, topsoil stripping and placement should be restricted to the late summer months to limit damage to propagules. The presence of the organic matter and vegetation in the topsoil mix will limit wind erosion but provision has been made to address potential problems by netting and organic soil binders should the need arise.

A number of factors will influence the development of vegetation from the freshly placed topsoil. These include:


- The age and condition of the vegetation of the harvested material
- The soil seed bank
- Timing and care of harvesting and placement
- Topography of the rehabilitation areas

The majority of the vegetation on the proposed mine footprint has not been exposed to fire recently and it is unsure what the status of quick germinating pioneer species in the seed bank would be. It is thus recommended to collect selected seed from the surrounding areas and to overseed all areas prior to the winter to ensure the establishment of initial cover vegetation to act as nurse plants.

Evaluation of the species composition of the rehabilitated areas at the end of the first growing season will inform the augmentation of the species by means of direct relocations and the establishment of propagated plants during the following winter.


The synopsis below forms the basis of the rehabilitation approach:

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Rehabilitation technique	Timeframe and limitations
Backfilling of mine pit will be done as part of the mining operations. Provision for bulk shaping on a landscape scale must be allowed for as part of the operational cost. The resulting landscape will be undulating reminiscent of the current topography. Additional allowance is made here for landscaping the rehabilitation areas post placement of topsoil to recreate the diversity in habitat that is currently found in the mosaic of LDS & SLS alternating with areas of SFS	Backfilling to commence in month 34. This process is not season dependant. It is anticipated that the moisture levels in the backfill mix of soft's and slimes will to some extent limit wind erosion and workability or shaping of the substrate. Topsoil placement can only commence once area has stabilised. Topsoil harvesting and direct placement should not be done between mid April and end of September
Installation of wind nets on backfilled pit area to prevent wind erosion. Nets can be re-used for up to three years	Installation should be left until such time as 60% of the surface area has been covered by vegetation by mid winter
Search and rescue and direct relocation of suitable plant material to rehabilitation blocks	Mark geophytes in winter and relocate in summer. Relocate suitable whole plants in June
Seed collection and hydroseeding of processed seed during April and May of every year. Seed collection will focus on functional species to provide initial vegetation cover. Seed requirement is estimated at 10kg /ha	Seed collection methods and processing to follow guidelines in Chapter 7 http://www.vulaservices.com/ES/Download/THE SIS-Issue%2010.pdf
Plant propagation of species required to increase diversity including establishment. Allowance made for cluster planting of 1250 plants per ha representing all functional plant groups that do not express from topsoil regeneration or seeding	
Maintenance of rehabilitated areas for 2 years until established	Cover and diversification to be achieved if it failed to manifest after initial rehabilitation
Continues maintenance and management of rehabilitated areas until closure. Areas will increase over time but maintenance sill reduce	

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Monitoring, evaluation and reporting	Monitoring methods to measure cover, species richness and landscape functionality
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9.6.7. MAINTENANCE

Maintenance forms a vital part of the successful rehabilitation of post mining environments. The aim of the maintenance is to ensure that localised problems with die back and erosion are addressed early on to prevent large-scale degradation. The proposed management strategy is based on adaptive principals that will be informed by formal monitoring and evaluation as well as continuous informal observations throughout.

Provision has been made for the introduction of specific species and functional groups that may not developed form the topsoil or basic seeding.

9.6.8. MONITORING AND EVALUATION

Detail methods for the monitoring en evaluation protocols will be developed and it is proposed to use a combination of techniques that include the following:

- Establishment of baseline data relating to species composition and cover of all four vegetation types
- Development of soil moisture profiles typical of all four vegetation types
- Comparative evaluation of restored areas for a period of 5 years to assess species composition as well as soil moisture profiles
- Long term monitoring of soil moisture profiles upstream of the dewatered pit and downstream of the recharge trenches
- Long term monitoring of the species composition upstream of the dewatered pit and downstream of the recharge trenches


Information obtained from monitoring must be fed back into the fine scale rehabilitation planning in order to adjust for deficiencies or improvement of cost effectiveness of strategies employed.

9.6.9. ALIEN VEGETATION MANAGEMENT

The purpose of early commencement with the implementation of an alien vegetation control problem is to reduce long term cost and to reduce the source of potential infestation of rehabilitation areas.

The techniques and approaches for the control of woody alien vegetation are well established and is widely used in the surrounding area. Cutting of mature trees and chemical stump treatment (*Acacia cyclops* and *Eucalyptus spp*) is the primary practice. The removal of usable biomass is recommended to reduce the fuel loading. Follow up selective application of registered herbicides is the most cost effective method of controlling seedlings and this would need to be done for several years until the surrounding vegetation has sufficiently recovered to suppress large scale germination from the soil seed bank.

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Particular attention should be paid to areas that were exposed to fire as large scale germination can be expected from areas with large alien seed banks. Under these conditions, early initial and follow up control using herbicides is the best practice.

9.6.10. VEGETATION MANAGEMENT OF BALANCE OF PROPERTY

The development of detailed management plan for the property is proposed and this will address the provisions for alien vegetation control, managed ecological burns and the rehabilitation of degraded areas. The implementation of the alien vegetation control and management of ecological burns are provided for in Closure costing.

9.6.11. FIRE PREVENTION AND MANAGEMENT

Fire is an important ecological driver in the fynbos biome but can be destructive to indigenous vegetation if not done property. In order to ensure that the existing plant communities flourish on the unaffected portions of the site and to aid with rehabilitation a fire and alien invasive management plan will be implemented.

Fire and alien invasive plant management are two of the most important issues on the greater site. Alien vegetation is relatively easy to deal with, and requires only a well structured plan and the will and money to implement it. The alien density is fairly high in the main patches where it occurs (dune area), and because it covers up to 500ha of the greater site substantial budget will be required in order to control this into the future (there will be ongoing but gradually diminishing costs), and it is thus suggested that the applicants factor this into their financial plans upfront. A management budget capitalised to at least R4m is likely to be necessary, as initial clearing costs are in the order of R2000 – R8000/ha. The mining area itself will also be a very likely site for alien plant invasion (soil disturbance being a primary factor in determining alien invasion likelihood) and a significant budget will be needed to manage this in both the operational and rehabilitation phases of the project.


As fire is a much more difficult issue to deal with, but cannot simply be ignored, as it is an essential ecological element, but is difficult to control and potentially dangerous in terms of infrastructure.

Due to the location of the study area and the proposed after use of the land as an extension of the West Coast National Park complex, it is proposed to integrate the fire management of the area with that the strategy followed by the WCNP. Detail planning would be required to integrate the approach in collaboration with SANParks. Provisions have been made in the cost estimates to developed and implement the controlled burn strategy.

9.6.12. INFRASTRUCTURE REHABILITATION

- During the decommissioning phase all non-operational structures and associated infrastructure will be demolished and removed from site.
- All equipment not being utilised will be removed from site.

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- All concrete foundations and contaminated underlying soil will be handled in terms of the closure plan.
- On the removal of all buildings and related infrastructures, the surface will be rehabilitated to a pre-determined standard. A rehabilitation programme, as part of the closure plan, is to be implemented to ensure that the area is completely rehabilitated.
- The stormwater dam and all other water management structures will be rehabilitated in accordance with the water management strategy to be developed. The fence and access gate around the dam will remain and be adequately signposted
- The access roads will remain open to allow access for maintenance and inspections. Any roads that do not require usage will be ripped and vegetated.
- All the fences and access gates will remain and be adequately signposted.

The Mine Closure Plan will have to identify decommissioning strategies for the following mine infrastructure components:

- Softs Stockpile
- Open Pit
- Stormwater Dam
- Concentrator Plant
- Workshops / Offices / Stores / Salvage Yard
- Conveyor Belts
- Fencing
- Gravel Roads
- Rehabilitation of Open Surfaces


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10. IDENTIFIED KNOWLEDGE GAPS

One assumption made during the compilation of the Elandsfontein EIA/EMP Report, was that the project data, mining related data and data used for the project specific drawings (including design, layout and height of the structures) supplied by EEM, are assumed to be up to date and accurate and will remain unchanged for the duration of the EIA/EMP Phase. In addition, due to stakeholders responses to some of the alternatives identified during the scoping phase, changes have been made to the project description, specifically the preferred option which now excludes the Inland Port Facility and the concentrate pipeline.

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11. FINANCIAL PROVISION

11.1. CLOSURE COSTS

This section was compiled in terms of Section 39 (4) (a) (ii) of the Act, read together with Section 41(1). Refer to Appendix A and Figure 4-8 showing the infrastructure and the mining layout respectively. The mitigations, monitoring and reporting of the impacts have already been discussed in this document.

11.2. CALCULATION

The closure costs for Elandsfontein Mine were assessed using the “Guideline Document for the Evaluation of the Closure-related Financial Provision Provided by a Mine – April 2004”). A rules-based approach was used and related back to the surface area of the various components included in the closure costs. According to this calculation an amount of R54 million (excluding VAT) needs to be provided as guarantee.

11.3. CONFIRMATION OF THE AMOUNT THAT WILL BE PROVIDED SHOULD THE RIGHT BE GRANTED

Should the right be granted the necessary guarantees will be provided for the amount of **R 54 753 799.71** (excl. VAT) as calculated below. This closure liability will be reviewed and appropriately updated during the annual review of mine closure costs for EEM.

11.4. THE METHOD OF PROVIDING FINANCIAL PROVISION CONTEMPLATED IN REGULATION 53

The projected financial provision quantum will be provided as per regulation 53 requirements once the mining right has been granted.

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Table 11-1: Closure Cost Calculation

Template for "rules-based" approach of the quantum for financial provision CALCULATION OF THE QUANTUM						
Mine:	Elandsfontein Mine			Escalation (CPI):		
Evaluator:	Vula Environmental and Braaf Environmental			Terrain (Weighting factor1):	1 (Flat)	
Risk Class:	Medium			Proximity (Weighting factor 2):	1.05 Peri-urban	
Area of sensitivity:	High			Applicable Period:	Year 1	
Component No.	Main Description	Unit	Quantity	Escalated Rate	Weighting Factor 1	Cost
1	Dismantling of processing plant and related structures (including power-lines and access road)	m2	139250	R 25.00	1.00	R 3 481 250.00
2(A)	Demolition of steel buildings and structures	m³	2550	R 155.76	1.00	R 397 188.00
2(B)	Demolition of reinforced concrete buildings and structures	m³	2550	R 229.54	1.00	R 585 327.00
3	Rehabilitation of access roads	m2	96000	R 77.00	1.00	R 7 392 000.00
5	Demolition of housing and facilities	m2	5000	R 311.52	1.00	R 1 557 600.00
6	Opencast rehabilitation including final voids and ramps	ha	68	R 163 304.16	1.00	R 11 104 682.88
8(A)	Rehabilitation of overburden and spoils	ha	28.8	R 108 869.44	1.00	R 3 135 439.87
8(B)	Rehabilitation of processing waste deposits and evaporation ponds (basic, salt-producing waste)	ha	35	R 135 594.92	1.00	R 4 745 822.20
9	Rehabilitation of subsided areas	m³	0	R 0.00	1.00	R 0.00
10	General surface rehabilitation, including vegetating all denuded areas	ha	68.5	R 86 242.96	1.00	R 5 907 642.76
12	Fencing	m	14900	R 96.43	1.00	R 1 436 807.00
13	Water management (Separation clean and dirty water, managing polluted water and managing impact on groundwater, including treatment, when required)	ha	120	R 32 792.00	1.00	R 3 935 040.00
14	5 years of maintenance and aftercare	ha	431	R 25 000.00	1.00	R 10 775 000.00
15	Baseline Vegetation Study	SUM	1			
16	Monitoring and Evaluation (annual X 5 years)	SUM	5	R 240 000.00	4.00	R 300 000.00
Subtotal 1						R 54 753 799.71
		W.F.2			1.05	
	Preliminary and General	%			6.00%	R 3 449 489.38
Subtotal 2						R 58 203 289.09
Contingency as a percentage of Sub- Total 1					10.0%	R 5 820 328.91
Subtotal 3						R 64 023 618.00
VAT					14.0%	R 8 963 306.52
TOTAL						R 72 986 924.52

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12. UNDERTAKING TO COMPLY WITH THE PROVISION OF THE ACT

I _____ the undersigned and duly authorised by Elandsfontein Exploration and Mining (Pty) Ltd hereby undertake to give effect to every undertaking contained in Section 11 of this document, and accept full responsibility therefore.

Signed at _____ on this _____ day of _____.

Witnesses:

1. _____ 2. _____

Signature

Signature

Approved


Approved in terms of the provisions of the Minerals and Petroleum Resources Development Act (Act No. 28 of 2002) (MPRDA).

Signed at _____ on this _____ day of _____.

Director

Region: _____

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13. CONCLUSION

Braaf Environmental Practitioners has undertaken an EIA/EMP for the proposed Elandsfontein Phosphate Mine Project in accordance with the requirements of the MPRDA. To date this has provided for a public engagement process as required in terms of the MPRDA.

Extensive specialist input has been sought for all key environmental aspects.

To date, there are no serious flaws that have been identified for the proposed Project. However, certain impacts require careful mitigation and monitoring. The most significant of these are:


- Groundwater contamination;
- Archaeological /Paleontological impacts;
- Biodiversity impacts in terms of the location of infrastructures on and within sensitive habitats;
- Air quality impacts during construction phase; and
- Heritage impact in terms of archaeological material and fossils. .

Some impacts, such as Softs Stockpile and processing plant require mitigation to be built into the planning and design.

An environmental management plan has been developed as part of this EIA-EMP to ensure the mitigation of these impacts as well as others. It is anticipated that it will be possible to successfully mitigate the majority of the environmental impacts to acceptable levels and the implementation will be monitored and audited to determine its effectiveness.

EEM should, continue to examine its existing management measures for their entire operations and should put initiatives in place to reduce its contribution to the environmental conditions of the Elandsfontein Farm. The investigation by specialists into the potential impact of the mine on the existing environment has been avoided, mitigated, and managed where possible. However, certain impacts are unavoidable, (removal of indigenous vegetation, etc). For this reason it is imperative that the compensation approach be followed in conjunction with avoidance and abatement. This will entail a Biodiversity Offset Process, in which EEM is to purchase/donate land units with similar ecosystem services/status as the areas to be impacted on. It is likely that the existing mine area as well as the areas that the mine will be offset against will be donated to SANParks allowing the extension of the WCNP (which will include portions of the mine area, after rehabilitation). Currently, EEM has drafted a heritage agreement with SANParks and Heritage Western Cape whereby the fossil area on Portion 2 of the Farm 349 (Elandsfontein) will be donated to SANParks for conservation of the heritage resource.

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