EIA report:

AS-R-2014-07-02

Environmental Impact Assessment Report and Environmental Management Programme for the proposed Separation Plant on portion 6 of the farm Langeberg 188, Saldanha Bay Local Municipality

July 2014

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Draft for public comment

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Environmental Impact Assessment Report and Environmental Management Programme for the proposed Separation Plant on portion 6 of the farm Langeberg 188, Saldanha Bay Local Municipality

July 2014

Prepared for:

Frontier Separation (Pty) Ltd

Compiled by:

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Executive Summary

1. Background

Africa Geo-Environmental Services Gauteng (Pty) Ltd (AGES) was appointed by Frontier Separation (Pty) Ltd to facilitate the Environmental Impact Assessment (EIA) process for the proposed Separation Plant development on portion 6 of the farm Langeberg 188, Saldanha Bay Local Municipality (SBLM), Western Cape Province.

The EIA process to be undertaken in respect of the authorisation process for the proposed Separation Plant (SP) is in compliance with the National Environmental Management Act (NEMA) (Act 107 of 1998) read with the Environmental Impact Assessment Regulations of 2010 (Government Notice No's R543, 544, 545 and 546 of 2010). The proposed development involves 'listed activities', as identified in terms of the NEMA and in terms of section 24(1), which requires that environmental authorisation is obtained from the competent authority. The potential consequences for, or impacts on the environment of inter alia listed activities must be considered, investigated, assessed and reported on to the competent authority, except in respect of those activities that may commence without having to obtain an environmental authorisation in terms of the NEMA. This EIA Report serves to report on the potential impact on the environment due to the proposed plant development.

2. Project Description

Bulk mixed rare earth salts (MRES) from a rare earth mine site (currently the proposed Zandkopsdrift mine, EIA reference number: NC/EIA/NAM/KAM/ZAN/2012) is proposed to be transported by road to the Separation Plant (SP) for further processing. The proposed Separation Plant will incorporate the following processes: hydrochloric acid leaching and clarification, solvent extraction, precipitation, filtration/dewatering, drying/calcining; and product packaging. The SP is intended to produce 20,000 tonnes per annum (tpa) of refined rare earth products.

The saleable rare earth elements (REEs) will be separated either as rare earth oxides (REOs) or carbonates with a purity equal to or greater than 99%. The non-saleable or non-profitable elements will be precipitated as carbonates and then temporarily stored in a waste settling pond for 6 months prior to further disposal or possible future sales.

The site is located approximately 6 km south-east of Vredenburg, 9 km north-east of Saldanha and 10 km north of Langebaan within a proposed Industrial Corridor.

The general coordinates for the site are:

Latitude: -32˚57’9.62” S

Longitude 18˚4’14.6” E

A detailed project description is provided in Section 4.

3. Terms of Reference

According to GNR 543 of 2010 the following needs to be included in the EIA report:

Legal and Regulatory Requirement	Cross-reference
details of – (i) the EAP who compiled the report; and (ii) the expertise of the EAP to carry out an environmental impact assessment;	Section 1.4
a detailed description of the proposed activity;	Section 4
a description of the property on which the activity is to be undertaken and the location of the activity on the property;	Section 1.1; Figure 1-1 to Figure 1-4
a description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity;	Section 6
details of the public participation process conducted in terms of sub regulation (1), including – (i) steps undertaken in accordance with the plan of study; (ii) a list of persons, organisations and organs of state that were registered as interested and affected parties;	Section 3.2; Appendix A: Public Participation
a description of the need and desirability of the proposed activity and identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community;	Section 4.1.1
an indication of the methodology used in determining the significance of potential environmental impacts;	Section 7.4
a description and comparative assessment of all alternatives identified during the environmental impact assessment process;	Section 5
a summary of the findings and recommendations of any specialist report or report on a specialised process;	Section 7

a description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation;	Section 7
an assessment of each identified potentially significant impact, including – (i) cumulative impacts; (ii) the nature of the impact; (iii) the extent and duration of the impact; (iv) the probability of the impact occurring; (v) the degree to which the impact;	Section 7
a description of any assumptions, uncertainties and gaps in knowledge;	Section 3.4
an opinion as to whether the activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	Section 10
an environmental impact statement which contains – (i) a summary of the key findings of the environmental impact assessment; and (ii) a comparative assessment of the positive and negative implications of the proposed activity and identified alternatives;	Section 7.10
a draft environmental management plan that complies with regulation 34;	Section 8
copies of any specialist reports and reports on specialised processes complying with regulation 33 and;	Appendix G to Q
any specific information that may be required by the competent authority.	See table below

According to Scoping approval received in the 12th of March 2014 the following needs to be included in the EIA report:

DEADP EIA Requirement	Cross-reference
Need and Desirability of the proposed development	Section 4.1.1
Signed service confirmation letter from local authority/ESKOM confirming sufficient spare unallocated capacity to service the proposed development	Appendix R: Service Agreement Documentation (water supply, waste, sewage)
Detailed Project Description and Site Layout Plan	Section 4; Appendix C1: Proposed layout of the plant

Detailed information with regard to the disposal of waste	Table 4-3
Alternatives	Section 5
Proof of submission of Water Use Licence Application (WULA) to the Department of Water Affairs	To be included with Final EIA Report
Independent review of the specialist assessment reports to be conducted by AGES.	Appendix H: Hydrogeological Study and Appendix O 2: Archaeological Impact Assessment
Specialist and Environmental Assessment Practitioner (EAP) Declarations.	Appendix F: Applicant and Environmental Assessment Practitioner (EAP) Declarations, Specialist Declarations are attached in Appendix G to Q **Please note** that the Terms of Reference for each specialist study are included in the respective reports. The EAP Terms of Reference is included in Section 3 below.
Required information in terms of Regulation 31 (2) of the NEMA EIA Amendment Regulations 2010.	Refer to table above.
Environmental Management Programme (EMP)	Section 8
Public Participation Process to be followed in the EIA Phase	Section 3.3; Appendix A 6: Comments and Response Report
The applicable guidelines developed by the Department must be taken into account	Sections 3.2, 3.3.1, and 4.1.1
How does the proposed development comply with the principles contained in Section 2 of the NEMA and how does the proposed development meet the requirements of sustainable development	Sections 3.2, 7, and 8

4. Environmental Impact Assessment and Public Participation Process

An Environmental Impact Assessment (EIA) is an essential planning tool for any development. It identifies the environmental impacts of a proposed project and assists in ensuring that a project will be environmentally acceptable and integrated into the surrounding environment in a sustainable way.

The key issues listed in the following section have been determined through the following avenues:

- Views of interested and affected parties;
- Authorities (DEADP additional requirements as per acceptance letter in Appendix B 1: Correspondence from DEADP
- Legislation; and
- Professional understanding of the project team, environmental assessment practitioners and specialist consultants.

Assessing the comments/concerns received during the public participation process, the DEADP review of the scoping report, applicable legislation and the input from the specialist team, it is evident that the key aspects are:

- Biodiversity impacts
  - Negative impacts on naturally occurring fauna and flora
  - Rehabilitation of disturbed areas according to best practice
- Palaeontology and archaeology
  - Need for palaeontological and archaeological surface surveys prior to any earth moving activities
  - Availability of previously conducted archaeological and palaeontological reports
  - Provision for monitoring of subsurface activity
  - Rescuing of fossil material during excavations
  - Requirement for a Heritage Impact Assessment
  - Fossil finds to be reported
- Air Quality Impacts
  - Air Pollution originating from the plant
  - The requirement for an Atmospheric Emissions Licence
  - Dust Pollution
- Soil pollution

- Noise Pollution
- Traffic Impacts
  - Increased heavy traffic impacting on the existing road infrastructure during the construction and operational phases
- Groundwater and surface water pollution and management
  - Impact on water users in the area
  - Pollution/contamination of groundwater resources
  - Lowering of the groundwater table due to abstraction of water
  - Poor storm water management that could lead to pollution of Saldanha Bay
  - Groundwater monitoring for water levels and seepage of salts
  - Water recycling
- Visual Impact
  - Requirement for a Visual Impact Assessment
- Material handling, storage and transportation
  - Usage and storage of hazardous chemicals
  - Management and disposal of solid and liquid waste
  - Processing and storage of Rare Earths
  - Development of contingence plan for transportation of residue to disposal facility
- Socio-Economic Impacts
  - Economic upliftment relating to local job creation and employment
  - Land use impacts
  - Impacts on farming of livestock, grain and bee keeping.
  - Safety and Security
  - Supply of building material
- Health Impacts
- Economic impacts related to:
  - Rare Earth Element supply and exporting
  - Rare Earth Element wastes and recovery of these wastes if possible
  - Separation of Rare Earths and resulting products
  - Beneficiation of South Africa’s natural resources, including establishing downstream electronics industries in South Africa

- Waste impacts
    - Handling and testing of sludge
    - Lining of waste settling dams/evaporation ponds
    - Capacity of waste disposal facility
    - Storage of hazardous waste
    - Disposal of hazardous waste
    - Disposal on unused products
    - Storage of raw materials
    - Disposal of waste to a disposal facility such as Vissershok
    - Disposal of non-process waste

5. Specialist Studies

As a result of the above-mentioned key aspects, the following specialist studies were undertaken during the EIA phase of the project:

- Air Quality Impact Assessment;
- Surface And Groundwater Impact Assessment;
- Stormwater Management;
- Archaeological Impact Assessment;
- Health Impact Assessment;
- Social Impact Assessment;
- Economic Impact Assessment;
- Noise Assessment;
- Visual Impact Assessment;
- Heritage Impact Assessment;
- Ecological Assessment;
- Palaeontological Impact Assessment;
- MHI Screening Assessment; and

- Traffic Impact Assessment.

Various studies have also been undertaken to either guide engineering designs or give feedback on the baseline environment or as part of planning for the development (operational plans):

- Storm Water Management Plan;
- Engineering Geotechnical Investigation; and
- Major Hazard Installation Screening Assessment.

6. Alternatives

In the case of the proposed development, possible alternatives were identified through discussions with authorities, discussions with Interested and Affected Parties (I&APs), reviewing of existing environmental data, specialist inputs/studies and the Applicant. Prior to the EIA application a Preliminary Environmental Assessment was undertaken in order to assess two different site alternatives. The study identified two possible sites for the proposed plant within the Saldanha Local Municipality from which Alternative Site 1 is considered to be the preferred alternative. This alternative site on Portion 6 of the farm Langeberg 188 was therefore taken further into the EIA process as the preferred alternative site.

Various technology alternatives were identified and assessed. These relate to the following aspects:

- Process Water Treatment Alternatives;
- Brine Disposal Alternatives;
- Mixed Rare Earth Carbonate Waste Disposal Alternatives; and
- Boiler Fuel Alternatives.

Two alternative access roads were also considered. The project was also evaluated against the no-go alternative in which case no development will be constructed.

Possible project impacts identified during the EIA process and specialist studies have been fed back to the project engineers. These impacts have been, together with the rest of the project team taken into consideration in developing the alternatives as discussed above. These design alternatives have reduced possible impacts. The impacts in Section 7 of this report have been rated on the best possible design alternatives chosen for the project.

7. Baseline Description

Geology - According to the available geological information, calcrete occur on the site to a depth of 8 metres. The calcrete does not form a layer that can be recognised as a uniform geology with a specific thickness. The presence of the calcrete is rather in blocks and boulders mixed with wind-blown sandy layers of different thickness and different limestone content. Sand and clay with an expected thickness of 40 to 50 m follows. The sand and clay layers may contain gravel fine and very fine sands alternated with clay lenses. A sandy layer consisting of black sand that may be peat is expected to be below the sand and clay layer before the Vredenburg Granite is to be found at an expected depth of 50 to 60 m.

Climate - Saldanha has a Mediterranean climate with highest temperatures occurring from December to March and the lowest between June and August. Saldanha Bay falls within a winter rainfall region and receives most of its rain during June and July. The rainfall data collected over a period of 116 years (1891 to 2007) shows that Saldanha has a Mean Annual Precipitation (MAP) of 325 mm/annum. The wind field (modelled by Airshed Planning Professionals) is fairly uniform with frequent southerly winds and occasional winds from the north. During the day the wind field is mostly characterised by wind from the south-west and south-southwest with 6.1% calm conditions. Wind speed decreases during the night, increasing the occurrence of calm conditions to 6.7%. The highest wind speeds (more than 6 m/s) occur during summer time and are mostly from the south south-east.

Topography and Drainage - The study area is situated between 27-29 meters above mean sea level (mamsl) within the Langebaanweg palaeo-embayment and is located on top of Langebaan Formation aeolianite and calcrete. The contours illustrate that the study area is relatively flat and slopes gently to the south, with subdued aeolianite ridges in places.

Ground and surface water – The Saldanha region is located in Water Management area number 19 (the Berg). The entire Saldanha region and the SP Site are located in quaternary drainage region G10M. No drainage lines occur on or adjacent to the site.

The SP site is located on the Langebaan Road Aquifer System (LRAS) which extend towards Vredenburg in the North-west, Velddrif in the north and Hopefield in the east.

Based on information collected during the hydro-census and the Aquifer Classification according to the Aquifer Classification of South Africa map, DWA, August 2012, the aquifer system in the study area can be classified as a “Non-Aquifer System”. The aquifer may be yielding in the order of 1 to 5 ℓ/s per borehole, but the classification is due to the very high salt loads in the water which render the water unacceptable. The water quality analyses of the water samples from the eight groundwater monitoring boreholes confirm the high sodium, magnesium, chloride, EC and TDS values. The vulnerability according to the Aquifer Vulnerability of South Africa map, DWA, August 2012, is classified as low.

Water level depths on the proposed SP site are currently between 2.7 and 4.1 m below ground level. The water level depth on the northern side of the site is in the order of 4.1 metres below surface. On the southern side of the site the water level depth is in the order of 2.7 metres below ground level.

Wetlands - A survey by ecologist Nick Helme did not find any evidence of seasonal or permanent wetlands on the proposed plant site.

Natural Vegetation (Flora) - The study area lies within the Fynbos biome and the Cape Floristic Region (CFR). The study area falls within the planning domain of the Saldanha Fine Scale Conservation Plan (Pence 2008). This important reference indicates that there are no terrestrial or aquatic Critical Biodiversity Areas (CBAs) found in the study area, nor immediately adjacent. The entire study area has been previously cultivated and has a low botanical conservation value at a regional scale. This is due to the disturbed nature of the soils in this area, the low plant diversity, and the lack of any plant Species of Conservation Concern. None of this area is a designated Critical Biodiversity Area (CBA). It was concluded that conservation of this area in its current condition would contribute very little to either species or ecological process targets for the region.

Animal Life (Fauna) - The cultivated nature of the primary development area, and the associated loss of natural vegetation and habitat, means that the faunal diversity is much reduced in this area relative to intact, natural veld. The avifauna is currently fairly typical of the agricultural landscape in this region, and two Species of Conservation Concern (SCC) have been recorded foraging in the vicinity of the study area, with another three passing overhead. The avian SCC recorded foraging in the area are Black Harrier and Blue Crane, whilst Great White Pelican, Lesser Flamingo and Greater Flamingo have been observed flying nearby, presumably to and from the Langebaan Lagoon (to the south) and the Berg River estuary (to the north), both critically important wetlands on a national scale.

A few mammal and reptile Species of Conservation Concern could potentially occur on site, but is more likely to be found in the Medium conservation value areas of natural vegetation to the west of the site. The region supports large populations of Angulate Tortoise, and at least three tortoises were seen in the study area and nearby during the site visit.

Air quality – Ambient air quality is currently measured at various locations in the Saldanha Bay area. These include stations owned by the Transnet Saldanha Port Terminal at Blouwater Bay and Vredenburg, a station at the Saldanha Steel Works of ArcelorMittal, a station at Tronox Namakwa Sands as well as a station at Vredenburg owned by the Provincial Government of the Western Cape. Available ambient monitoring data indicate elevated PM10 concentrations in the immediate vicinity of existing industries in exceedence of NAAQS. Ambient PM10 levels at residential areas (Blouwater Bay and Vredenburg) are however low and compliant with NAAQS. Ambient NO2 and SO2 concentrations are within NAAQS.

Heritage – During a recent archaeological assessment, no archaeological sites were identified on site. No Stone Age remains were observed on site but surface calcrete occurrences were observed in the area. No Iron Age farmer, Historical / Colonial Period and recent times or grave sites where found during the survey. A desktop palaeontological assessment indicated that beneath a thin cover of sand, the project site is underlain by calcareous aeolianites (old dune sands) and calcretes ("surface limestones") of the Langebaan Formation. These strata do not appear to be very fossiliferous, but the fossils that have been found are of profound scientific value. The Langebaan Formation aeolianites have been a prime source of information on Quaternary faunas and archaeology. Notably, some fossil finds have been made in the nearby area.

Noise - The proposed Separation Plant will be located in a district where the character and levels of ambient noise are already affected by urbanisation, industrialisation and other economic activities. Except for zones in the immediate proximity of roads and industrial complexes, typical ambient levels to be expected in an area of this nature would be in the order of 50 dBA (daytime) and 40 dBA (night-time), respectively. Noise monitoring of three residences in close proximity to the separation plant confirmed night-time ambient noise levels of 41 to 44 dBA.

Environmental impact prediction and evaluation

Risks and key impacts were evaluated in consultation with the interested and affected parties, and based on specialist studies conducted. Mitigation measures were proposed in order to reduce or eliminate impacts identified. The significance of an identified impact was rated by taking into account its duration, scale, severity (magnitude) and the probability that the impact may occur.

Below is a summary of the potential environmental impacts associated with the pre-construction and construction phases.

Impact	Significance	
	WOM	WM
Ecology		
Loss of the partly natural vegetation	Low	Low
Impact on fauna: Road kill along access road; displacement; loss of foraging areas	Low	Low
Hydrogeological		
Contamination of surface water with reagents such as acids during the testing phase and filling of storage facilities	Negligible	Negligible
During the final stages of the construction of the plant, filling the storage and testing of all systems may contribute to a contamination risk	Low	Negligible
Spillages and leakages from oil and diesel used during construction activities	Moderate	Low
Groundwater contamination due to spillages from portable sanitation units	Negligible	Negligible
Foundation structures may be impacted on negatively	Negligible	Negligible
On site storm water containment and management	Negligible	Negligible
An open coal yard without proper flooring may lead to groundwater contamination	Negligible	Negligible
A fluctuating perched water table may have a negative corrosive influence on the stability and life of foundations	Low	Negligible
Heritage		
Impact on heritage resources	Low	Low
Palaeontology		
Loss of palaeontological (fossil) materials / Finding and recovery of fossil material	Low	Low +
Social		
Job creation	High +	High +
Secondary job creation	Moderate +	High +
Conflict about jobs and benefits	Moderate	Low
Spread of infectious diseases such as HIV and TB	High	Moderate
Spread of HIV along transportation routes	High	Moderate

Pressure on existing health services	Moderate	Low
Specific impacts of vulnerable women in surrounding communities	Moderate	Low
Local tension and violence	Moderate	Negligible
Availability of resources (housing)	Moderate	Low
Unrealistic expectations of local communities (pre-construction)	High	Moderate
Unrealistic expectations of local communities (construction)	High	Low
Liveability of the social environment	Low	Negligible
Visual		
Visual impact of development on surrounding landscape	Moderate	Low
Noise		
Noise disturbance and nuisance	Negligible	Negligible
Traffic		
Increased traffic flow on the surrounding roads	Low	Low
Economic		
Temporary increase in trade deficit	Low	Low
Temporary increase in production in the area	High +	High +
Temporary increase in country's GDP-R	High +	High +
Creation of employment opportunities	High +	High +
Temporary increase in household income	High +	High +
Skills development during construction	Low+	Moderate +
Increase on government revenue	High +	High +
Sterilisation of agricultural land	Moderate	Moderate

A summary of the potential environmental impacts associated with the operational and decommissioning phases can be found below.

Impact	Significance	
	WOM	WM
Ecology		
Loss of ecological connectivity; habitat fragmentation; facilitated spread of alien invasive vegetation	Low	Low
Impact on fauna: Road kill along access road; displacement; loss of foraging areas	Low	Low
Hydrogeological		
Contamination of groundwater from reagents such as acids and kerosene during the normal activities at the plant with filling of the storage facilities and the plant tanks. Contamination around the foundations of the buildings will jeopardize the integrity of the building foundations	Low	Negligible
The planned solid waste settling ponds will provide onsite waste storage for up to six months and will contain insoluble solids of the SP concentrate feed and mixed rare earth carbonates of Ho/Er/Tm/Yb/Lu. Groundwater quality may be at risk if leakage does occur	Moderate	Low
Groundwater quality may be at risk if leakage does occur	Low	Negligible
Potential leakages and spillages (brine)	Moderate	Low
Potential leakages and spillages (organic waste)	Low	Negligible
Ground water quality impact. Perched water table (storm water storage pond)	Low	Negligible
Ground water quality impact. Perched water table (storage of process water)	Low	Negligible
Ground water quality impact (diesel storage)	Low	Negligible
Ground water quality impact (storage of coal and coal dust)	Negligible	Negligible
Ground water quality impact (sewerage tank)	Negligible	Negligible
Air Quality		
Deterioration in air quality due to pollutants from all activities	N/A	Negligible
Deterioration in air quality due to pollutants from the handling of materials	Negligible	N/A
Deterioration in air quality due to vehicular emissions	Negligible	N/A

Deterioration in air quality due to wind erosion	-	-
Deterioration in air quality due to process emissions	N/A	Negligible
Social		
Job creation	High +	High +
Secondary job creation	High +	High +
Conflict about jobs and benefits	Moderate	Low
Spread of infectious diseases such as HIV and TB	High	Moderate
Spread of HIV along transportation routes	Moderate	Low
Pressure on existing health services	Moderate	Negligible
Specific impacts of vulnerable women in surrounding communities	High	Moderate
Local tension and violence	Moderate	Low
Availability of resources (housing)	Low	Low
Unrealistic expectations of local communities	Moderate	Low
Liveability of the social environment	Moderate	Low
Health		
Impact from criteria pollutants	Low	Negligible
Impact from airborne REE	Negligible	Negligible
Impact from process chemical vapour	Negligible	Negligible
Visual		
Visual impact of development on surrounding landscape	Moderate	Low
Noise		
Noise disturbance and nuisance	Negligible	Negligible

Traffic		
Increased traffic flow on the surrounding roads	Low	Low
Economic		
Increase in production during operations	High +	High +
Increase in GDP-R during operations	High +	High +
Creation of sustainable employment opportunities	High +	High +
Increase in household income during operations	High +	High +
Development of skills during operations	Moderate +	High +
Increase of government revenue	Moderate +	Moderate +
Stimulation of the economy and job creation	Low +	Low +

By implementing the mitigation measures described in the Environmental Management Plan (Section 8), **most of the negative impacts will be mitigated to be of negligible or low significance** and most of the positive impacts will be enhanced to be of moderate to high significance. All the impacts which were rated as of high significance following mitigation are positive impacts.

The following **negative impacts of moderate significance** following mitigation were identified:

- Social Impacts:
    - Spread of infectious diseases such as HIV and TB
    - Spread of HIV along transportation routes
    - Specific impacts of vulnerable women in surrounding communities
    - Unrealistic expectation of local communities
- Economic Impacts
    - Sterilisation of agricultural land

No negative impacts of high significance after mitigation were identified.

The following **positive impacts** of **high or moderate significance** after mitigation are expected for the development:

- Social Impacts
  - Job creation
  - Secondary job creation
- Economic Impacts
  - Temporary increase in production in the area
  - Temporary increase in the country's GDP-R
  - Creation of employment opportunities
  - Temporary increase in household income
  - Skills development during construction
  - Increase in government revenue
  - Increase in production during operations
  - Increase in GDP-R during operations
  - Creation of sustainable employment opportunities
  - Increase in household income during operations
  - Development of skills during operations
  - Impact on government revenue

8. Conclusions & Recommendations

The findings of the specialist studies undertaken during this EIA provide an assessment of both the benefits and potential negative impacts anticipated as a result of the proposed project. The findings conclude that provided that the recommended mitigation and management measures are implemented there are no environmental disqualifying factors that should prevent the proposed project from proceeding. In order to achieve appropriate environmental management standards and ensure that the findings of the environmental studies are implemented through practical measures, the mitigation measures detailed in the specialist studies have been captured in Section 8.

This EMP will form part of the contract with the contractors appointed to construct and maintain the proposed plant and associated infrastructure. The EMP would be used to ensure compliance with environmental specifications and management measures. The implementation of this EMP for key cycle phases (i.e. construction and operation) of the proposed project is considered to be fundamental in achieving the appropriate environmental management standards as detailed for this project.

LIST OF ABBREVIATIONS

Abbreviation	Description
ACRM	Agency for Cultural Resource Management
AEL	Atmospheric Emission Licence
BCC	Behaviour Change Communication
CAH	Chlor-Alkali Holdings
CAPEX	Capital Expenditure
CAPF	Chlor Alkali Production Facility
CBA	Critical Biodiversity Area
CBO	Community-Based Organisations
CFR	Cape Floristic Region
CREW	Custodians of Rare and Endangered Wildflowers
DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism
DC CVES	Direct Current Continuous Vertical Electrical Soundings
DM	District Municipality
DPM	Diesel Particulate Matter
DWA	Department of Water Affairs
EAP	Environmental Assessment Practitioner
EC	Electrical Conductivity
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMP	Environmental Management Plan
ESA	Early Stone Age
FTE	Full-time equivalent
GDP	Gross Domestic Product
GDP-R	Gross Domestic Products per Region
HDPE	High Density Polyethylene
HRT	High Rate Thickener
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
IDZ	Industrial Development Zone
IWUL	Integrated Water Use Licence
IWULA	Integrated Water Use Licence Application
LOS	Levels-Of-Service
LPG	Liquid Petroleum Gas
LM	Local Municipality

LRAS	Langebaan Road Aquifer System
LSA	Later Stone Age
MAMSL	Meters Above Mean Sea Level
MAP	Mean Annual Precipitation
MHI	Major Hazard Installation
MRES	Mixed Rare Earth Salt
MSA	Middle Stone Age
NAAQS	National Ambient Air Quality Standards
NEMA	National Environmental Management Act (Act 107 of 1998)
NEMAQA	National Environmental Management: Air Quality Act (Act 39 of 2004)
NEMWA	National Environmental Management: Waste Act (Act 59 of 2008)
NGO	Non-Governmental Organisations
NWA	National Water Act (Act 36 of 1998)
OPEX	Operational Expenditure
PGWC	Provincial Government of the Western Cape
RAG	Road Access Guidelines
REEs	Rare Earth Elements
REO	Rare Earth Oxides
RO	Reverse Osmosis
SAHRA	South African Heritage Resource Agency
SANS	South African National Standards
SBLM	Saldanha Bay Local Municipality
SDF	Spatial Development Framework
SEZ	Special Economic Zones
SCC	Species of Conservation Concern
SIA	Social Impact Assessment
SRMOP	Saldanha Regional Marine Outfall Project
SSD	Shoulder Sight Distance
SP	Separation Plant
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
US EPA	United States Environmental Protection Agency
WCDM	West Coast District Municipality
WM	With Mitigation
WML	Waste Management Licence
WOM	Without Mitigation
WWTW	Waste Water Treatment Works
DEADP	Western Cape Department of Environmental Affairs and Development Planning

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1 INTRODUCTION

Africa Geo-Environmental Services Gauteng (Pty) Ltd (AGES) was appointed by Frontier Separation to facilitate the Environmental Impact Assessment (EIA) process for the proposed Rare Earths Separation Plant development on portion 6 of the farm Langeberg 188 (Figure 1-1 to Figure 1-4), Saldanha Bay Local Municipality (SBLM), Western Cape Province.

The EIA process to be undertaken in respect of the authorisation process for the proposed Separation Plant (SP) is in compliance with the National Environmental Management Act (NEMA) (Act 107 of 1998) read with the Environmental Impact Assessment Regulations of 2010 (Government Notice No's R543, 544, 545 and 546 of 2010). The proposed development involves 'listed activities', as identified in terms of the NEMA and in terms of section 24(1), which requires that environmental authorisation is obtained from the competent authority. The potential consequences for, or impacts on the environment of inter alia listed activities must be considered, investigated, assessed and reported on to the competent authority, except in respect of those activities that may commence without having to obtain an environmental authorisation in terms of the NEMA. This EIA Report serves to report on the potential impact on the environment due to the proposed plant development.

Sedex Minerals (Pty) Ltd. (Sedex) a subsidiary of Frontier Rare Earths Ltd proposes to develop a rare earth element (REE) mining and mineral processing operation on portion 2 and the remainder of the farm Zandkopsdrift 537, located 30 km south of the town of Garies in the Northern Cape Province of South Africa. The proposed development includes an opencast mine, mineral processing plant, tailings storage facility and associated surface infrastructure, collectively termed the Zandkopsdrift Mine.

The Zandkopsdrift Mine will produce a Mixed Rare Earth Salt (MRES) with an equivalent of 10,000tpa Total Rare Earth Oxide (TREO) content. Sedex intends to double the capacity of the Zandkopsdrift Mine to produce a total equivalent of 20 000tpa of TREO through a Phase 2 expansion project as soon as possible following Phase 1 reaching full production.

Bulk MRES from the Zandkopsdrift Mine site is proposed to be transported by road or rail to the SP for further processing. The proposed SP will incorporate the following processes: hydrochloric acid leaching and clarification, solvent extraction, precipitation, filtration/dewatering, drying/calcining; and product packaging. The SP is intended to produce 20,000 tonnes per annum of highly purified rare earth oxides (REO) or their equivalents.

The saleable rare earth elements (REEs) will be separated either as rare earth oxides (REOs) or carbonates with a purity equal to or greater than 99%. The non-saleable or non-profitable elements will be precipitated as carbonates and then temporarily stored in a waste settling pond for 6 months prior to further disposal or possible future sales.

1.1 Regional Setting

The site is located approximately 6 km south-east of Vredenburg, 9 km north-east of Saldanha and 10 km north of Langebaan within a proposed Industrial Corridor. Refer to Figure 1-1 to Figure 1-4 for locality maps.

The general coordinates for the site are:

Latitude: -32˚57'9.62" S

Longitude 18˚4'14.6" E

1.2 Magisterial District and Municipality

The site falls within the jurisdiction of the SBLM and the West Coast District Municipality (WCDM) within the Western Cape Province.

1.3 Details of the applicant

The details of the applicant are listed below:

Details of the Applicant	
Full name of the applicant:	Frontier Separation (Pty) Ltd
Contact person:	Cyril Thomas
Telephone number:	021 4466040
Fax number:	021 4466050
Address:	PO Box 8399, Foreshore, Cape Town

1.4 Details of the Project Team

As per the requirements of Section 31 (2)(a) of the Environmental Impact Assessment Regulations of 2010 as promulgated under the National Environmental Management Act (Act No. 107 of 1998) (NEMA), as amended, the following information is required with regards to the Environmental Assessment Practitioners (EAP) that has conducted the EIA for the proposed development:

EAP	Qualifications	Years' experience
Dr. JC Vivier	PhD Environmental Management	10 years
Mr Herman Gildenhuys	BSc Hons Wildlife Management (Pr.Sci.Nat)	7 years
Ms Chantal Smith	BHCS Hons Archaeology	6 years

The EIA process was managed by Africa Geo-Environmental Services Gauteng (Pty) Ltd (AGES), an independent company.

Contact Details of Principal Environmental Assessment Practitioner:

Environmental Assessment Practitioner	
Company name:	Africa Geo-Environmental Services Gauteng (Pty) Ltd
Contact person: Address	Herman Gildenhuys Postnet Suite 74, P/Bag X07, Arcadia, 0007
Telephone number:	012 751 2160
Fax number:	086 607 2406

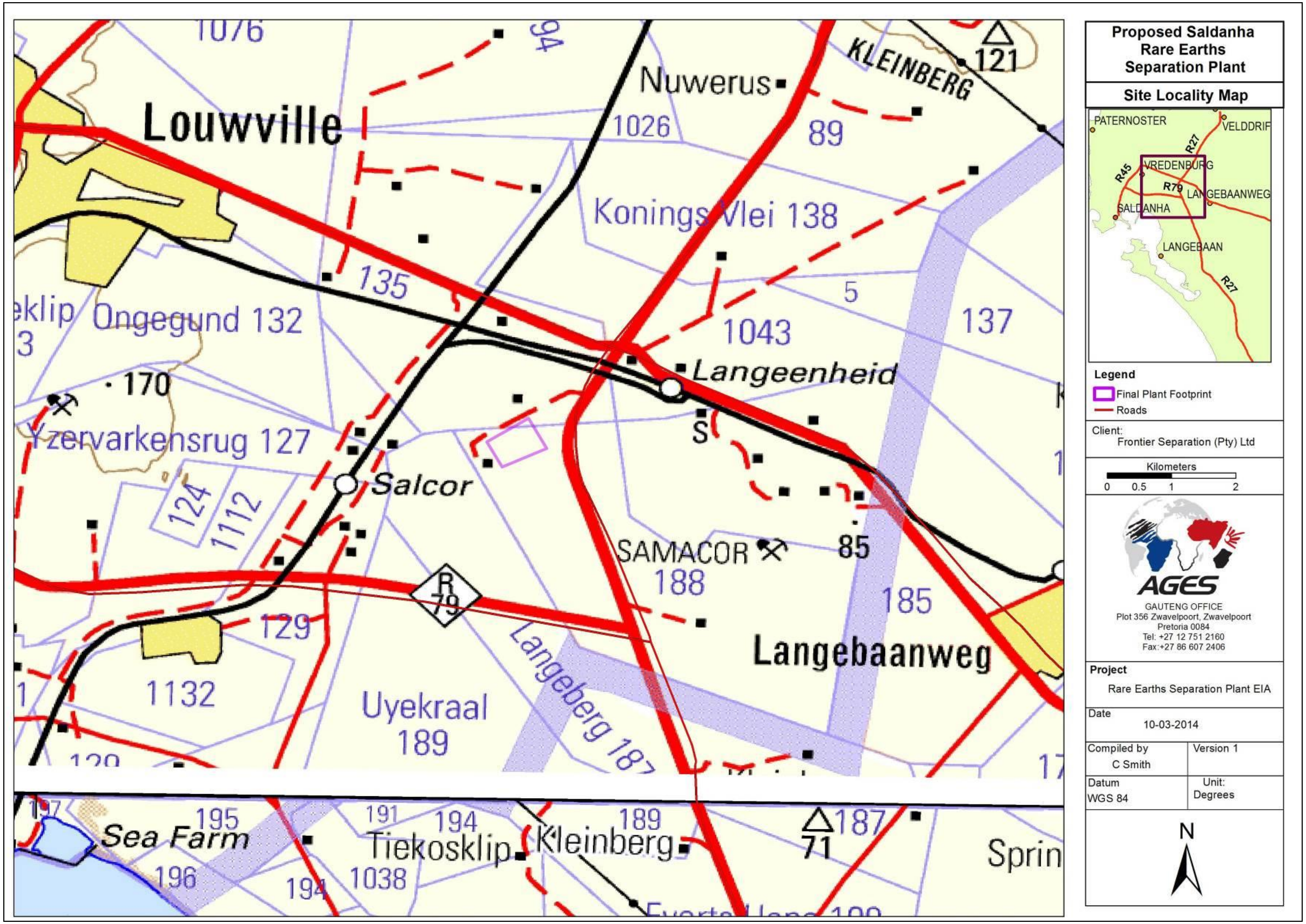
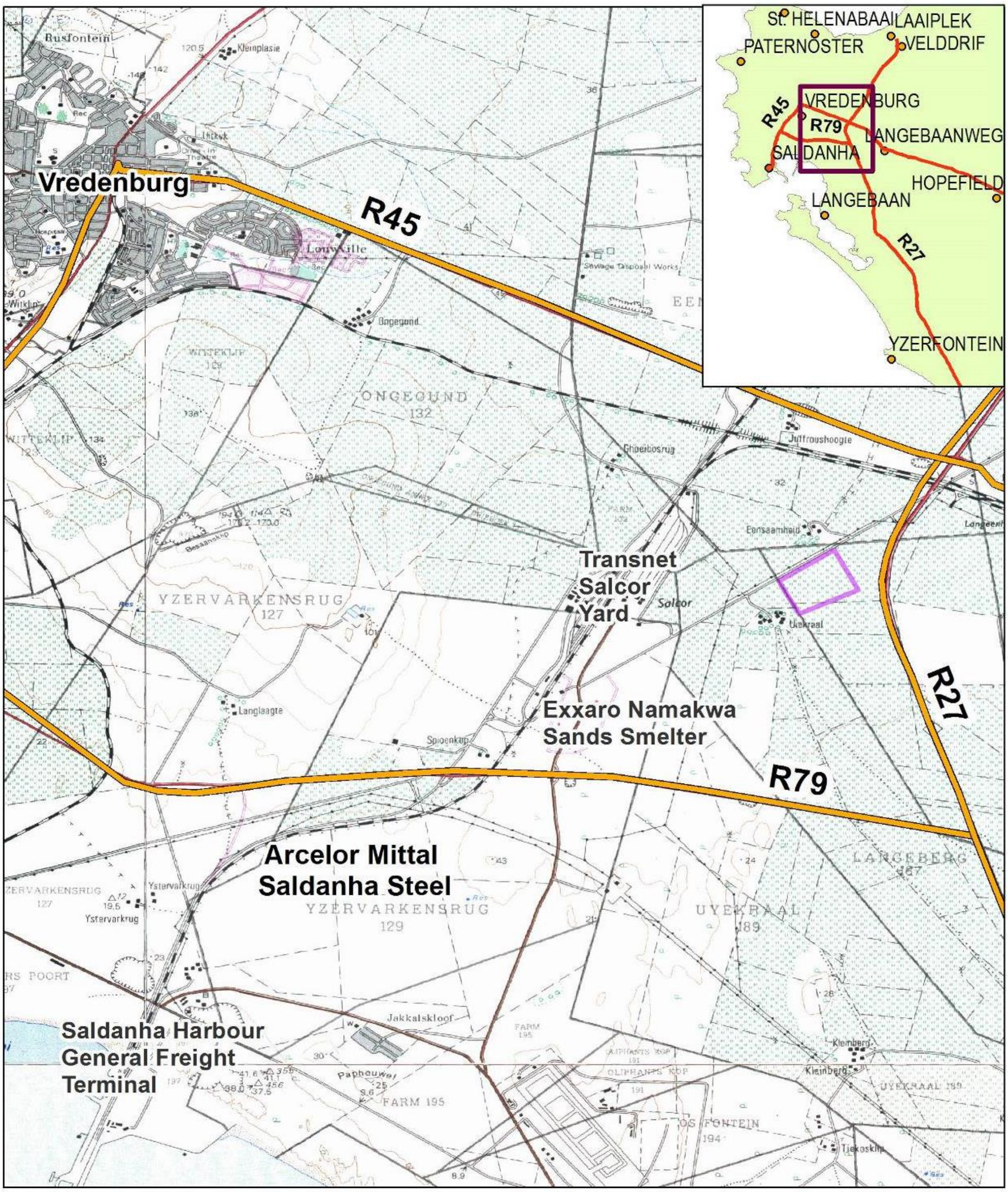


Figure 1-1 Regional Locality Map



Topographical Locality Map

Client
Frontier Seperation (Pty) Ltd

Project
Rare Earths Separation Plant EIA

0 600 1 200 2 400 Meters

Compiled by
C Smith

Version 1

Date
10-03-2014

Datum
WGS 84

Projection

N

Legend
Final Plant Footprint
Roads

AGES
GAUTENG OFFICE
Block E
The Village Office Park,
309 Glenwood Road
Faerie Glen, Pretoria 0081
Tel: +27 12 751 2160
Fax:+27 86 607 2406

Figure 1-2 Site Topographical Locality Map

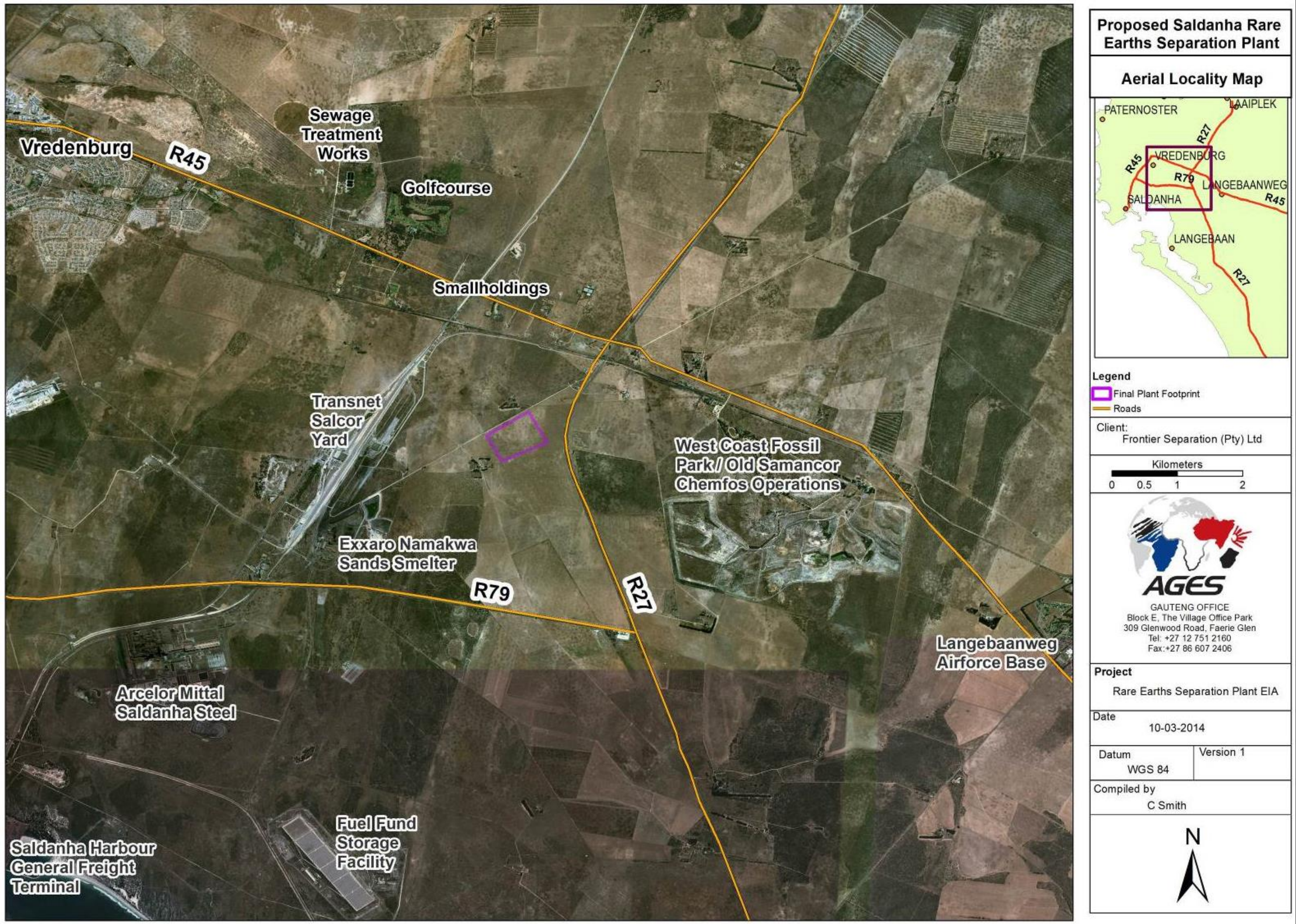


Figure 1-3 Aerial Locality Map 1

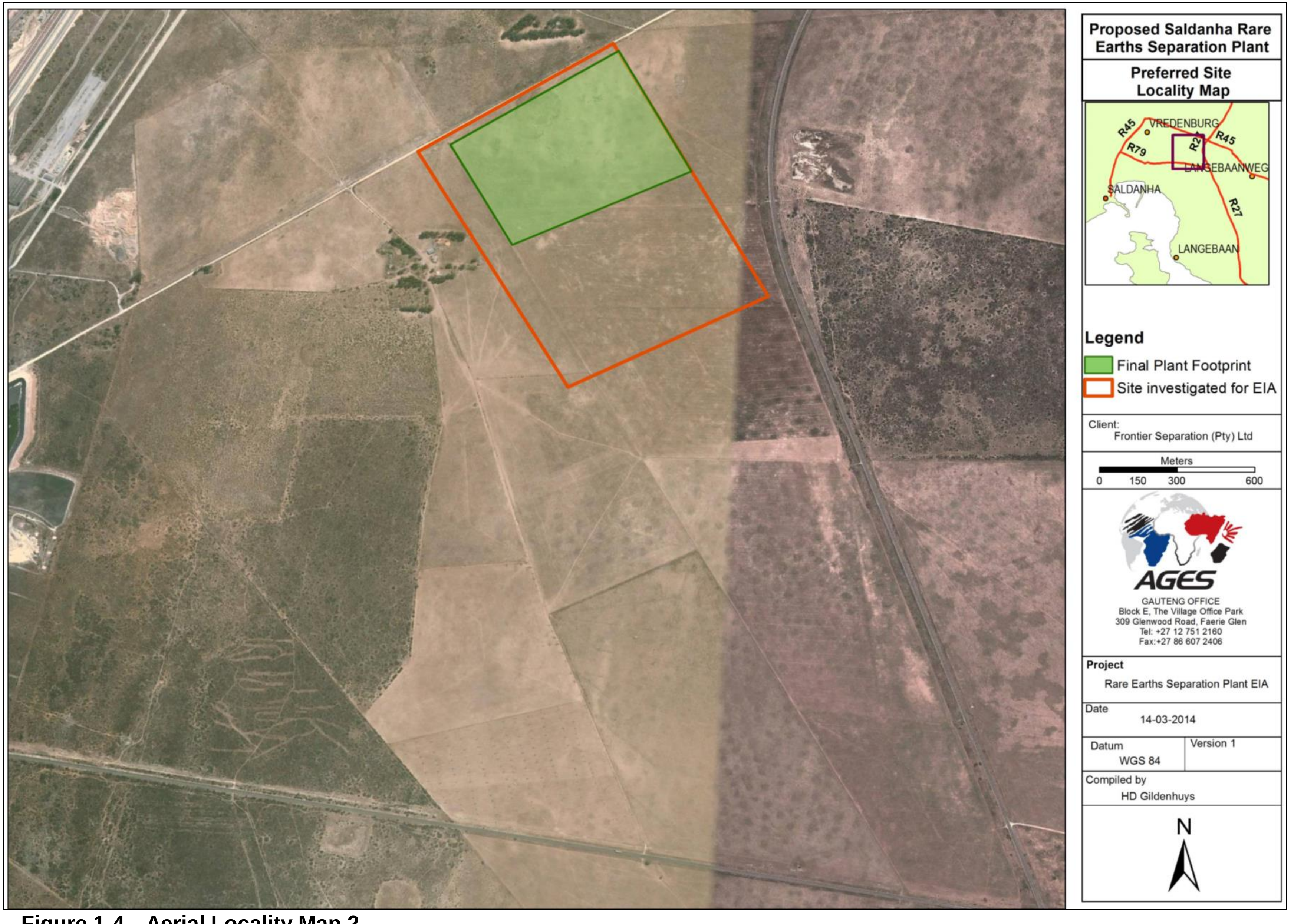


Figure 1-4 Aerial Locality Map 2

2 STATUTORY FRAMEWORK AND REQUIREMENTS

There are a number of regulatory requirements at local, provincial and national level to which the proposed development will have to conform during the development phase and acquisition of authorisations. A brief summary of the different Acts which are relevant to the project are outlined below.

The extensive description of the legislation applicable to the project has been included as Appendix D: Other Legislative Requirements. The list provided is not intended to be definitive or exhaustive and serves to highlight key environmental legislation and obligations only.

2.1 Legislation applicable to the project

2.1.1 The National Environmental Management Act (107 of 1998) (NEMA) and the Environmental Impact Assessment Regulations, 2010

The overarching principle of the National Environmental Management Act 1998 (Act 107 of 1998) (NEMA) is sustainable development. It defines sustainability as meaning the integration of social, economic and environmental factors into planning, implementation and decision making so as to ensure the development serves present and future generations.

The Environmental Impact Assessment (EIA) process to be undertaken in respect of the authorisation process of the proposed plant is in compliance with the NEMA read with the Environmental Impact Assessment Regulations of 2010 (Government Notice No's R543, 544, 545 and 546 of 2010). The proposed plant development involves 'listed activities', as identified in terms of the NEMA and in terms of section 24(1). The potential consequences for, or impacts on the environment of *inter alia* listed activities must be considered, investigated, assessed and reported on to the competent authority, except in respect of those activities that may commence without having to obtain an environmental authorisation in terms of the NEMA.

As stated above, an environmental authorisation application in terms of section 24 of the NEMA has been submitted to the Western Cape Department of Environmental Affairs and Development Planning (DEADP) for consideration. The following activities as listed in GNR 544, 545 and 546 of 2010 were identified as applicable to the proposed plant operations (Table 2-1).

Table 2-1 Identification of Listed activities triggered under the 2010 EIA Regulations

Government Notice Activity No(s):	Describe the relevant Activity(ies)	The portion of the development as per the project description that relates to the applicable listed activity
GNR 545		
3	The construction of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres.	Combined capacity of the dangerous goods stored will exceed 500 cubic meters. For a list of chemicals to be used in the process refer to Section 4.2.10
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 that Act will apply.	Sub-categories 1.3, 4.1 and 5.1 of the NEM:AQA Listed Activities and Minimum National Emission Standards published on the 22nd of November 2013 (Government Gazette No. 37054). Section 21(g) water use licence application for the waste settling pond.
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; i. except where such physical alteration takes place for linear development activities; or ii. agriculture or afforestation where activity 16 in this Schedule will apply.	Footprint of the Separation Plant will be approximately 31 hectares.
26	Commencing of an activity, which requires an atmospheric emission licence in terms of section 21 of the National Environmental Management Air Quality Act (Act no 39 of 2004), except where such commencement requires basic assessment in terms of Notice No. R 544 of 2010	Sub-categories 1.3, 4.1 and 5.1 of the NEM:AQA Listed Activities and Minimum National Emission Standards published on the 22nd of November 2013 (Government Gazette No. 37054).
GNR 546		
2	The construction of reservoirs for bulk water supply with a capacity of more than 250 cubic metres.	The water reservoirs will have the following capacities: - Fire water storage tank: 450 m^3 - Potable water storage tank: 3150 m^3
4	The construction of a road wider than 4 metres with a reserve less than 13,5 metres	Plant roads proposed will be wider than 4 m

The treatment of effluent, wastewater or sewage was not listed according to GNR 544, 545 and 546 of 2010 when the EIA Application Form was submitted to the DEADP on the 26th of February 2013. Such treatment was regulated by the National Environmental Management Waste Act (GNR 718 of 3 July 2009). The EIA Listed Activities was however amended by GNR 922 and GNR 923 of 29 November 2013 and now the construction of such facilities does require authorization according to GNR 544 and GNR 545 of 2010 (and not GNR 718 of 3 July 2009).

Important to note however is that treatment facilities are only listed once they reach a daily throughput capacity of more than 2000 cubic metres (according to listed activity 55A of GNR 544) and a daily throughput capacity of 15 000 cubic metres and more (according to listed activity 27 of GNR 545). The proposed Separation Plant will treat 1800 cubic metres per day. This is below the threshold for GNR 544 and GNR 545, and the construction of such facilities is therefore not listed.

2.1.2 National Water Act (Act No 36 of 1998) (NWA)

In terms of the National Water Act (NWA) all water uses listed according to Section 21 of the Act require a water use license. A person may only use water without a water use license under certain circumstances. A person may only use water without a license if such water use is permissible under Schedule 1 (generally domestic type use), if that water use constitutes a continuation of an existing lawful water use (water uses being undertaken prior to the commencement of the NWA, generally in terms of the Water Act of 1956), or if that water use is permissible in terms of a general authorisation issued under section 39 (general authorisations allow for the use of certain section 21 uses provided that the criteria and thresholds described in the general authorisation is met). Permissible water use furthermore includes water use authorised by a license issued in terms of the NWA.

As is set out below, water uses associated with the project will require water use licensing in terms of section 22 of the NWA. Section 21 of the NWA contains those water uses that are to be registered and licensed in accordance with the legal obligations contained in the NWA. Insofar as the undertaking of Section 21 water uses are concerned, it is to be anticipated that application for registration and water use licensing must be undertaken (Table 2-2). Of particular relevance within the context of waste disposal and water use and management the following use is applicable, as verified with DWA at the Focus Group Meeting on the 14th of June 2013 (refer to Appendix A 5.1: Focus Group Meeting Minutes):

Table 2-2 Identification of Water Uses to be applied for in the Water use license application

Use	Definition	Description
21(g)	Disposing of waste in a manner which may detrimentally impact on a water resource	Two waste storage areas proposed: - Sewage stored in a sewage collection tank on site and removed by means of a Honey

		sucker, and - REE Carbonate waste to be stored in settling ponds for a period of 6 months.

The mentioned uses will be applied for through an application for a Integrated Water Use Licence (IWUL). Proof of submission of the Integrated Water Use Licence will be attached to the final Environmental Impact Report.

2.1.3 National Environmental Management: Air Quality Act, 2003 (Act No. 39 of 2004) (NEMAQA)

In terms of section 22 no activity may be undertaken which is listed on the National list anywhere in the Republic or listed on a list applicable to a province without a provisional atmospheric emission license or an atmospheric emission license.

The Minister of Water and Environmental Affairs published a list of activities contemplated in section 21(1)(a) and the minimum emission standards for the listed activities as contemplated in section 21(3)(a) and (b) of the NEMAQA and read with GN 893 of 22 November 2013 (previously GN 248 of 31 March 2010, and GN 964 of 23 November 2012).

A Focus Group Meeting was held on the 11th of April 2013 with the Air Quality Officials from the WCDM in order to determine the applicable listed activities according to the National Environmental Management Air Quality Act (Act No. 39 of 2004), and to be informed of the Atmospheric Emission License Application Process. Refer to Meeting Minutes attached as Appendix A 5.1: Focus Group Meeting Minutes.

According to the process descriptions and with the input from the WCDM, the Listed Activities that are relevant to the proposed development include (Table 2-3):

Table 2-3 Identifications of Listed Activities to be applied for in the Atmospheric Emission Licence Application

Listed Activity Number	Category of Listed Activity	Sub-category of the Listed Activity	Description of the Listed Activity
1.3	Combustion Installations	Solid Biomass Combustion Installations	Solid biomass fuel combustion installations used primarily for steam raising or electricity generation.
4.1	Metallurgical Industry	Drying and Calcining	Drying and calcining of mineral solids including ore
5.1	Mineral Processing, Storage and Handling	Storage and Handling or Ore and Coal	Storage and handling of ore and coal not situated on the premises of a mine or works as defined in the Mines Health and Safety Act 29/1996.

The mentioned listed activities were applied for through an application for an atmospheric emission license (AEL), and the following reference number was awarded for the AEL on the 22nd of May 2013: AEL Reference Number: 12/3/1/11(WC/WC/026). The original application was for Sub- Categories 4.1 and 4.2 of the NEM:AQA Listed Activities, but the listed activities has changed in November 2013 with the publishing of the NEM:AQA Listed Activities and Minimum National Emission Standards on the 22nd of November 2013. The WCDM will be approached in order to update the AEL application.

2.1.4 National Environmental Management Waste Act (Act 59 of 2008) (NEMWA)

In terms of the current statutory framework with regards to waste management, a waste management licence is required for those waste management activities identified in the Schedule to GN 921 of 29 November 2013. Certain of the waste management activities listed in the Schedule are governed by specific thresholds. Where any process or activity falls below or outside the thresholds stipulated, a waste management licence is not required.

A Waste Management License (WML) Application was submitted to the National Department of Environmental Affairs and on 26 June 2013 the following reference number was awarded to the Application: 12/9/11/L1262/9.

Important to note is that the listed activities mentioned in GN 718 of 3 July 2009 was applicable when the Waste Management Licence (WML) Application was submitted on 27 May 2013, however these listed activities were repealed with the publication of GN 921 of 29 November 2013. The waste management activities as listed in GN 718 of 3 July 2009 which were originally applied for as part of the WML Application, as well as the listed waste management activities according to GN 921 of 29 November 2013 (currently applicable) are indicated in Table 2-4.

Table 2-4 Listed Activities according to Waste Management Licence Listed Activities (GNR 718 and GNR 921)

DESCRIPTION OF ACTIVITY:	CATEGORY AND LISTED ACTIVITY ACCORDING TO GNR 718 OF 3 JULY 2009	LISTED ACTIVITY DESCRIPTION ACCORDING TO GNR 718 OF 3 JULY 2009	CATEGORY AND LISTED ACTIVITY ACCORDING TO GNR 921 OF 29 NOVEMBER 2013	LISTED ACTIVITY DESCRIPTION ACCORDING TO GNR 921 OF 29 NOVEMBER 2013
Temporary **Sewage** storage on site (40m^3), removal by honey sucker and transportation by truck to Vredenburg or Saldanha WWTW. Temporary **storage of brine** on site in two tanks, each with a capacity of approximately 750 m^3.	Category A Listed Activity 2	The storage including the temporary storage of hazardous waste at a facility that has the capacity to store in excess of 35 m^3 of hazardous waste at any one time, excluding the	Category C Listed Activity 2	The storage of hazardous waste at a facility that has the capacity to store in excess of 80 m^3 of hazardous waste at any one time, excluding the storage of hazardous waste in lagoons or temporary storage of such waste.

		storage of hazardous waste in lagoons.		
Construction of storage facilities on site for the **storage of sewage**.	Category A Listed Activity 18	The construction of facilities for activities listed in Category A (not in isolation to associated activity).	The construction of facilities for the storage of hazardous waste is not listed according to GNR 921 of 29 November 2013.	
Temporary storage of **Rare Earth Carbonates** in a **Waste Settling Pond** on site. Size of Settling Pond: approximately 1200m^3	Category B Listed Activity 1	The storage including the temporary storage of hazardous waste in lagoons.	Category B Listed Activity 1	The storage of hazardous waste in lagoons excluding storage of effluent, wastewater or sewage.
Various disposal options for the waste brine solution were assessed. Disposal to the sea, at Danger Bay, together with the brine return from the proposed WCDM's desalination plant was found to be the most favourable option (environmentally and financially). This project was initiated and is referred to as the Saldanha Regional Marine Outfall (SRMO) Project. Project is proposed to service a number of industries in the area. It is therefore not only linked to the proposed SP and hence a separate EIA is being conducted for this project. An EIA for the SRMO project has been initiated (EIA Reference no: 16/3/1/2/F4/17/3009/13). The SRMO It should also be noted that various other brine disposal alternatives were investigated to ensure that the most feasible brine disposal option is chosen (refer to Section 5.2.2.1.2).	Category B Listed Activity 7	The treatment of effluent, wastewater or sewage with an annual throughput capacity of 15 000 cubic metres or more.	The treatment of effluent, wastewater or sewage is not listed according to GNR 921 of 29 November 2013 and is now included in the EIA Listed Activities (as amended by GNR 922 and GNR 923 of 29 November 2013). Also refer to Section 2.1.4 above.	
Construction of **waste settling ponds** for the temporary storage of rare earth carbonates, and	Category B Listed Activity 11	The construction of facilities for activities listed	Category B Listed Activity 10	The construction of a facility for a waste management activity listed in Category B of

insoluble.		in Category B (not in isolation to associated activity).		this Schedule (not in isolation to associated waste management activity).

2.1.5 Major Hazard Installation Regulations

Hazards, which have the potential to harm members of the public beyond the site boundaries, are classified as major hazards and the facilities from where they originate as a Major Hazard Installation.

The main chemicals used by the separation facility in the leaching and extraction processes, will be hydrochloric acid (32% concentration) and flammable solvents (kerosene and other naphtha based materials). Due to the presence of chemicals on site ISHECONcc (a company specialising in risk assessments) was appointed to undertake a screening assessment to determine whether the facility should be classified as a Major Hazard Installation (MHI) under the Occupational Health and Safety Act (Act No. 181 of 1993). The sections below provide an overview of the MHI Regulations and also discuss the applicability of the MHI Regulations on the proposed plant.

2.1.5.1 Overview of Major Hazard Installation Regulations

The Major Hazard Installation (MHI) Regulations (GNR 692) falling under the Occupational Health and Safety Act of 1993 (Act No. 181 of 1993) were promulgated on 16 January 1998. Although these regulations were revised in July 2001, the fundamental requirements remain in force.

The regulations in part require existing facilities and all new facilities, which have hazardous materials on their sites, to conduct a risk assessment to indicate their potential for causing major hazardous events (i.e. hazardous events of catastrophic proportions that can affect employees and the public outside the perimeter of the facility). This risk assessment must be reviewed every 5 years.

The risk assessment, which indicates why the installation is a major hazard installation, must then be presented to the National, Provincial and Local Authorities. The authorities have a responsibility to ensure suitable risk levels and separation distances between new installations, new residential developments and sensitive areas such as hospitals, etc. The public in the area of an MHI must be notified and for new installations persons have 60 days to make submissions to the relevant authorities.

The regulations are not prescriptive in terms of the classification of MHIs. Should anything occur which does indeed impact on the general public; the onus will lie with the management of the facility to prove why the installation is not classified as a major hazard and why the associated precautions / plans etc. were not implemented.

2.1.5.2 Applicability to project

The assessment by ISHECON found that there are no reasonably foreseeable accident scenarios possibly arising on the SP site that could have significant effects beyond the site boundaries. The facility need not be classified as a MHI, neither on the basis of the inventory of hazardous chemicals nor on the basis of possible accidents impacting on persons outside the site.

The proposed SP will therefore not be considered a Major Hazard Installation and the MHI notifications are not applicable.

Important to note however is that the MHI regulations are expected to change in the near future and that the classification of the facility could possibly change as well as the requirements against the facility. The revised regulations are currently expected to come into effect within the next three years or so. Under the new classification, which is expected to be similar to the United Kingdom's COMAH system, the facility might be classified as an MHI based on the total inventory of solvents on site. There may then be additional requirements against the site, including at least the completion of the MHI Risk Assessment. It is recommended that the Applicant should monitor the possible changes to the OSH Act and that once the regulations change, a risk assessment should again be conducted in order to ascertain the applicability of the OSH Act and the MHI Regulations. Other relevant legislation

For a description of other legislation also relevant to the proposed project refer to Appendix D: Other Legislative Requirements.

3 APPROACH TO THE PROJECT

3.1 Scoping Study

An Environmental Scoping Study was undertaken by AGES. The application was initiated under the National Environmental Management Act (Act 107 of 1998) on the 26th of February 2013. A reference number (16/3/1/2/F4/17/3004/13) was issued by the Department on the 12th of March 2013. A draft Scoping Report was compiled and submitted to the Department (DEADP) on the 26 of August 2013, thereafter it was placed on public review from the 27th August 2013 until 28th of October 2013. The final Scoping report and Plan of Study for EIA was submitted to the DEADP on 29 January 2014. The department responded to the application by accepting the Scoping report and Plan of Study for EIA on the 12th of March 2014 (see Appendix B 1: Correspondence from DEADP). Thereafter AGES was appointed to facilitate the Specialist Studies and Environmental Impact Assessment Phase.

3.2 Stakeholder engagement process

The principles of NEMA and the Western Cape Department of Environmental Affairs and Development Planning (DEADP) guideline on public participation govern consultation with interested and affected parties (I&APs). These principles include the provision of sufficient and transparent information to I&APs on an on-going basis, to allow them to comment.

3.2.1 Identification of Interested and Affected Parties

The following process was undertaken to facilitate the public participation process for the proposed project (for proof of consultation refer to Appendix A: Public Participation):

3.2.1.1 Newspaper Advertisement

Advertisements, notifying the public of the Environmental Impact Assessment application and process, and requesting I&APs to register their comments with AGES, was placed in both English and Afrikaans in the Weslander on the 4th of July 2013. In addition an advertisement was also placed in English in the Cape Times on the 5th of July 2013. These advertisements were placed in accordance with regulation 54(2)(c) of the EIA Regulations of 2010 and Section 38 (3)(b) of the National Environment Management: Air Quality Act (Act 39 of 2004). These advertisements also served as notification regarding the Waste Management Licence, Atmospheric Emission Licence and Integrated Water Use Licence Applications (IWULA).

3.2.1.2 Site notice

In order to inform surrounding communities and adjacent landowners of the proposed development, notice boards in accordance with regulation 54(2)(a) and 54(3) of the EIA Regulations were erected as per table below on the 4th of July 2013 (refer to Appendix A):

Site notice number	Placement	Language
1	On site – facing the gravel road to the north	English and Afrikaans
2	Within close proximity to the site – at the Weskus Spens padstal, intersection of the R27 and the gravel road leading to the site (facing the R27)	English and Afrikaans
3	Within close proximity to the site – at the intersection of the R27 and R79 (facing the R27)	English and Afrikaans
4	Saldanha (municipal offices)	English and Afrikaans
5	Langebaan Primary School	English and Afrikaans
6	Vredenburg (municipal offices)	English and Afrikaans

3.2.1.3 Direct Notification of Identified I&APs

Key stakeholders, who included the following sectors, were informed by means of hand deliveries, emails, faxes or registered post of the proposed development:

- The owners and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site;
- The owners and occupiers of land within 100 meters from the boundary of the site or alternative site who are or may be directly affected by the activity;
- West Coast District Municipality;
- Saldanha Bay Local Municipality;
- Department of Environmental Affairs: Branch Oceans & Coast;
- Department of Environmental Affairs and Development Planning (DEADP): Coastal Management;
- Department of Agriculture;
- Department of Water Affairs;
- Western Cape Department of Transport and Public Works;

- Western Cape Department of Economic Development and Tourism;
- South African Heritage Resources Agency (SAHRA);
- West Coast Biosphere Reserve;
- Cape Nature;
- West Coast Fossil Park;
- Eskom; and
- Transnet.

The Public Participation process was initiated during the Scoping phase of the project, and will continue during the EIA Phase. A Final Comments and Response Report, detailing all comments from the I&APs will be included in the Final Environmental Impact Report (EIR).

3.2.1.4 Public Open day

An open day was held on the 10th of September 2013 at the Blue Bay Lodge to provide more information to I&APs regarding the proposed project. Meeting minutes of the public open day is attached in Appendix A5.2: Open Day Documents.

3.2.1.5 Focus group meetings

A focus group meeting was held on the 11th of April 2013 with the Air Quality Officials from the WCDM in order to determine the applicable listed activities according to the National Environmental Management Air Quality Act (Act No. 39 of 2004), and to be informed of the Atmospheric Emission License Application Process.

A focus group meeting was also held on the 14th of June 2013 with the Department of Water Affairs and the Department of Oceans & Coast.

Key notes of these two meetings are attached in Appendix A 5.1: Focus Group Meeting Minutes.

3.2.1.6 Raising of Issues for investigation by EIA Specialists

I&APs have had the opportunity to raise issues either in writing, by telephone or email, or at the focus group meetings and the open day. All the issues raised by I&APs during the scoping process thus far have been captured in a Comment and Response Report

(Appendix A 6: Comments and Response Report) and I&APs received letters acknowledging their contributions. The following key aspects were raised by I&APs during the public participation process to date:

- Biodiversity impacts
  - Negative impacts on naturally occurring fauna and flora
  - Rehabilitation of disturbed areas according to best practice
- Palaeontology and archaeology
  - Need for palaeontological and archaeological surface surveys prior to any earth moving activities
  - Availability of previously conducted archaeological and palaeontological reports
  - Provision for monitoring of subsurface activity
  - Rescuing of fossil material during excavations
  - Requirement for a Heritage Impact Assessment
  - Fossil finds to be reported
- Air Quality Impacts
  - Air Pollution originating from the plant
  - The requirement for an Atmospheric Emissions Licence
  - Dust Pollution
- Soil pollution
- Noise Pollution
- Traffic Impacts
  - Increased heavy traffic impacting on the existing road infrastructure during the construction and operational phases
- Groundwater and surface water pollution and management
  - Impact on water users in the area
  - Pollution/contamination of groundwater resources
  - Lowering of the groundwater table due to abstraction of water
  - Poor storm water management that could lead to pollution of Saldanha Bay
  - Groundwater monitoring for water levels and seepage of salts
  - Water recycling
- Visual Impact
  - Requirement for a Visual Impact Assessment
- Material handling, storage and transportation

- Usage and storage of hazardous chemicals
- Management and disposal of solid and liquid waste
- Processing and storage of Rare Earths
- Development of contingence plan for transportation of residue to disposal facility

- Socio-Economic Impacts
  - Economic upliftment relating to local job creation and employment
  - Land use impacts
  - Impacts on farming of livestock, grain and bee keeping.
  - Safety and Security
  - Supply of building material
- Health Impacts
- Economic impacts related to:
  - Rare Earth supply and exporting
  - Rare Earth wastes and recovery of these wastes if possible
  - Separation of Rare Earths and resulting products
  - Beneficiation of South Africa's natural resources, including establishing downstream electronics industries in South Africa
- Waste impacts
  - Handling and testing of sludge
  - Lining of waste settling dams/evaporation ponds
  - Capacity of waste disposal facility
  - Storage of hazardous waste
  - Disposal of hazardous waste
  - Disposal on unused products
  - Storage of raw materials
  - Disposal of waste to a disposal facility such as Vissershok
  - Disposal of non-process waste

3.2.1.7 Draft Scoping Report

The EIA Regulations specify that I&APs must have an opportunity to verify that their issues have been captured. A period of 30 days (27 August to 30 September 2013) was made available to allow for public comment on the Draft Scoping Report. The availability of the Draft Scoping Report was announced via personal notification letters, posters and/or sms to all the registered I&APs on the distribution list. The following methods were available for I&APs to access the reports:

- Published on the AGES website at www.ages-docs.co.za;

- Hard copies were made available at Blue Bay Lodge in Saldanha and the Vredenburg Public Library; and
- Electronic copies were distributed upon request.

3.2.1.8 Final Scoping Report

A Comments and Response report was prepared following comments on the Draft Scoping Report. The Draft Scoping Report was updated to accommodate all comments received. This Final Scoping Report was placed on review for 21 days (11 November to 2 December 2013) prior to submission to the DEADP. The Final Scoping Report was made available to the public as follows:

- Published on the AGES website at www.ages-docs.co.za;
- Hard copies were made available at Blue Bay Lodge in Saldanha and the Vredenburg Public Library; and
- Electronic copies were distributed upon request.

3.3 Environmental Impact Assessment

This Environmental Impact Report (EIR) expands on the key aspects and concerns identified during the Scoping Phase. Specialist studies were conducted and results included in this report. The specialist studies assisted with the assessment of anticipated impacts and highlighted the key areas of concern as well as necessary mitigation measures. The specialists and the environmental practitioner evaluated the impacts using professional judgement and scientific evaluations where available.

3.3.1 Methodology used for the impact assessments

Assessments of impacts were based on DEAT's (1998) Guideline Document: EIA Regulations. The significance of the aspects/impacts of the process were rated by using a matrix derived from Plomp (2004) and adapted to some extent to fit this process. These matrixes use the consequence and the likelihood of the different aspects and associated impacts to determine the significance of the impacts. For more information also see Section 7.4.

3.3.2 Public Participation during the Impact Assessment Phase

Public participation during the EIA Phase provided inputs into the findings of this Draft Environmental Impact Assessment Report (EIR) and the Environmental Management Plan (EMP). The findings are presented in this Draft EIR, Specialist Studies and EMP.

Details of the public engagement process followed during the course of the assessment and an indication of how issues raised have been addressed were included in the EIR as contemplated in regulation 31(2)(e) of the EIA Regulations.

3.4 Assumptions, uncertainties and limitations

The following assumptions, uncertainties and/or limitations applied to the study:

- **General:**
  - It is proposed that the project will ultimately produce 20 000 tonne per annum (tpa) of separated, >99% refined rare earth oxides. The plant is currently proposed to be developed in two phases, with each phase producing 10 000 tpa. Phase 2 would be a replica of Phase 1. The environmental impacts associated with the plants were determined for both phases in order to ascertain the impacts on the environment for the completed 20 000 tonne per annum plant.
- **Heritage Impact Assessment:**
  - The pedestrian survey of the proposed SP site primarily focused around areas noted during the aerial survey, of human settlement and activity catchment potential. No major constraints were encountered during the survey. However, even though it might be assumed that survey findings are representative of the heritage landscape of Langeberg, it should be stated that the possibility exists that individual sites could be missed due to the localised nature of some heritage remains as well as the possible presence of sub-surface archaeology. Therefore, maintaining due cognisance of the integrity and accuracy of the archaeological survey, it should be stated that the heritage resources identified during the study do not necessarily represent all the heritage resources present on the property. The subterranean nature of some archaeological sites, dense vegetation cover and visibility constraints sometimes distort heritage representations and any additional heritage resources located during consequent development phases must be reported to the Heritage Resources Authority or an archaeological specialist.
- **Palaeontological Study:** The assumption is that the fossil potential of the formation underlying the site (Langebaan Formation) will be typical of that found in the region and more specifically, similar to that already discovered nearer to the site. Scientifically important fossil bone material is expected to be sparsely scattered in these deposits and much depends on spotting this material as it is uncovered during digging i.e. by monitoring excavations.

A limitation on predictive capacity exists in that it is not possible to predict the buried fossil content of an area or formation other than in such general terms. Certain processes/agents can produce significant concentrations of fossil bones, but the possibility of these specific buried palaeoenvironments being present is only hinted at by the general setting of a site.

- **Social Impact Assessment:**
  - Not every individual in the community could be interviewed therefore only key people in the community were approached for discussion. Additional information was obtained using existing data, attending public meetings and records of public meetings.
  - The social environment constantly changes and adapts to change, and external factors outside the scope of the project can offset social changes, for example changes in local political leadership. It is therefore difficult to predict all impacts to a high level of accuracy, although care has been taken to identify and address the most likely impacts in the most appropriate way for the current local context within the limitations.
  - Social impacts can be felt on an actual or perceptual level, and therefore it is not always straightforward to measure the impacts in a quantitative manner.
  - Social impacts commence when the project enters the public domain. Some of these impacts are thus already taking place, irrespective of whether the project continues or not. These impacts are difficult to mitigate and some would require immediate action to minimise the risk. These risks will be discussed under the relevant section of the report.
  - There are different groups with different interests in the community, and what one group may experience as a positive social impact, another group may experience as a negative impact. This duality will be pointed out in the impact assessment section of the report.
- **Ecological Impact Assessment:**
  - Fieldwork was undertaken on 28 August 2012, which is within the peak spring flowering period in this winter rainfall region. The timing of the site visit was thus optimal, and the seasonal constraints on the comprehensiveness of the botanical findings were thus minimised. Most plants present were in identifiable condition. In addition, the available Google Earth imagery is of a high resolution and is easily interpreted.
  - Conservation worthy habitats are those with high species diversity; those that support rare, threatened or localised plant species; those that are rare in a regional context, and those areas where ecological processes are deemed to be important and vulnerable to disturbance. Sufficient detail was evident in the

aerial images and on site to be able to assess the overall conservation value and botanical sensitivity of the area, and confidence in the accuracy of the botanical findings is high.

- No additional associated infrastructure was assessed as part of the impact assessment, except for about 160m of new access road.
- Reference was made to the GIS based database of rare plant localities maintained by CREW (Custodians of Rare and Endangered Wildflowers, based at Kirstenbosch, updated to March 2012), to the Red List of South African plants (Raimondo et al 2009), to the Fine Scale Vegetation map of the Saldanha Municipality (Helme & Koopman 2007), and to Cape Nature's Fine Scale Conservation Plan for the Saldanha Municipality (Pence 2008). Red Data status for birds was taken from Barnes (ed; 2000), mammals from EWT (2004), and frogs from Minter et al (2004). There is no published reptile Red Data List, although it is supposedly in press (M. Burger – pers. comm.), and status was taken from Alexander and Marais (2007).

- **Air Quality Impact Assessment:**
  - The impact assessment focussed on emissions from the plant. Air emissions from haul trucks on public roads, carrying loads to and from the plant were not included in the assessment.
  - Gaseous pollutants from on-site vehicle exhausts (including CO, diesel particulate matter (DPM), NOx, and SO2) were not simulated due to the lack of detailed information. However, these impacts are expected not to be significant.
  - Combustion sources emit mainly nitrogen monoxide (NO), which is rapidly converted in the atmosphere into the more toxic NO2. The rate of this conversion process is determined by both the rate of the physical processes of dispersion and mixing of the plume and the chemical reaction rates. As a conservative measure all long- and short-term oxides of nitrogen emissions (NOx, i.e. NO+NO2) impacts were assumed to be NO2.
  - Information on source specific characteristics (e.g. particle size distribution of all materials) was not available for all the sources and therefore data published by the US Environmental Protection Agency (US EPA) emission estimation documents, and available relevant data from activities in South Africa were used.
  - The exact routes taken while transporting material within the plant area were not known. Paved roads were therefore allocated into a representative area source that covers the entire plant.
  - Emission factors where used to estimate all fugitive and processing emissions (were required) resulting from plant activities. These emission factors generally assume average operating conditions.

- Design maximum production rates were utilised. Thus even though the nature of the operations may vary at times the modelling would reflect the worst case condition (i.e. resulting in the highest impacts and (or) closest to receptors).
- All possible windblown dust sources except the coal stockpile will be enclosed. The coal's moisture content is high and air emissions from this source are expected to be mainly confined to the plant boundaries.
- It was assumed that all processing operations will have ceased by the closure phase of the project. The potential for impacts during this phase will depend on the extent of demolition and rehabilitation efforts during closure and on features which will remain. Information regarding the extent of demolition and/or rehabilitation procedures were limited and therefore not included in the emissions inventory or the dispersion modelling but discussed qualitatively.
- There will always be some error in any geophysical model, but it is desirable to structure the model in such a way to minimise the total error. A model represents the most likely outcome of an ensemble of experimental results. The total uncertainty can be thought of as the sum of three components: the uncertainty due to errors in the model physics; the uncertainty due to data errors; and the uncertainty due to stochastic processes (turbulence) in the atmosphere. Nevertheless, dispersion modelling is generally accepted as a necessary and valuable tool in air quality management.

- **Noise Impact Assessment:**
  - Noise modelling and the calculation of project noise footprints include all initial, as well as future SP processing modules. As far as information is available, noise assessments are made for a 20 year projection in accordance with the project plan. Noise modelling and prediction of noise impact therefore incorporate all future modules indicated on the project plan.
  - Noise implications of operations and activities on the SP site only were considered in the noise study. Noise generated by traffic on the SP site, as well as noise from the access road to the site is included in the calculations. The impact of product road transport from the mine to the plant (except for the site access road) is however excluded from the current noise study.
  - It is assumed that Frontier Separation will comply with the provisions of Noise Regulations under the Occupational Health and Safety Act and SANS 10083, in terms of which the 8-hour noise rating LAeq, 8h in the work place (i.e. inside the SP plant buildings) is not allowed to equal or exceed the hearing safety limit of 85 dBA.
  - A conservative estimate for purposes of noise modelling was obtained by assuming that the average total (direct plus reverberant field) interior noise level impinging on the walls and boundaries of buildings is 82 dBA.

- Plant building walls will be of pre-finished steel construction (Typical Farmer's shed building).
- Doorways, openings for material transport and air vents comprise 5 % of the total surface area.
- Roofs will be of standard 0,6 mm steel construction with insulation.
- All plant components, truck and other vehicle movements on the plant site are incorporated in the noise model. The noise of the emergency electrical power generators is excluded because it is assumed that the generators will not be operating under normal conditions. Roads outside the plant site, i.e. the transport route and the access road do not form part of the Noise Impact Assessment and are therefore excluded from the model.
- Noise footprints are calculated for unfavourable conditions resulting in maximum noise impact. All activities in the operational phase are assumed to take place 24 hours/day.
- Noise contours were calculated for night-time conditions when traffic volumes on the R27 and other public roads and consequently also the resulting background noise levels, are low and when the area is most sensitive to intrusive noise.
- Noise predictions and noise maps must be interpreted with caution. Although the accuracy of the acoustic model is good, predicted levels are valid for the assumptions made in respect of specific or ranges of meteorological and other conditions. Since meteorological conditions in particular are highly variable, levels produced at a distance by a source at a constant acoustic output will vary considerably, even during the course of a single day-time or night-time period. Variance in noise level due to changes in atmospheric conditions increases with distance from the source. Noise propagation is not only affected by distance and wind, but by ever-changing, indeterminate temperature gradients in the atmosphere as well. Noise contours calculated for the SP represent best estimates of continuous operation noise levels averaged over a relatively long duration, in this case the nominal night-time period of 8 hours.

- **Economic Impact Assessment:**
  - The Capital Expenditure (CAPEX) and Operational Expenditure (OPEX) figures reflect the real situation accurately enough for the purpose of the impact assessment.
  - The impact assessment assumes that the proposed development concept is financially viable, and both, private and public companies will be involved in its realisation.
  - Production activities in the economy are grouped in homogeneous sectors.
  - The mutual interdependence of sectors is expressed in meaningful input factors
  - Each sector's inputs are a function of the specific sector's production,

comparative advantage, and location.

- The production by different sectors is equal to the sum of the production of separate sectors.
- No structural changes in the economy are experienced during the projection period.

- **Health Impact Assessment:**
  - The South African health- and population data presented in this report are not as detailed as ideally required to perform the possible health effect estimations for which risk factors are available. In this study only mortality as effect was considered as there are no condition specific data available for rates of hospital admissions in the Western Cape Province. The assessment could have included estimates for effects on hospitalisation rates but data for other provinces would have to be adapted, which means that the assessment could not have been performed with a high degree of confidence.
  - The provincial data used for assessment of the effect on mortality rates is approximately three years old, but is considered to be an adequate representation of cause specific mortality in the municipal area where the SP will be sited. The quality of the mortality data used therefore does not detract from the level of confidence in the results obtained from the health risk assessment.
  - Due to limitations in the available population statistics specific to the study area, the risk factors could not be used to predict potential numbers of deaths. If baseline mortality or hospitalisation numbers are not available, risks cannot be assessed in terms of numbers, but only in terms of the potential percentage change, which may be difficult to interpret (for example, 5 per cent of 2 deaths may not be significant, or may be impossible to interpret from the community's perspective, but 5 per cent of 100 deaths may, or may not, be significant to the community). Quantification of risks in terms of potential changes is therefore not the method of choice, but the results are nevertheless useful to indicate areas where modelled concentrations of pollutants may result in proportionally high effects. The impact assessment assumes that the proposed development concept is financially viable, and both, private and public companies will be involved in its realisation
  - The lack of background air monitoring data for the area surrounding the proposed SP necessitated the presumption that the modelled concentrations represent the total pollutant concentrations in the area as a result of the proposed project. This assumes that the SP is the primary contributor to the concentrations of PM10, SO2, CO and NO2 and that any other potential sources of these substances in the in the area are insignificant in comparison. This assumption has the potential for misinterpretation of actual risks. However, in

this case the assumption is regarded as valid, because the dispersion modelling was not based on measured pollutant concentrations that could have included contributions from other sources.

- Concentrations of contaminants in groundwater were not estimated with quantitative contaminant transport modelling and are therefore conservatively based on simple dilution factors that illustrate the effect the addition of contaminates in leachate may have on concentrations in groundwater. This assumption also has the potential to greatly overestimate risks, but in this case has demonstrated that even under extreme conditions the potential for health effects are low. The mutual interdependence of sectors is expressed in meaningful input factors.

4 PROJECT DESCRIPTION

4.1 Project Motivation

4.1.1 Need and Desirability

In terms of the EIA Regulations, when considering an application, the relevant competent authority must have regard to a number of specific relevant considerations, including specifically having to consider "the need for and desirability of the activity" (DEADP Guideline on Need and Desirability, March 2013),. The need and desirability of the project is assessed below taking into account the strategic plans, frameworks and policies applicable to the area.

4.1.1.1 Mineral beneficiation

South Africa is endowed with a significant mineral resource base, estimated at US$ 2.5 trillion in value (Department of Government Communications, 2011). In 2011, the mining industry accounted for a total of 5.9% (R1.7 billion) of the national Gross Domestic Product (GDP) in constant 2005 prices (Quantec, 2013). The extent of the mineral resource base is therefore recognised as an important asset and contributor to the South African economy in terms of direct revenue inputs. Directly and indirectly the mining industry is critical to the economy, contributing 50% of South African foreign exchange revenue and making up 26.5% of total exports (South African Chamber of Mines, 2012).

South Africa continues to export the majority of raw mined material for further processing abroad. Government has identified mineral beneficiation as a further way to boost the economy and one of the means to create new employment opportunities and reduce poverty in the country (Department of Mineral Resources, 2011). Beneficiation has significant positive multiplier effects along upstream activities through the procurement process and along its downstream activities through the creation of new investment opportunities. The Mineral Beneficiation Strategy aims to transform primary mining material into semi-finished or finished products for export, which will increase the value-added generated in South Africa and boost export revenue.

Frontier Rare Earths Ltd recently discovered one of the largest Rare Earth Elements (REE) deposits outside of China in South Africa's Northern Cape Province. South Africa is now strategically positioned to exploit the extraction of the estimated 20 000t expected to be exhumed annually by the proposed Zandkopsdrift Rare Earth Elements mining operation (Mineweb, 2012). Together with the increase in global demand and price, South Africa has the potential to generate additional foreign reserves and stimulate economic growth.

About half of global REEs reserves are located in China. This coupled with weak labour and environmental legislations, positioned China as a leader in the global REE markets. However, in 2010, China announced it would be decreasing REE exports by 70% prompting a drastic increase in Rare Earth commodity prices (Geology for Global Development, 2013). Other significant countries with REE reserves include Australia, the United States, Canada, Brazil, Russia, Malaysia and India. South Africa is also identified as one of the countries with a significant REEs reserve base.

The Government of South Africa has identified the need to add value to raw materials mined within South Africa in order to realise the economic opportunities provided by the downstream processing of the raw materials. Through the “Amendment to the Broad-Based Socio-Economic Empowerment Charter for the South African Mining Industry” (Department of Minerals and Energy, 2010), the South African Government encourages the downstream beneficiation of raw materials, by the mining industry.

The more stages of the production process that can be carried out on South African territory, the better the outcome in terms of revenue, added value and employment. It is therefore important that separation is handled in South Africa. Should the project be approved and the South African REE industry be further developed, the potential exists for South Africa to become a regional hub for rare earth ores from other African countries that may not possess the necessary resources to separate ores (Jepson, 2012).

The Industrial Policy Action Plan (IPAP 2010 – 2014) constitutes a central tool in the New Growth Path (NGP) job-creation strategy for South Africa. It has been anticipated that the IPAP2[1] (2011/12- 2012/13 period) interventions could lead to 43 000 direct jobs and 86 000 indirect jobs, totalling 129 000 jobs across various sectors as identified within IPAP2. Downstream minerals beneficiation, such as is proposed at the SP is identified as one such sector.

4.1.1.2 West Coast District Municipality Integrated Development Plan

The WCDM Integrated Development Plan (WCDM Draft IDP 2012 – 2016) is a planning and strategic framework to help the district municipality fulfil its developmental mandate. The IDP consists of the following strategic objectives that the municipality is geared to achieve in a five year period from 2012 to 2016:

- To pursue economic growth and facilitation of job opportunities
- Ensuring good governance and financial viability

1 Source: https://www.environment.gov.za/greeneconomysummit/docs/2011_2013ipap.pdf

The current status of the WCDM and SBLM sees limited employment opportunities and high population growth. Communities in the area are lacking sustainable employment opportunities, which contribute to poverty in the region. According to the Saldanha Bay Integrated Development Plan (IDP), the work force in the area is relatively well skilled (Saldanha Bay IDP, 2012-2017). Observations suggest that new employment opportunities can be created by utilising the Saldanha Bay deep-water port as a catalyst for growth. Export orientated industries requiring a skilled labour force should be encouraged to develop in the region: the establishment of a national IDZ in the municipality provides the prospects for this growth.

The proposed SP would be ideally located to utilise the Transnet Port to export processed minerals. In addition, the construction of the SP will help to create new job opportunities in Saldanha. Taxing income will also contribute to the municipality's financial viability.

4.1.1.3 West Coast District Municipality Spatial Development Framework

The WCDM Spatial Development Framework (WCDM SDF 2007) is the spatial expression of the West Coast Integrated Development Plan (IDP). Its overall goal is to create a spatial framework within which the sustainable development of the region and its resources can take place. Furthermore, it is aimed at achieving the orderly and desirable spatial development of the region, ensuring guidance in relation to decision-making on a continuous basis, thereby creating integrated sustainable and viable regions, towns and settlements. The WCDM SDF has four strategic themes with which it align its objectives. Among these are to ensure appropriate economic growth and align future settlements and investment with places of economic and resource potential, also taking into account efficiency at regional level.

Due to the concentration of mineral beneficiation facilities in the region as well as the proximity of the Saldanha Bay port, the REE separation facility will, based on the economic potential of the region, align to the future investment plans of the local municipality. The area where the proposed SP is planned to be established is demarcated as urban growth area in the WCDM SDF. Although the proposed project will be of an industrial land use it is in line with the WCDM's vision to expand urban development of Saldanha in the area where the proposed SP is to be built (Urban-Econ; 2014).

4.1.1.4 Saldanha Industrial Development Zone

The South African Government, as part of its growth and development strategy, has implemented numerous policies and strategies at all levels of government to try and stimulate economic growth and reduce poverty; national objectives are to increase economic growth by up to 5.4% per year (National Development Plan, 2011). Significant growth is expected to come from infrastructure investment and creation of Industrial Development Zones (IDZs) where concentrated manufacturing and industrial processing facilities are to increase local and national economic output and in return improve the social conditions of local communities.

The strategic location of Saldanha Bay and the availability of economic infrastructure in the form of a port, railway links and road networks created an opportunity for the development of the Industrial Development Zone (IDZ) in the area. The proposed Saldanha IDZ, once designated, will comprise of two key components, i.e. the oil and gas and marine repair cluster and the demarcation of a free zone which includes the port of Saldanha Bay.

The 2012/13 IPAP[2] identified Special Economic Zones (SEZs) as key levers in support of long-term industrial and economic development. The SEZs Programme was specifically developed to promote the creation of a regionally diversified industrial economy by establishing new industrial hubs in underdeveloped regions of the country. Saldanha is one such area which has been identified as the first key milestone in the roll out of the SEZs. The aim is to establish SEZs that can achieve the following:

- Increased foreign and domestic investment;
- Increased beneficiation of mineral and agricultural resources;
- Increased export of beneficiated products;
- World-class infrastructure;
- Increased job opportunities; and
- Regional industrial development.

The proposed SP will process 20 000t of REEs mined from Zandkopsdrift, which will be primarily exported through the port at Saldanha. The beneficiation of REEs at Saldanha will have significant impacts on the local and national economies and expand South Africa's significance as a global actor in the minerals sector.[3]

4.1.1.5 Saldanha Bay Local Municipality Spatial Development Framework (SDF 2011)

2 Source: http://www.thedti.gov.za/news2013/ipap_2013-2016.pdf

3 For more info on the Saldanha Bay IDZ please refer to the news article in Appendix T

The purpose of a SDF is to provide general direction to guide decision-making on an on-going basis aiming at the creation of integrated sustainable and habitable regions, cities, towns, and residential areas. The Saldanha Bay Spatial Development Framework provides spatially based guidelines and proposals whereby changes, needs, and growth in the area can be managed to the benefit of the environment and its inhabitants.

The vision of the SBLM is identified to be “a caring Municipality” with a number of goals as indicated below:

- To develop and maintain a strong local economic base, through the promotion of non-consumptive tourism, industrial development and the role of agriculture in the municipal area’s economy
- To protect and conserve the heritage resources of the area
- To provide an environmentally and economically sustainable bulk service infrastructure and road transport network
- To address the social needs and expectations of all sections of the community
- To promote the conservation and sustainable use of natural resources in the Saldanha Bay Municipality
- To ensure that on-going development pressure and its spatial implications are managed in a sustainable manner that protects the unique character of the existing cultural landscape and the place-specific character and form of the existing settlement pattern

The area where the SP is to be built has been proposed for development of the industrial corridor as outlined in the map below (Figure 4-1), which suggests that establishment of industrial facilities has already been considered by government. This means that the area has already been pre-screened for its suitability for industrial uses and the establishment of the SP would not go against these plans.

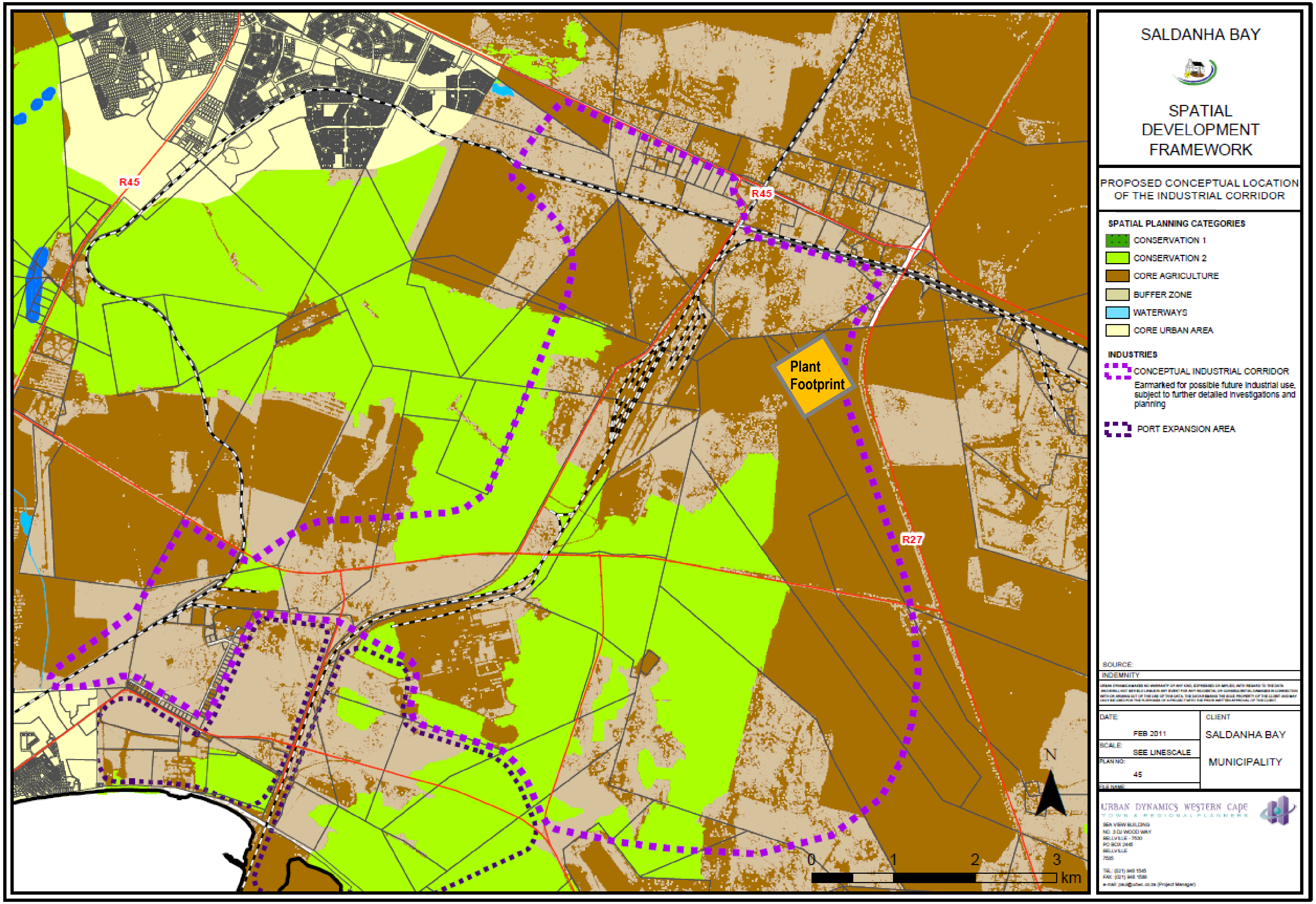


Figure 4-1 Proposed conceptual location of the industrial corridor in the SBLM (SBLM, 2011).

4.2 Process Description

4.2.1 Separation Plant

Bulk mixed rare earth salts (MRES) from a rare earth mine site (currently the proposed Zandkopsdrift mine, EIA reference number: NC/EIA/NAM/KAM/ZAN/2012[4]) is proposed to be transported to the SP. The plant is intended to produce 20 000 tonnes per annum (tpa) of refined rare earth products. The Separation Plant at Saldanha Bay is to be developed in two phases, with each phase producing 10 000 tpa of the refined rare earth oxides. Phase 2 would be a replica of Phase 1. The saleable rare earth elements (REEs) will be separated either as rare earth oxides (REOs) or carbonates with a purity equal to or greater than 99%. The non-saleable or non-profitable elements will be precipitated as carbonates and then temporarily stored in a settling pond for 6 months prior to further disposal or possible future sales.

Major unit operations for the Separation Plant include the following:

- concentrates receiving;
- hydrochloric acid leaching and clarification;
- solvent extraction;
- precipitation;
- filtration/dewatering;
- drying/calcining; and
- product packaging.

Each of the steps is described in more detail below and is shown in the sections below. The proposed layout of the plant is attached in Appendix C: Technical documentation

Appendix C1: Proposed layout of the plant. An illustration of a typical Rare Earth Separation Plant is provided below (**Figure 4-2**).

4 Please note: A separate environmental authorization process is currently taking place for this mine which is proposed to be located close to the town of Garies in the Northern Cape.

Figure 4-2 Illustration of a typical Rare Earth Separation Plant

4.2.2 Production Rate and Product Purities

Table 4-1 below lists the intended REO production and product purities for the proposed SP.

Table 4-1 Intended Production Rate and Product Purities

Rare Earth Product	Production² t/a	Percentage	Target Purities	Remarks
Lanthanum (La) Oxide	5,084	25.42%	99.999%	After Calcining
Cerium (Ce) Carbonate	8,832	44.16%	99%	After Drying
Praseodymium (Pr) Oxide	910	4.55%	99.9%	After Calcining
Neodymium (Nd) Oxide	3,154	15.77%	99.9%	After Calcining
Samarium (Sm) Oxide	462	2.31%	>99%	After Calcining
Europium (Eu) Oxide	118	0.59%	99.99%	After Calcining
Gadolinium (Gd) Oxide	288	1.44%	>99%	After Calcining
Terbium (Tb) Oxide	34	0.17%	99.99%	After Calcining
Dysprosium (Dy) Oxide	154	0.77%	99.9%	After Calcining
Yttrium (Y) Oxide	814	4.07%	99.999%	After Calcining
Ho/Er/Tm/Yb/Lu[1] Carbonate	150	0.75%	N/A	After Filtration
TOTAL	20,000	100%		

Notes:

1. Ho/Er/Tm/Yb/Lu stands for Holmium/Erbium/Thulium/Ytterbium/Lutetium.
2. Production rates are for REO or REO equivalent in cases where carbonates are the final products.

4.2.3 Concentrate Receiving

At the Zandkopsdrift mine near Garies in the Northern Cape, rare earth elements are precipitated in bulk to produce a mixture of rare earth salts, which will be moderately dried to approximately 10% moisture prior to being transported to the Separation Plant. Mixed rare earth salts are delivered in containers to the SP.

An overhead crane, or alternatively container forklifts, will be utilized to offload full containers from trucks to the concentrate storage shed, which will be capable of storing up to one (1) week's feed without stacking or two (2) week's feed with containers double stacked. Empty containers will be sent back together with trucks to the mine site for further concentrate shipment. A weigh bridge beside the gate house will measure the weight of incoming and outgoing trucks.

4.2.4 Hydrochloric Acid Leaching and Clarification

Mixed rare earth salts are transferred from the containers to leaching tanks by means of a belt or pan conveyor. The conveyor will be covered to prevent dust release to the atmosphere and avoid contamination from the foreign dust in the air. A dust collector is utilized to collect the dust generated during concentrate dumping, and the collected concentrate dust will be recycled to combine with the feed to the leaching tanks.

Concentrated (9N/±32%) hydrochloric acid (HCl) is proposed to be used to dissolve the rare earth salt mixture into an aqueous solution that is suitable to feed the downstream solvent extraction circuits. It is assumed that any impurities will be removed at the Zandkopsdrift mine site operation.

The preferred source of HCl and NaOH to the plant is currently proposed to come from the directly adjacent Chlor-Alkali Production Facility (CAPF). The chlorine, caustic soda and HCl facility currently proposed by Chlor-Alkali Holdings (Pty) Ltd (CAH) is yet to be constructed and is currently in the process of applying for environmental authorization from the Western Cape Department of Environmental Affairs and Development Planning (Reference No: 16/3/1/2/F4/17/3053/12).The proposed SP is however not solely dependent on HCl and NAOH from the CAH plant and these substances can also be imported (bought from a different source) if necessary. The rare earth (RE) salt feed will be leached in agitated tanks, with approximately 98% of the dry feed assumed to be dissolved. After leaching, the slurry is pumped to a clarifier for solids removal. The underflow (“U/F”) from the clarifier is further dewatered by a plate and frame filter prior to being temporarily stored in the settling ponds (insoluble waste); the overflow solution from the clarifier is processed through sand filters or inline filters to achieve absolute clarity prior to being discharged to the solvent extraction circuits.

4.2.5 Solvent Extraction

Frontier Separation requested that the Separation Plant process be based on two solvent extraction (SX) modules, each capable to separately produce 10 000 tpa REOs thereby achieving the overall intended capacity of 20,000 tpa.

In order to separate the mixed rare earth chloride solution into the desired products, the separation process of either solvent extraction module is composed of multiple solvent extraction circuits. Each circuit consists of four process steps, including loading, extraction, washing and stripping. The required number of stages for each process step within the extraction circuits varies according to the feed composition and product purities requirement; however, all mixers/settlers within a given separation circuit will be of the same size, regardless of their function. In order to separate the REEs at the specified purities, a total of 908 sets of mixers/settlers are required for one solvent extraction module, and 1816 sets for both modules.

Sodium hydroxide (NaOH), produced as by-product from the adjacently proposed chlor-alkali plant, or alternatively imported, is used to prepare the solvent to load the rare earth elements. A mixture of 50% P507 in a kerosene diluent is used as the extractant for most separations, except for yttrium extraction where 50% naphthenic acid in a kerosene diluent is used. HCl is used to strip the REEs from the organic phase. De-ionized water is added in the washing and stripping stages to dilute and adjust the reagent concentration.

4.2.6 Precipitation

The strip, or in some cases, raffinate solutions are pumped to feed the next stage of solvent extraction until purified solutions are obtained, at which time the solutions are pumped to the dedicated precipitation circuits. The individual precipitation stages are operated in a batch processing mode in order to permit control of particle size. There are three batch precipitation tanks to provide a continuous feed to each product dryer/calciner arrangement. One tank will be filled with fresh solution, the second will be in precipitation mode, and the third will empty the precipitated slurry to the drying/calcining stage. Altogether two precipitation modules, with either one designated to one solvent extraction module, are proposed to accommodate better process control and increase production flexibility.

Sodium carbonate (Na_2CO_3) is used to precipitate lanthanum, cerium, praseodymium and neodymium products as carbonates. A stream of mixed holmium, erbium, thulium, ytterbium and lutetium are also precipitated by Na_2CO_3 as carbonate slurry, but are not further processed and will be stored for 6 months as waste before being sold (if a market can be found), or disposed of to an appropriately licensed waste disposal facility.

Oxalic acid (H_2C2O_4) is utilized for precipitation of the rest of the rare earth elements, including samarium, europium, gadolinium, terbium, dysprosium and yttrium.

4.2.7 Filtration/Dewatering

The separated rare earth precipitates are pumped to filters where they are dewatered prior to discharging to the dryers. The filtrate is sent to water treatment for purification and recycling if feasible. A designated set of filtration/dewatering units are included for each separated REEs to avoid cross contamination.

For the REEs that are currently considered non-profitable, such as holmium, erbium, thulium, ytterbium and lutetium, the precipitated slurry will be sent to a high rate thickener (“HRT”) for thickening before being sent to wet storage at the settling pond for later disposal or potential sale.

4.2.8 Drying/Calcining

Cerium carbonate will be dried after filtration and dewatering and sold as a carbonate. Other saleable RE precipitates, including lanthanum, praseodymium, neodymium, samarium, europium, gadolinium, terbium and dysprosium, will be dried and calcined to produce highly purified rare earth oxides.

Each rare earth product will have a designated set of dryer/calciners, coolers and wet scrubbers to avoid cross contamination. An electric indirect-fired horizontal rotary dryer is utilized to produce cerium carbonate, and electric indirect-fired horizontal calciners are utilized to decompose the carbonate or oxalate components to produce a pure oxide for the market. Following calcining or drying, the products will be cooled and transferred to bins prior to feeding the packaging system.

4.2.9 Product Packaging and Storage

After drying/calcining, the cooled rare earth products are conveyed to the packaging units to continuously feed product containers. Holmium, erbium, thulium, ytterbium and lutetium mixed precipitates will be wet stored after thickening for future reprocessing or potential sales.

In consideration of the SP feed composition and final production rates, the types of containers or bulk bags indicated in Table 4-2 are currently considered for final product packaging, but will be ultimately be determined by customer preference.

Table 4-2 Final Products Packaging

Final Products	Packaging
La Oxide	1t Bulk Bag
Ce Carbonate	1t Bulk Bag
Pr Oxide	200L Drum
Nd Oxide	1t Bulk Bag
Sm Oxide	200L Drum
Eu Oxide	20L Drum
Gd Oxide	200L Drum
Tb Oxide	20L Drum
Dy Oxide	20L Drum
Y Oxide	20L Drum

The containers or bulk bags placed on wood pallets are lined and will be sealed upon completion of the packaging operation. Full final product packages are moved by forklift trucks from packaging to storage. The product storage facility provides two weeks of capacity, with 1t bulk bags and 200L (55 Gallon) containers double stacked and 20L containers triple stacked.

4.2.10 Reagent Handling, Preparation and Storage

4.2.10.1 Hydrochloric Acid (HCl)

Hydrochloric acid is used as the leaching and stripping reagent. Two (2) HCl tanks, each with a holding capacity of 6 hours, will provide a total of 12 hours of onsite storage.

4.2.10.2 Sodium Hydroxide (NaOH)

Sodium hydroxide is used to prepare the solvent to load rare earth elements. 50% NaOH will be supplied by others from the same Chlor-Alkali Holdings Plant and delivered to the Separation Plant through pipelines.

One (1) tank is utilized for bulk raw material on-site storage of 12 hours, and two (2) additional tanks are used to prepare the required 9N NaOH solution for feeding the two solvent extraction modules.

4.2.10.3 Sodium Carbonate (Na_2CO_3)

Sodium Carbonate (Soda Ash) in an 8% solution is used to precipitate the lanthanum, cerium, praseodymium, neodymium, and a mixed holmium, erbium, thulium, ytterbium and lutetium product as carbonates. Dry soda ash as the raw material is delivered by road to the SP and stored on site in a bulk material storage shed with a capacity of up to

14 days' consumption.

One (1) mixing tank and one (1) solution storage tank are utilized to prepare the required sodium carbonate solution on a continuous basis. Overhead crane and forklift trucks are utilized to manoeuvre the soda ash raw material packages.

4.2.10.4 Oxalic Acid ($H_2C_2O_4$)

Oxalic Acid in a 20% solution is used to precipitate samarium, europium, gadolinium, terbium, dysprosium, and yttrium products as oxalates. Oxalic acid as the raw material is normally supplied in solid form and delivered by trucks.

One (1) mixing tank and one (1) solution storage tank are utilized to prepare the required oxalic acid solution on a continuous basis. Overhead crane and forklift trucks are utilized to manoeuvre the material packages.

4.2.10.5 Naphthenic Acid

Naphthenic acid in a kerosene diluent, at a volume ratio of 50:50, is used as the extractant for yttrium solvent extraction. The solvents are ion carriers and will re-circulate continuously through the process. The only consumption is via entrainment loss and minor evaporation. Naphthenic acid as the raw material is normally supplied in drums, and is delivered by trucks to the SP.

Due to its relatively low consumption, naphthenic acid is directly transferred by drum pumps from drums to a mixing tank, where it will mix with the kerosene diluent. An additional storage tank is utilized to temporarily store the prepared solution and provide continuous extractant supply.

4.2.10.6 HEHEHP ("P507")

P507 in a kerosene diluent, at a volume ratio of 50:50, is used as the extracting agent for rare earth separations except yttrium extraction. Similar to naphthenic acid, the only consumption is via entrainment loss and minor evaporation. P507 as the raw material is normally supplied in drums, and it is delivered by trucks to SP.

Due to its relatively low consumption, P507 is directly transferred by drum pumps from their containers to a mixing tank, where it will mix with the kerosene dilluent. An additional storage tank is utilized to temporarily store the prepared P507 solution and provide continuous extractant supply.

4.2.10.7 Kerosene

Kerosene is used as a diluent for both P507 and naphthenic acid for rare earth separations. Similarly consumption of kerosene is low, mainly via entrainment and minor evaporation.

A transfer tank is utilized to provide kerosene to the P507 and naphthenic acid mix tanks for dilution.

A Materials Safety Data Sheet (MSDS) must be available on site for the above chemicals. A flow diagram of the separation process is provided below in **Figure 4-3**. A more detailed diagram is attached to Appendix C.

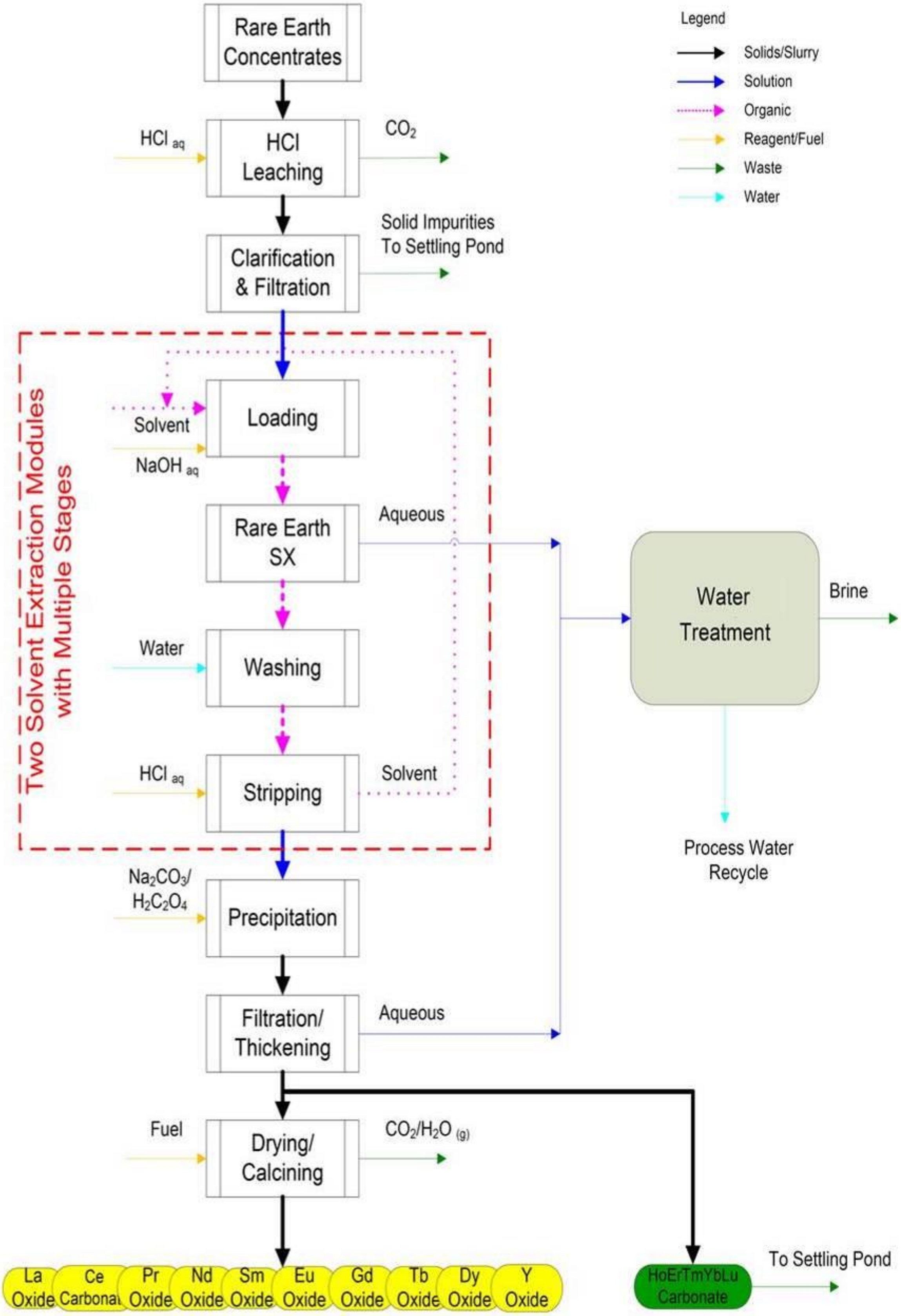


Figure 4-3 Flow diagram of the separation process

4.3 Other infrastructure on site

Other infrastructure on site includes:

- Main electrical substation;
- Waste disposal settling pond;
- Process water and fire water storage tanks;
- Water treatment plant and boiler building;
- Storm water storage pond;
- Main electrical sub-station;
- Control room and electrical rooms;
- Parking area;
- Reserved area for truck parking or empty container storage;
- Emergency back-up power generation;
- Fuel storage for genset and calciners;
- Waste Settling Pond (Ho-Lu and 2% insoluble MREC); and
- Storm Water Retention Pond.

It is estimated that the plant will require a steam generating capacity of 5t/h of steam at a pressure of 10 Bar. Two alternative fuel sources for the boiler were proposed namely coal and Liquid Petroleum Gas (LPG) and this will be taken into account as part of the AEL application. Also refer to Section 5.2 regarding alternatives considered for steam generation.

4.4 Services

The relevant service agreement letters are attached as Appendix Q to this report. The Separation Plant will require the following external services:

4.4.1 Water Supply

Domestic water as fresh water is proposed to come from the municipal facilities. Current figures indicate that the plant requires processing water to the amount of 1943 kl/day for Phase 1. Frontier Separation has settled the AoD with the SBM (Appendix R: Service Agreement Documentation (water supply, waste, sewage)) for the supply of 1912.43 kl/day of potable water for the proposed SP Phase 1 development. An additional 3.8 to 4 ml/day of potable water will be required for future expansion of the SP (Phase 2), to be determined after commissioning of Phase 1. The WCDM has stated that should the proposed desalination plant at Danger Bay be operational when the expansion of the SP is proposed the WCDM would be open to negotiating a take-off for the required additional estimated potable water supply.

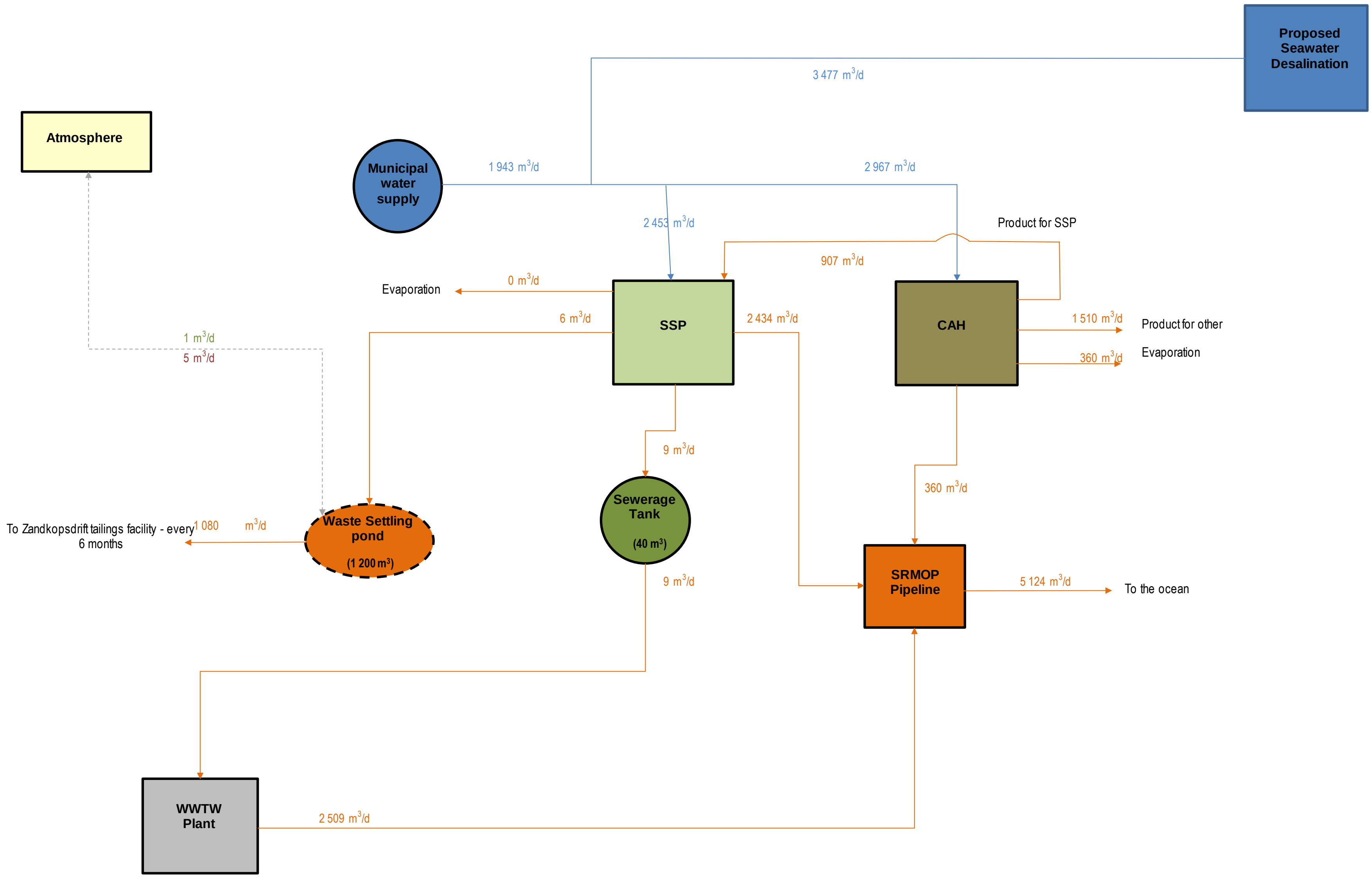


Figure 4-4 Environmental site water balance

4.4.2 Electricity

A Budget Quotation was received from Eskom for a supply of 65 MVA power to the proposed SP and CAPF. The SP will however only require 15 MVA with the CAPF requiring the balance (50 MVA).

4.4.3 Roads

An option to Purchase agreement have been signed with Trans African Murals (Pty) Ltd, the landowner of portion 6 of the farm Langeberg 188, and includes the provision to provide a 6m wide tar access road to the Separation Plant with connection to internal tar roads inside the Separation Plant site. Easy truck manoeuvrability has been considered as part of the planning process for the internal road network.

The internal road network for proposed industrial development area, including the access road to the site, forms part of a separate basic assessment which is currently being undertaken.

A Traffic Impact Assessment has been undertaken as part of the EIA phase of this project. Please refer to Section 7.9.7 and Appendix P: Traffic impact assessment.

4.4.4 Sewage

Sewage will, as a temporary measure, be disposed of in a sewage collection tank which will be pumped out by means of honey sucker truck and disposed of at the municipal sewage treatment works. The sewage collection tank will have a capacity of capacity of 40 m^3. Frontier Separation has settled an Acknowledgement of Debt (AoD) with the SBLM to provide services for the removal of 8.63 kl/day of sewage from the SP. The Vredenburg Municipality has confirmed capacity for the additional sewage (Appendix Q).

A regional Waste Water Treatment Works (WWTW) is proposed for the SBLM, which will service the proposed industrial area within which the SP is proposed to be located. Once the regional WWTW is operational the SBLM may be approached on order to connect the SP sewage to the proposed municipal sewage treatment works.

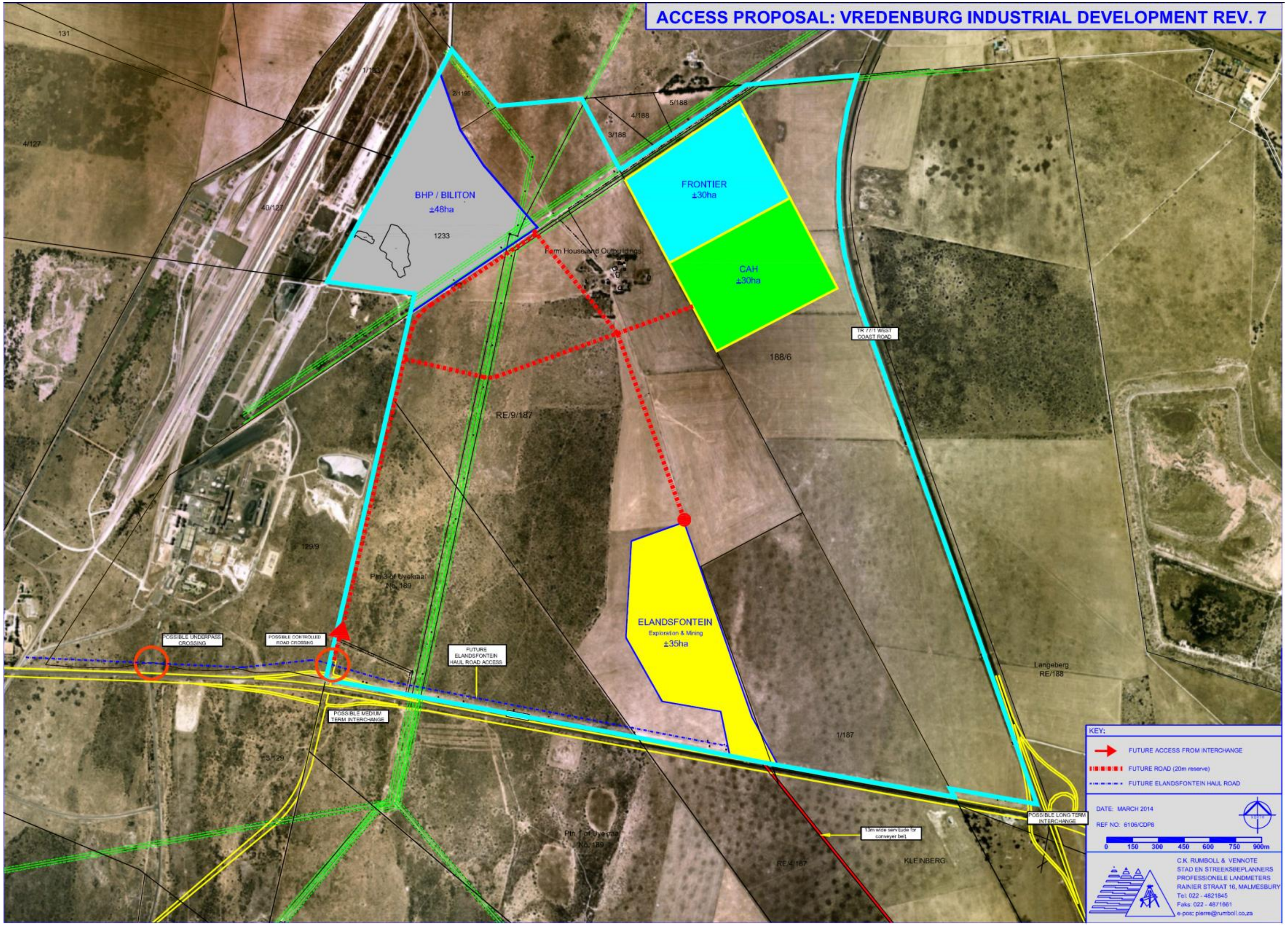


Figure 4-5 Conceptual Road Access Plan from TR 85

4.4.5 Waste disposal

The following section provides an overview of waste disposal activities anticipated for the proposed plant. Detailed assessment with regards to waste disposal and alternatives in this regard is discussed in Section 5.2.2.1.

4.4.5.1 Aqueous Waste

Liquid effluents are sodium chloride brines and a number of alternatives have been considered for disposal of the liquid effluent. A treated industrial effluent pipeline that will discharge the liquid effluent into the sea at Danger Bay, together with the brine proposed by the WCDM's desalination plant, is currently the preferred alternative for the disposal of liquid effluent. The project is known as the Saldanha Regional Marine Outfall (SRMO) Project. An Environmental Impact Assessment (EIA) is currently underway for the proposed construction and operation of this pipeline transfer system. Please note that this is a separate EIA and the following reference number was awarded to this project by the DEADP: 16/3/1/2/F4/17/3009/13.

An alternative trade off analysis for the brine effluent disposal is provided in Section 5.2 below.

4.4.5.2 Solid Waste

The solid waste settling pond provides temporary onsite waste storage for up to six months from the following two major feed sources besides precipitation:

- Insoluble solids contained in the SP concentrate feed; and
- Mixed rare earth carbonates of Ho/Er/Tm/Yb/Lu.

It is estimated that the pond will be 40 meters long by 20 meters wide with a dead depth of 1.5 meters based on the preliminary hydrology assessment. The minimum pond length to width ratio will be 2:1, to provide sufficient flow path for total suspended solids ("TSS") settling. The disposed solids will be removed every six months. The pond retention storage will provide two weeks of retention time for mean annual maximum daily rainfall.

Both the waste & storm water dams will be lined with a three layer lining (top layer, middle leak detection layer, and bottom layer). All the layers will be made of UV-light and heat stabilised pure high density polyethylene (HDPE). The top/primary liner layer will be a 1,50mm HDPE flexible membrane lining, the drainage/leakage detection Hi-Drain layer will be a 0,75mm (750u) HDPE flexible membrane lining and the bottom/secondary layer will be a 1,00mm HDPE flexible membrane lining. The proposed design of the liners for the storm water and settling pond is indicated in Appendix C.

It is foreseen that for the settling pond the lined material will be covered with a capping layer consisting of a selected aggregate or polymer concrete. In this manner mechanical machinery, for example a small skid steer loader, can be supported without damaging the liner. Please refer to Appendix C3 for a sectional view of the proposed waste settling pond. The waste can be left to dry to a moisture content of 10% to 5% minimising dust generation and loaded onto a truck to be sold or to be disposed of at the Vissershok Disposal facility.

The mixed rare earth carbonates of Ho/Er/Tm/Yb/Lu will be sold if a market can be found. Alternative means of disposal are assessed further in Section 5.2.2.

4.4.5.3 Organic Waste

Organic solvents will be re-circulated through the mixers and settlers. Incidental spillage, waste from laboratory tests and contamination are the primary causes to generate organic waste. The volume for organic waste is expected to be low. It will be collected and temporarily stored in a tank, and collected by external approved waste disposal contractors for disposal.

4.4.5.4 Off Gas

Carbon dioxide is the primary component in the off gas. A significant amount of carbon dioxide will be generated during the leaching process. Trace amounts of evaporated HCl and organic solvent might also be present. Off gas will be treated by a scrubber prior to being released to the atmosphere. Emissions to the atmosphere were further investigated during the EIA phase as part of an Air Quality Impact Assessment. Please refer to Section 6.1.8.

4.4.5.5 Dust Control

All primary unit operations will be enclosed in a building. Depending on the outcome of feed characteristics, baghouses might be designed to capture the dust generated during the concentrate receiving and transferring. This collected dust would be returned to the process.

4.4.5.6 Domestic Waste

Domestic waste will be recovered, reused and recycled where possible. Waste will be sorted according to the different categories for recycling (e.g. metals, paper, plastic, glass and organic). Waste will only be disposed to a landfill as a last resort. Domestic waste will be collected on site by the SBLM or an approved contractor and discharged to municipal facilities. The AoD with the SBLM allows for the collection of 10 bins per week.

Table 4-3 Proposed Solid Waste Inventory

Nr.	Area	Waste	Batch/Continuous	Quantity	Nature	Destination	Comments
General Waste							
1.1	Utilities and Services - Steam Generation	Coal ash	Continuous	180 t/month dry ash	General	Recover, reuse, sale or recycle where possible. Landfill as a last resort.	Specialist waste disposal contractor will be engaged for responsible disposal to appropriately licensed waste disposal facility or for recycling
1.2	Utilities and Services - Workshops	Empty drums and containers	Batch	Small / Undefined	General	Recover, reuse, sale or recycle where possible. Landfill as a last resort.	Sold to supplier who will reclaim the drums and containers
1.3	Utilities and Services - Roads	Dust collecting on the roads in the production facility via Road Sweeper	Batch	Small / Undefined	General	Recover, reuse, sale or recycle where possible. Landfill as a last resort.	Specialist waste disposal contractor will be engaged for responsible disposal to appropriately licensed waste disposal facility or for recycling
1.4	Administration Area (incl. Offices, Canteen, Guardhouse and Ablution blocks) as well as workshops and laboratory	General office waste* * Paper, Plastics, Cans, Food, Cigarette butts, etc.	Batch	30 t/month	Domestic	Recover, reuse or recycle where possible. Landfill as a last resort.	Sort waste: Metals, Paper, Plastic, Glass, Organic
Chemical / Hazardous Waste							

2.1	Main SP plant	Insolubles	Continuous	1.9 tpd	Hazardous	Stored on site in Waste Settling Ponds. Sale if possible or disposed of alternatively (refer to next column).	Disposed via an appropriately licensed waste disposal facility and waste disposal contractor
2.2	Main SP plant	Organic Process Discard (Emulsion)	Continuous	0.14 tpd	Hazardous	Stored on site and will be collected and temporarily stored in a tank, and picked up on demand by external parties for disposal.	Disposed via an appropriately licensed waste disposal facility and waste disposal contractor.
2.3	Main SP plant	RE Carbonate Products (Holmium, Erbium, Thulium, Ytterbium & Lutetium)	Continuous	0.41tpd	Hazardous	Stored on site in Waste Settling Ponds. Sale if possible or disposed of alternatively (refer to next column).	Disposed via an appropriately licensed waste disposal facility and waste disposal contractor
2.4	Main SP plant	Utilities - Treated Effluent	Continuous	3.36 Ml/d	Hazardous	Recycle water where possible but ultimately will be disposed of via the SRMO Project	Disposed into brine tank on SP site and pumped to the SRMO Project for Disposal (EIA Reference 16/3/1/2/F4/17/3009/13)
2.5	Main SP plant	Feed & Product Spills - REE	Batch	Small / Undefined	Hazardous	Recycle	Recycled at SP or return to Zandkopsdrift Minerals Processing plant for reprocessing.

2.6	Reagent Storage and Make-up	Empty reagent drums, bulk bags and containers	Batch	Small / Undefined	Hazardous	Recycle where possible/ appropriate land fill	Returned to supplier or specialist waste disposal contractor will be engaged for responsible disposal to appropriately licensed waste disposal facility or for recycling.
2.7	Utilities and Services - Sewage System	Sewage	Batched	8.63m3/d	General	Recover, reuse or recycle	Collected by SBLM for disposal, part of AoD.
2.8	Utilities and Services - Laboratory	Solid reagent waste	Batch	Small / Undefined	Hazardous	Landfill	Returned to supplier or specialist waste disposal contractor will be engaged for responsible disposal to appropriately licensed waste disposal facility or for recycling
2.9	Utilities and Services - Workshops	Used oil / fuel/ solvents	Batch	Undefined	Hazardous	Recover (Sell)	Sell to an oil reprocessing company
2.1	Utilities and Services - Workshops	Oily/Grease/fuel rags	Batch	Undefined	Hazardous	Landfill	Returned to supplier or specialist waste disposal contractor will be engaged for responsible disposal to appropriately licensed waste disposal facility or for recycling
2.11	Utilities and Services - Workshops	Empty Oil / fuel drums and containers	Batch	Undefined	Hazardous	Reuse	Returned to supplier or specialist waste disposal contractor will be engaged for responsible disposal to appropriately licensed waste disposal facility or for recycling
Plant shutdown and maintenance waste							

3.1	Main SP plant	Equipment replacement and clean up. Scrap metal, fibre glass, PVC, HDPE etc.	Batch	Small/ Undefined defined	General	Recover/Reuse	Sell or recycle
3.2	Utilities and Services	Used Bag and Dust filters	Batch	Small/ Undefined	General	Landfill	Returned to supplier or specialist waste disposal contractor will be engaged for responsible disposal to appropriately licensed waste disposal facility or for recycling
3.3	Utilities and Services - Steam system	Scale	Batch	Very little	General	Landfill	Specialist waste disposal contractor will be engaged for responsible disposal to appropriately licensed waste disposal facility or for recycling
3.4	Utilities and Services - Electrical	Transformer oil	Batch	Small/ Undefined	Hazardous	Recover (Sell)	Sell to an oil reprocessing company
3.5	General Plant	Building Rubble from plant maintenance upgrades / modifications	Batch	Small/ Undefined	General	Landfill	Approved Landfill site
3.6	General Plant	Fluorescent light bulbs	Batch	Small/ Undefined	Hazardous	Specialised Disposal	Specialist waste disposal contractor will be engaged for responsible disposal to appropriately licensed waste disposal facility or for recycling

5 ALTERNATIVES

5.1 Overview

Regulation 28(1)(j) of the NEMA Regulations (GNR 543) require that an environmental investigation needs to consider feasible alternatives for any proposed development. Therefore, the Department requires that a number of possible proposals or alternatives for accomplishing the same objectives should be considered.

5.2 Process to assess alternatives

In the case of the proposed development, possible alternatives were identified through discussions with authorities, discussions with Interested and Affected Parties (I&APs), reviewing of existing environmental data, specialist inputs/studies and the Applicant.

5.2.1 Preliminary Environmental Assessment Site Alternatives considered

Prior to the EIA application a Preliminary Environmental Assessment (PEA) was undertaken in order to assess two different site alternatives within the SBLM:

- Portion 6 of the farm Langeberg 188 (Alternative Site 1); or
- Portion 0 of the Farm Uyekraal 189 (Alternative Site 2).

A map illustrating the localities of these two sites is shown in **Figure 5-1**. These two sites were visited by an Archaeologist and an Ecologist to assist with determining the best site option for the proposed plant. Positioning the plant closer to the Saldanha Port Terminal were originally considered, but was deemed unfeasibly due to the high baseline dustfall levels in the area as well as the predicted future increases in dustfall in the area (Burger & Krause, 2011). Should there be high dustfall levels in the vicinity of the proposed SP it will have the potential to negatively impact on product quality and for this reason such areas should be avoided.

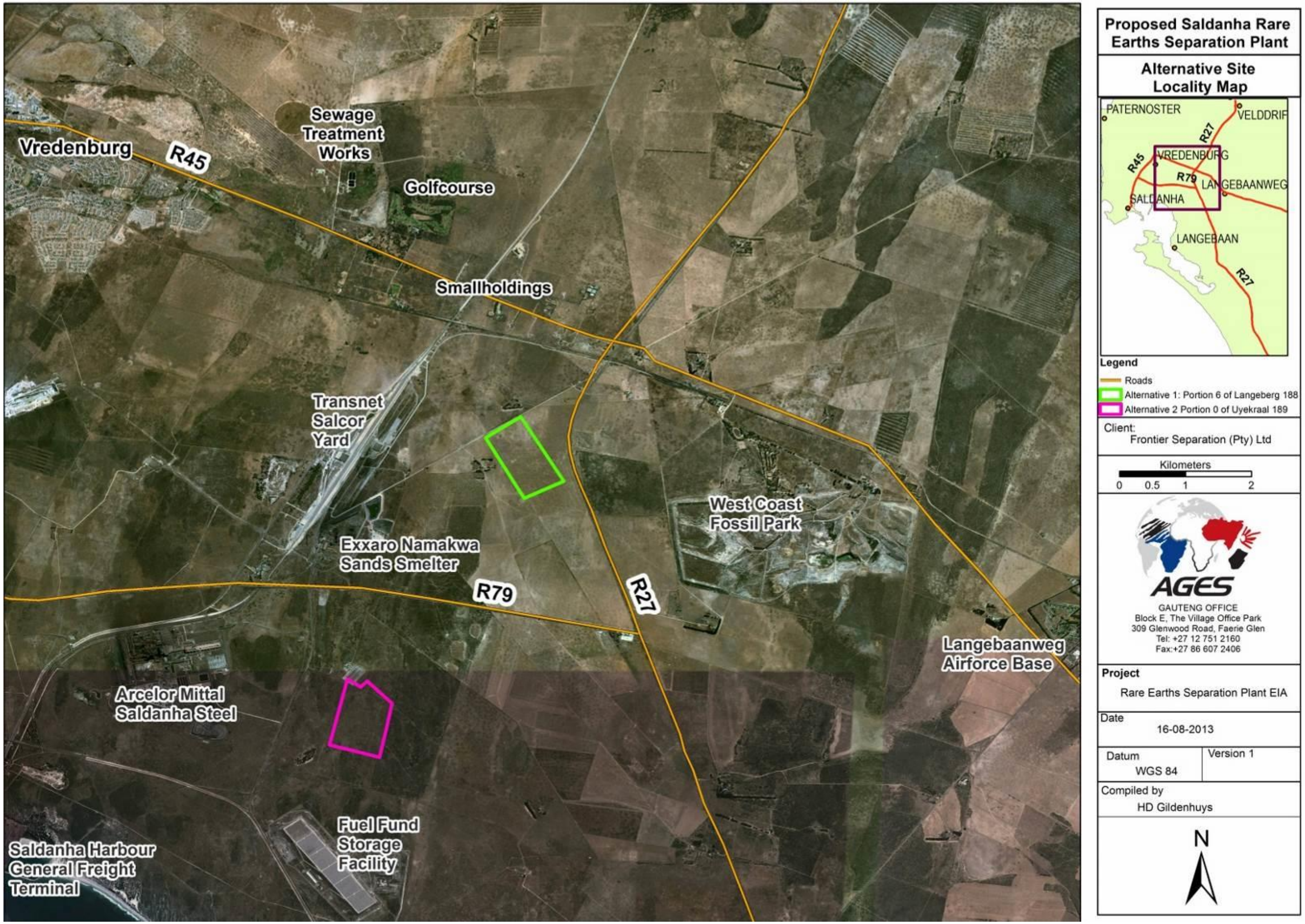


Figure 5-1 Alternative Site Localities considered as part of the Preliminary Environmental Assessment.

5.2.1.1 Portion 6 of Langeberg 188 (Alternative Site 1 –Site proposed in this EIA)

5.2.1.1.1 Heritage

As reported in Section 6.1.10 below, a site visit by an Archaeologist (Mr N. Kruger from AGES) did not identify any archaeological sites. No Stone Age, Iron Age farmer, Historical / Colonial Period and recent times or grave sites where found during the survey.

5.2.1.1.2 Ecology

As mentioned in Section 6.1.4 above, Alternative Site 1 will be located within an area of Low botanical conservation value, and no threatened plants are likely to be impacted.

The Saldanha Fine Scale Conservation Plan (Pence 2008) did not identify this area as important in terms of terrestrial or aquatic biodiversity as it falls outside any areas identified as Critical Biodiversity Areas (CBAs). No CBAs were also found immediately adjacent to the proposed site (refer to **Figure 5-2**).

5.2.1.1.3 Infrastructure

Alternative Site 1 can in future potentially provide access to rail infrastructure. Rail access could have a positive impact to alleviate road congestion in the area. A railway siding is being considered for the Industrial Area and therefore rail transport is seen as an alternative future transport method.

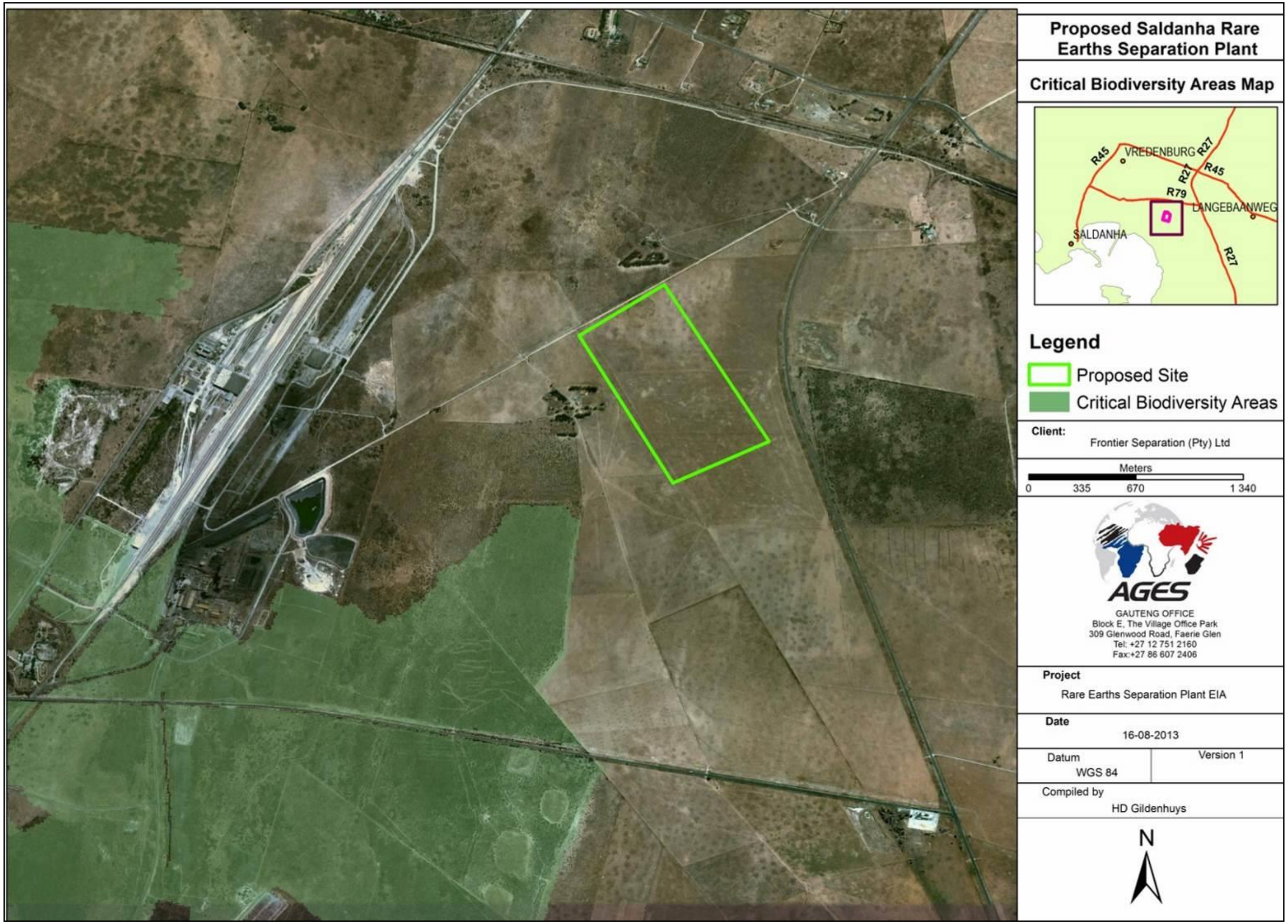


Figure 5-2 Alternative Site 1 in relation to the Saldanha Municipality Fine Scale Conservation Plan's Critical Biodiversity Areas (Pence 2008).

5.2.1.2 Portion 0 of Uyekraal 189 (Alternative Site 2)

5.2.1.2.1 Heritage

During the archaeological survey conducted by Mr Neels Kruger from AGES on Alternative Site 2 (Portion 0 of the farm Uyekraal 189), isolated Middle Stone Age (MSA) and Later Stone Age (LSA) material were documented, which included a few limestone and quartz MSA and LSA flakes randomly scattered across the property, and scattered ostrich eggshell fragments possibly related to other LSA material occurring in the area. Refer to **Figure 5-3** below.

A Colonial period foundation structure and midden rich in material culture were located on the south-eastern boundary of Alternative Site 2 (**Figure 5-4**). The square stone foundation structure, measuring approximately 2m x 3m has been ruined and is dilapidated. A small household dump heap, measuring approximately 4m x 3m occurs directly north of the foundations structures. The midden, which contains glass fragments and glass objects, ceramic (porcelain) and faunal remains, seems to be largely intact and well preserved. The features might be associated with the early phases of settlement of the farm.

A number of large stone heaps are scattered across the property but the provenance and context of these features are not known (**Figure 5-5**). It is however unlikely that the heaps are archaeological or historical in nature (Kruger; 2014).

Refer to **Figure 5-6** for a Heritage Sensitivity Map.

Figure 5-3 Artefacts observed at Uyekraal (from left to right): possible LSA Ostrich eggshell, LSA quarts flake, Colonial Period porcelain and glass and MSA limestone flake.

Figure 5-4 Stone foundation structure and midden (left).

Figure 5-5 Large stone heaps of unknown origin or context occurring widely in the survey area.

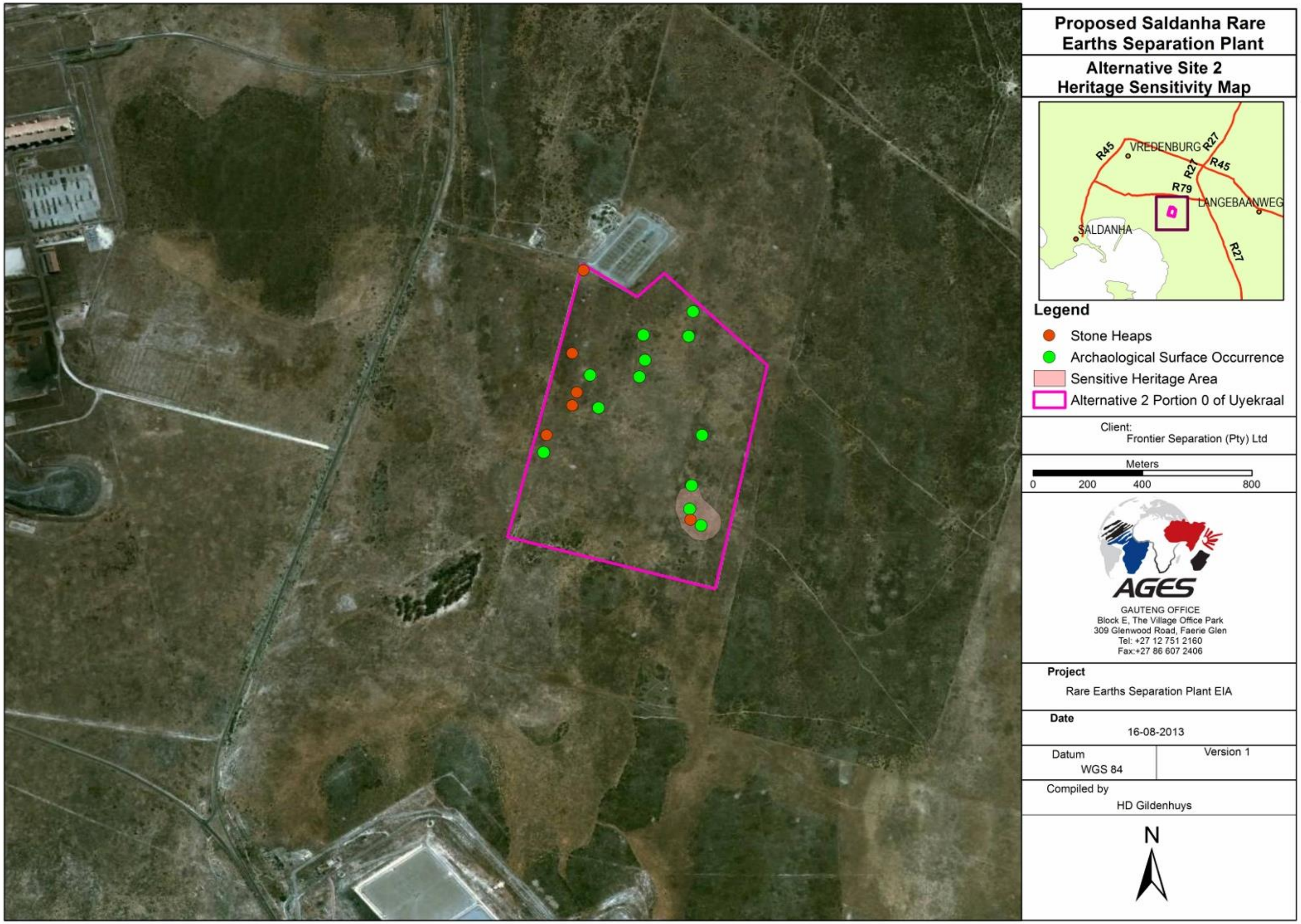


Figure 5-6 Heritage Sensitivity Map for Alternative Site 2.

A large number of archaeological sites have been recorded along the West Coast of South Africa, and it is a reflection of the palaeontological, archaeological and historical diversity of this area. From an archaeological perspective, the coastal zone is particularly sensitive due to the presence of Middle Stone Age sites that show evidence of early use of marine resources and archaeological and palaeontological sites that contain ancient human remains. Equally important are the palaeontological resources of the broader area and Colonial remains elucidating cultural contact and continuity on the Cape frontier in the last 500 years. Consequently, the Saldanha Bay area is likely to produce evidence of fossil faunas, and/or evidence for marine transgressions and regressions, and a range of other preserved remains. Therefore, the significance of sites located at Uyekraal should not be considered in isolation, but rather in terms of its position in this rich archaeological and historical landscape.

The Stone Age material at Uyekraal occurs in low densities in open contexts and their original positions have probably been lost due to agriculture activities which has altered large portions of the surface soil in the study area. These occurrences are therefore of low significance.

The Colonial Period midden and foundation can typically be related to early Colonial farming activities in the area. The site is of medium significance as it might potentially inform on a wider conception of a rich Western Cape Colonial history.

5.2.1.2.2 Ecology

A site visit was undertaken by Mr Nick Helme from Nick Helme Botanical Surveys on 17 June 2011 and again on 15 August 2011. The study site, although covered with what could be termed indigenous vegetation, has been disturbed in the past, so that the vegetation present today is not pristine. The large piles of calcrete rocks visible in parts of the site are a clear indication that the site was at least ripped, probably about 30 or 40 years ago. The landowner at the time was probably trying to improve grazing for livestock, and presumably sowed the ripped area with a grazing grass, possibly *Cynodon dactylon* (fynkweek), which is still present on site. The site is currently heavily grazed by cattle. Overall botanical species diversity on site is Low – Moderate when compared to undisturbed adjacent areas of the same habitat type, and botanical sensitivity is also Low - Moderate at a regional scale.

Two plant Species of Conservation Concern (SCC) were recorded in the study area, and there is a Low to Moderate likelihood that one or two others may be present in the area. *Otholobium bolusii* (Fabaceae) is Red Listed as Near Threatened. *Afrolimon capense* (Plumbaginaceae) is Red Listed as Near Threatened (Raimondo *et al* 2009). This typical limestone species is common on limestones (or calcretes) in the region.

The site is surrounded by areas delineated as Critical Biodiversity Areas (CBA) according to the Saldanha Municipality's Fine Scale Conservation Plan (Pence 2008). Furthermore the north-eastern section of the site falls within a CBA.

5.2.1.2.3 Infrastructure

Access to the railway line will be more challenging compared to Alternative Site 1 as the site is located further away from the existing railway line.

5.2.1.3 Overview of site selection

Site	Heritage	Ecology	Infrastructure
Langeberg (Alternative Site 1)	No archaeological sites were identified on this site.	The site is largely disturbed. No Critical Biodiversity Areas were found on or adjacent to the site.	Alternative Site 1 can in future potentially provide access to rail infrastructure as it is within close proximity to an existing railway line.
Uyekraal (Alternative Site 2)	Various artefacts were found on the site. A Phase 2 Archaeological Assessment will be required. Such measures should minimally include the sampling of cultural and other remains that will adequately allow the temporal, cultural and spatial classification of the site, the mapping of the site and further desktop studies in order to contextualize the site within the larger historical landscape.	Two plant Species of Conservation Concern (SCC) were recorded in the study area, and there is a possibility that one or two other such species may be present in the area. The site itself partly falls within a Critical Biodiversity Area, and is also largely surrounded by Critical Biodiversity Areas.	Rail access to the site will be more difficult as it is located further away from an existing railway line compared to Alternative Site 1.

Considering the ecological and heritage significance of the two alternative sites, as well as access to rail infrastructure, Alternative Site 1 is considered to be the preferred alternative.

This alternative site on Portion 6 of the farm Langeberg 188 was therefore taken further into the EIA process as the preferred alternative site.

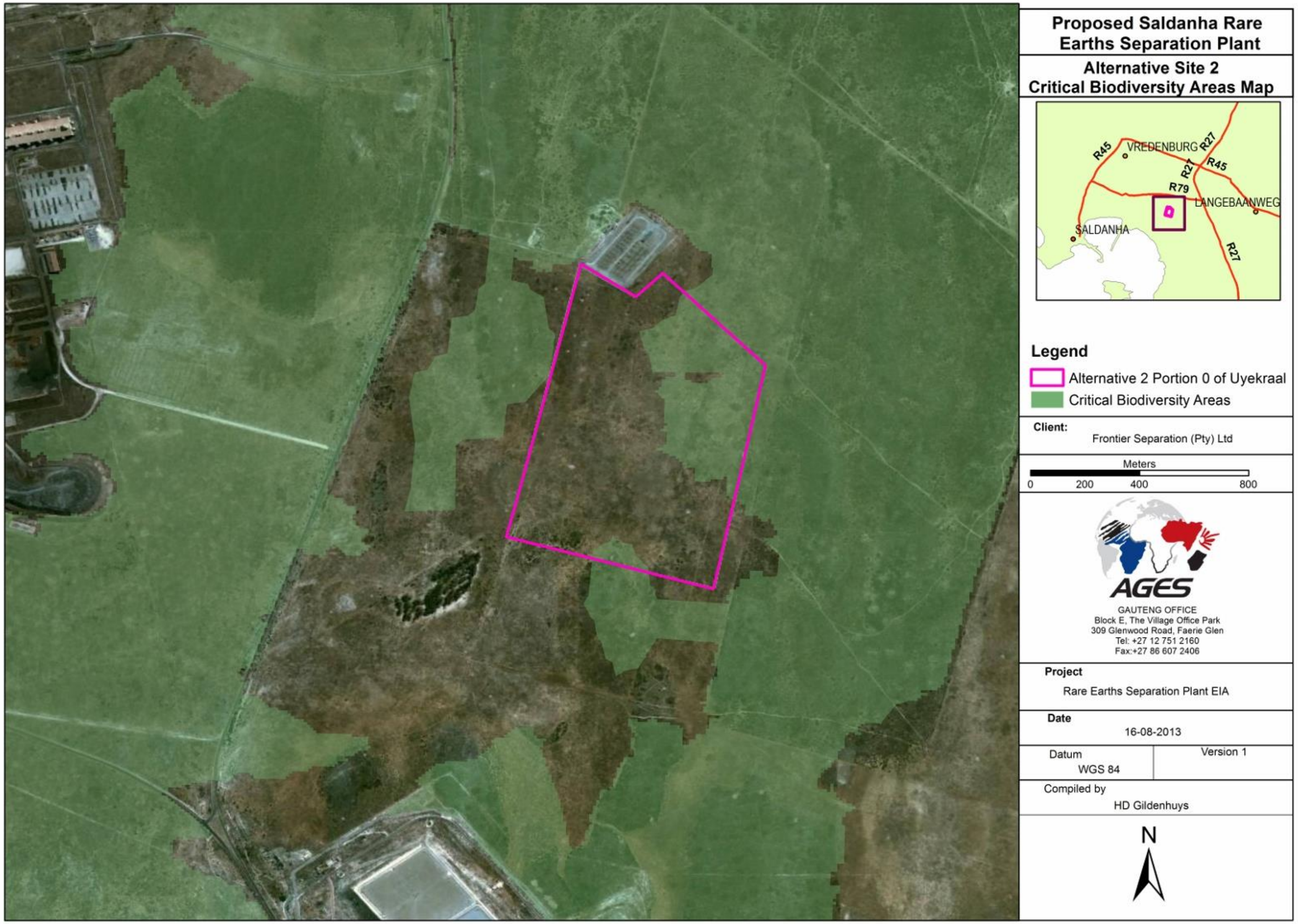


Figure 5-7 Alternative Site 2 in relation to the Saldanha Municipality Fine Scale Conservation Plan's Critical Biodiversity Areas (Pence 2008).

5.2.2 Alternatives considered as part of the EIA phase

The alternatives assessed included:

- Technology Alternatives;
- Service Alternatives; and
- Status quo / no-go alternative.

5.2.2.1 Technology alternatives

Various technology alternatives were identified and are assessed below. These relate to the following aspects:

1. Process Water Treatment Alternatives;
2. Brine Disposal Alternatives;
3. Mixed Rare Earth Carbonate Waste Disposal Alternatives; and
4. Boiler Fuel Alternatives.

5.2.2.1.1 Process Water Treatment Alternatives

Three reverse osmosis process water treatment alternatives were investigated in a study by SCN Lavelin (Willis *et al*., 2013):

- Alternative 1: Full bleed of process brine (no process waste water recycling);
- Alternative 2: Reverse osmosis combined with thermal treatment with moderate process brine bleed (i.e., moderate water recycling); and
- Alternative 3: Reverse osmosis combined with thermal treatment of the full process waste water (i.e. maximum water recycling).

5.2.2.1.1.1 Process Water Treatment Alternative 1

For Alternative 1, the Reverse Osmosis (RO) system is comprised of four RO units, which are designated as RO #1, RO #2, RO #3 and RO #4 respectively. The four units are similar in design although vary in sizes and operational parameters such as feed pressure and recovery. An **evaporator/condenser is not required** since no recovery from process waste water is attempted via this approach.

Raw domestic water is treated by using RO #1 and RO #2 in series to produce high quality process water with a TDS of less than 5 mg/l. The concentrate from RO #1 feeds RO #3 following a pre-treatment. The product permeate from RO #3 is combined with RO #2 concentrate to feed a fourth unit – RO #4. The permeate from RO #4 (TDS ~ 5 mg/l) is directly recycled back to the process water tank. RO #4 concentrate (TDS ~ 740 mg/l) is recycled to mix with raw water and feed RO #1.

Full bleed of process waste water, combined with RO #3 concentrate, forms the final brine for disposal. As a result of this alternative, there is **no recycle of process waste water**.

5.2.2.1.1.2 Process Water Treatment Alternative 2

For Alternative 2, in order to recover water from the process effluent brine, an **evaporator/condenser will be required** in addition to the four RO units and other supporting treatment.

Similar to Alternative 1, raw domestic water is treated using two RO units, RO #1 and RO #2, to produce the process water with the required quality of less than 5 mg/l TDS. The concentrate from RO #1 feeds RO #3 following pre-treatment. The product permeate from RO #3 is combined with RO #2 concentrate and the evaporator/condenser condensate to feed a fourth unit, RO #4. The permeate from RO #4 (TDS ~ 5 mg/l) is directly recycled back to the process water tank. RO #4 concentrate (TDS ~ 1600 mg/l) is recycled to mix with raw water and feed RO #1.

In contrast to Alternative 1, only a **moderate bleed of process waste water** is combined with RO #3 concentrate and the evaporator/condenser brine to form the final brine. The remaining amount of process waste water is pre-treated and then processed in the evaporator/condenser for recovery. As a result of this alternative, **moderate water recycling** is achieved.

5.2.2.1.1.3 Process Water Treatment Alternative 3

The process for Alternative 3 is very similar to that of Alternative 2, except that there is no bleed of process waste water. Alternatively full process waste water is **treated by** the **evaporator/condenser**, immediately following chemical and physical pre-treatment.

For this alternative, **water recycling** is close to if not **fully maximized**. Alternative 3 is attempting to achieve the maximum recovery possible by this combined treatment system and provides an indication of the **minimum amount of raw water supply** required based on similar assumptions, regardless of overall system cost.

5.2.2.1.1.4 Overview of Technology Alternatives

Table 5-1 provides a comparison between the three RO water treatment alternatives investigated.

Table 5-1 Comparison between RO Water Treatment Alternatives

	Alternative 1	**Alternative 2**	**Alternative 3**
Technology	Evaporator/ condenser not required	Evaporator/ condenser required	Evaporator/ condenser required
Recycling	Full bleed of process waste water. No recycling of process waste water.	Moderate bleed of process waste water, moderate water recycling.	No bleed of process waste water. Recycling fully maximized.
Waste Sludge Generated (m^3/h)	1	3.4	5.4
Waste Sludge Generated (m^3/annum)	8640	29376	46656

Alternative 1 provides lowest generation of waste sludge, however process water is not recycled, while Alternative 3 maximizes water recycling and generates an enormous amount of waste sludge.

The waste sludge would consist mainly of NaCl and the City of Cape Town's Solid Waste Management Department has indicated that they are unable to accept a salt waste sludge at Vissershok due to the high saline load (refer to a letter from the City of Cape Town attached as Appendix S). Since there is currently no disposal facility able to accept this waste sludge it was decided to exclude the reverse osmosis process water treatment alternatives for the project but rather include for alternative water treatment processes.

5.2.2.1.2 Brine disposal alternatives

The treated industrial liquid effluent emerging from the proposed SP will predominantly be a sodium chloride (table salt), salt brine solution with trace levels of other elements. The following options have been identified for the potential treatment and disposal of the salt effluent stream:

1. Disposal to one or more of the existing local WWTW;
2. Constructing evaporation ponds to generate salt for responsible disposal;

3. Evaporating and crystallising the effluent to generate salt for responsible disposal;

4. Evaporating and crystallising for re-use of salt; or

5. Sea disposal of the effluent via the SRMO Project.

The following aspects are important to note in terms of the brine effluent that will be produced. The SP is proposed to produce 140 m^3/hour of effluent. The estimated density of the effluent is 1 050 kg/m^3 while the expected temperature will range between 18°C and 25°C. The pH is expected to vary between 5 and 8.5.

The effluent brine is made up of 132 g/l of sodium chloride with a maximum total of 1.1 g/l of all other impurities. The most significant other impurity is oxalate at 0.42 g/l. This chemical has a tendency to scale (a hard mineral coating that forms on the inside surfaces of heating equipment like boilers and kettles) and needs to be removed prior to evaporation. Similarly, calcium and magnesium also cause scaling.

Disposal at the Saldanha, Vredenburg and Langebaan Waste Water Treatment Works were considered in a study by Royal HaskoningDHV (McPherson & Van Eeden, 2013); while Process Projects investigated the other three alternatives (Zietsman, 2013). These four brine disposal alternatives are discussed below in terms of their practical, financial and environmental feasibility.

5.2.2.1.2.1 Disposal to existing local waste water treatment works

The study by Royal HaskoningDHV found that the Saldanha WWTW has hydraulic capacity available compared to the plants at Vredenburg and Langebaan, but has no organic capacity available. The Vredenburg plant was the only plant with available organic capacity. Furthermore the effluent is expected to raise the electrical conductivity in the plants to well above the allowable general limit of 150 (mS/m) and excessive chlorine concentrations will have a detrimental effect on the process treatment at the plants. The chlorine will oxidise any organic matter and destroy the bacteria, breaking down the organics and thus remove all activated sludge treatment at the wastewater treatment plants (McPherson & Van Eeden, 2013).

The study by Royal HaskoningDHV concluded that the brine effluent cannot be treated at any of the three waste water treatment plants in their present form and that other alternatives needed to be assessed (McPherson & Van Eeden, 2013).

5.2.2.1.2.2 Constructing evaporation ponds to generate salt for responsible disposal

The study by Process Projects (Zietsman, 2013) stated that calculations based on an evaporation rate of 1.3m/year and adjusted for the influence of high salt concentrations in the effluent brine indicate that 45 ha of evaporation ponds are required to process 70 m^3/hour of effluent brine for Phase 1. In the process, some 57 000 tons/year of salt will be produced. This waste salt will have to be disposed of at an acceptable disposal site.

Both the City of Cape Town and EnviroServe confirmed in writing that the Vissershok disposal facility will not be able to accept the waste salt produced. Furthermore, as the containment walls of the evaporation ponds will be 3m high, evaporation ponds will have a major visual impact on the area and, since the ground water table is in places as shallow as 2.7 m below surface (refer to Section 6.1.7.1.3 below); groundwater contamination is a possibility and therefore a concern (Zietsman, 2013). The establishment of evaporation ponds may lead to:

- The requirement of additional sprays may be required to assist with evaporation that may end up in contaminating ground water as the wind may blow spray over the evaporation ponds;
- Possible leakage of the lining material that may lead to a salt load building up in the Langebaan Road Aquifer below the site;
- Possible deterioration of foundation structures; and
- Groundwater levels rising if lining leakage does occur.

These impacts on the site and beyond the site may lead to the probability that the Langebaan Aquifer may be impacted on in the long term. The geology of the aquifer consists of sand to an expected depth of 50 to 60 metres. The unsaturated zone of the aquifer below the site consisting of sand does not have the ability to buffer the inflow of brine into the saturated zone. The surface deposits consisting of fine sand have very low clay content that have high permeability figures.

The establishment of these evaporation ponds will possibly increase the risk of contaminating the Langebaan Road Aquifer. This option is consequently considered to be neither visually desirable, nor practically implementable and might pose a risk of groundwater contamination.

5.2.2.1.2.3 Evaporating and crystallising to generate salt for responsible disposal

An alternative to evaporation ponds is to use evaporative crystallisers to produce waste salt and recover water for reuse. While the overall impact of this option is perceived to be lower due to the lower impact to the groundwater and smaller footprint size, the disposal of the produced waste salt, still remains unsolved since Vissershok cannot accept the waste salt (Zietsman, 2013).

5.2.2.1.2.4 Evaporating and crystallising for re-use of salt

The CAPF has indicated that they would be willing to utilize a moist salt at their proposed neighbouring plant, provided that impurities in the salt have been reduced to acceptable levels. The process of producing a salt to a standard acceptable to CAH will require the precipitation of non-sodium chloride (NaCl) salts, followed by the reduction of the residual metals using either nano-filtration or ion exchange.

Furthermore, a suitable disposal site for the produced sludge (the non-sodium chloride precipitated salt) has to be identified. As already mentioned, Vissershok have confirmed that they will not be able to accept the waste salts. The cost to produce the salt through this option (crystallisation and impurity removal) is estimated at R2 059.00 per ton of salt, which will be uneconomical, if compared against the cost to deliver salt from Walvis Bay to Saldanha at between R700 and R850 per ton of salt. Re-using the salt at the neighbouring CAPF will therefore not be economically viable.

5.2.2.1.2.5 Sea disposal of the effluent (Saldanha Regional Marine Outfall Project)

The philosophy behind this option is as follows: The concentration of non-NaCl elements in the effluent brine are estimated at approximately 1 g/l (g/l = gram/litre or <0.1% by weight) compared to the NaCl concentration of 132 g/l (approximately 10% by weight). Seawater contains about 3.5% dissolved salts that is mostly NaCl. As a result, the impact of disposing NaCl into seawater will be minimal while the small amount of non-NaCl ions will add to the ions already in seawater. The impact of this falls outside the scope of this EIA and is the subject of a separate EIA (EIA Reference no: 16/3/1/2/F4/17/3009/13).

Sea disposal would involve the building of a terrestrial pipeline from both the SP and the CAPF to Danger Bay for disposal. Danger Bay is located west of Saldanha. The brine will be pumped through a marine outfall into the Atlantic Ocean either by Frontier Saldanha Utilities (Pty) Ltd or together with the proposed WCDM) desalination plant's brine outfall. The future regional WWTW planned by the SBLM is also planning to use the effluent pipeline for disposal of treated effluent (Zietsman, 2013). Sea disposal seems to be the only feasible alternative from a practical point of view and will be further investigated as part of the EIA for the SRMO Project. Should the EIA for the SRMO project indicate that the project is not acceptable from an environmental perspective further alternatives will need to be investigated.

5.2.2.1.3 Mixed rare earth carbonate waste disposal alternatives

The solid waste settling pond provides temporary onsite waste storage for up to six months from the following two major feed sources besides precipitation:

- Insolvable solids contained in the SP concentrate feed; and
- Mixed rare earth carbonates of Ho/Er/Tm/Yb/Lu.

Approximately 75-150tpa solid mixed rare earth carbonates of Holmium, Erbium, Thulium, Ytterbium and Lutetium and 350-700tpa of insoluble MRES will be produced. The following alternatives are considered:

1. Sell if a market can be found,
2. Disposal at an appropriately licensed waste disposal facility (e.g. Vissershok).

At present there is no market for these mixed rare earth carbonates and therefore Alternative Option 1 is not an option. However, it is possible that these rare earth carbonates could potentially become valuable in future and in such a scenario disposal at a public waste disposal facility would mean a loss of revenue to Frontier Separation as it would be impossible to retrieve the mixed rare earth carbonates.

5.2.2.1.4 Boiler Fuel Alternatives

A Boiler System will be required at the SP with a steam generating capacity of 5t/h of steam at a pressure of 10 Bar. Coal and Liquid Petroleum Gas (LPG) was considered as fuel alternatives for the proposed boiler system. Electrical boilers were also initially considered, but are not deemed suitable due to the high cost of electricity as well as the limited electrical power capacity available in Saldanha Bay.

For a constant 5t/h steam generation capacity two 5t/h boilers were assumed to be required as legislation requires that annual maintenance and inspections need to take place. Therefore only one boiler may be operational for a certain period of the year.

The following aspects were considered when evaluating Boiler Fuel Alternatives:

1. Emissions
2. Operational Cost
3. Capital Cost

5.2.2.1.4.1 Emissions:

Coal contains more sulphur than LPG and therefore coal fired boilers can be expected to emit more SO_2 than LPG fired boilers, however additional capital cost can be invested to install an abatement system that will reduce the SO_2 emissions to similar values compared to LPG fired coal boilers.

5.2.2.1.4.2 Operational Cost:

The annual fuel cost for a LPG boiler will by far exceed the cost compared to a coal fired boiler. The use of LPG is expected to be far more expensive compared to coal. A coal fired boiler will have an estimated annual operational cost of R17 558 484.35 compared to R100 201 066.46 for a LPG fired boiler. This is a difference of R82 642 582.11 per annum.

5.2.2.1.4.3 Capital Cost:

The Capital Cost for LPG and coal fired boilers are similar estimated at R 15 m. However coal fired boilers will require additional capital for a scrubber system, coal storage facility and ash conveying, transport and storage system estimated at R 32 .5m.

5.2.2.1.4.4 Boiler Fuel Alternatives Summary

From a Capital Cost perspective the coal fired boilers including utilities are more expensive than the LPG boilers; however the high operation cost of an LPG boiler will ensure that the additional capital cost of the coal boilers will be paid back within the first year of operation.

A baghouse will be installed on the coal boilers, while all other stacks will have scrubbers. Boiler emissions estimated by Airshed Planning Professionals in the Air Quality Impact Assessment (Appendix I) were below the small boiler emissions published in the Government Gazette on No. 36973 (refer to Section 7.8). Therefore even though coal is expected to have a higher sulphur content than LPG, the abatement measures that will be applied ensured that an impact of Negligible Magnitude was rated by Airshed in terms of the impact assessment criteria.

Coal is therefore deemed to be the preferred alternative from a Boiler Fuel perspective.

5.2.2.2 Service alternatives

Alternatives with regards to Service Provision have been evaluated during the EIA phase. The services under which different alternatives have been considered include:

- Access Roads
- Sewage
- Water Supply

5.2.2.2.1 Access Roads

Two alternative access roads were evaluated (refer to Figure 5-8 for an illustration):

- Alternative A – 1.44 km west of the TR77_1/TR85_1 intersection
- Alternative B – 2.84 km west of the TR77_1/TR85_1 intersection

ITS Engineers compiled a conceptual Access Management Plan for the industrial area during 2008, while in 2013 AECOM prepared a Road Network Plan for the Saldanha Municipal Area. Initial planning by ITS for access to the Separation Plant made use of Access Alternative A. However, due to AECOM's planning of the TR85/1 as an abnormal truck route with limited interchange access only, Alternative A were not supported by the Provincial Roads Authority. Based on the above Road Network Plan, Alternative B will be the preferred access.

At the time of completion of the Traffic Impact Assessment study the access position had been confirmed as that of Alternative B. All the intersections of Route Alternative B are currently operating at acceptable Levels-Of-Service (LOS) during all peak periods. Therefore no upgrades are proposed from an intersection capacity point of view. The available Shoulder Sight Distance (SSD) at both access alternatives was evaluated. The TR85/1 is relatively straight and flat and therefore a SSD of more than 300 meters is available. The servitude for the proposed access road will be 25 metres wide, which should be sufficient to accommodate further development on the larger property. Please note that the authorisation of the above access road is subject to a separate Basic Assessment Process (DEADP Reference: E12/2/4/1-F4/22-3001/12).

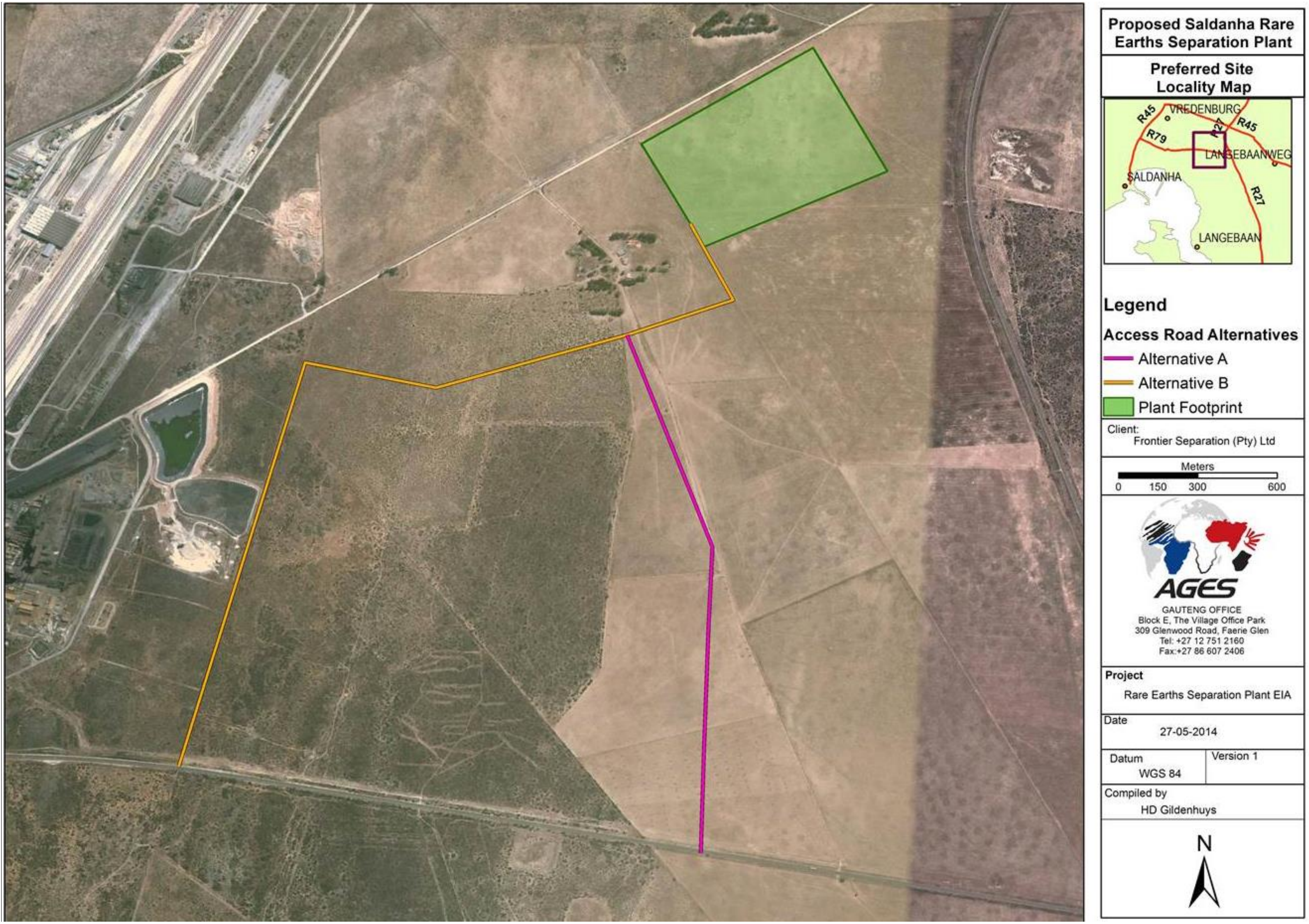


Figure 5-8 Aerial Photograph indicating alternative access roads A and B

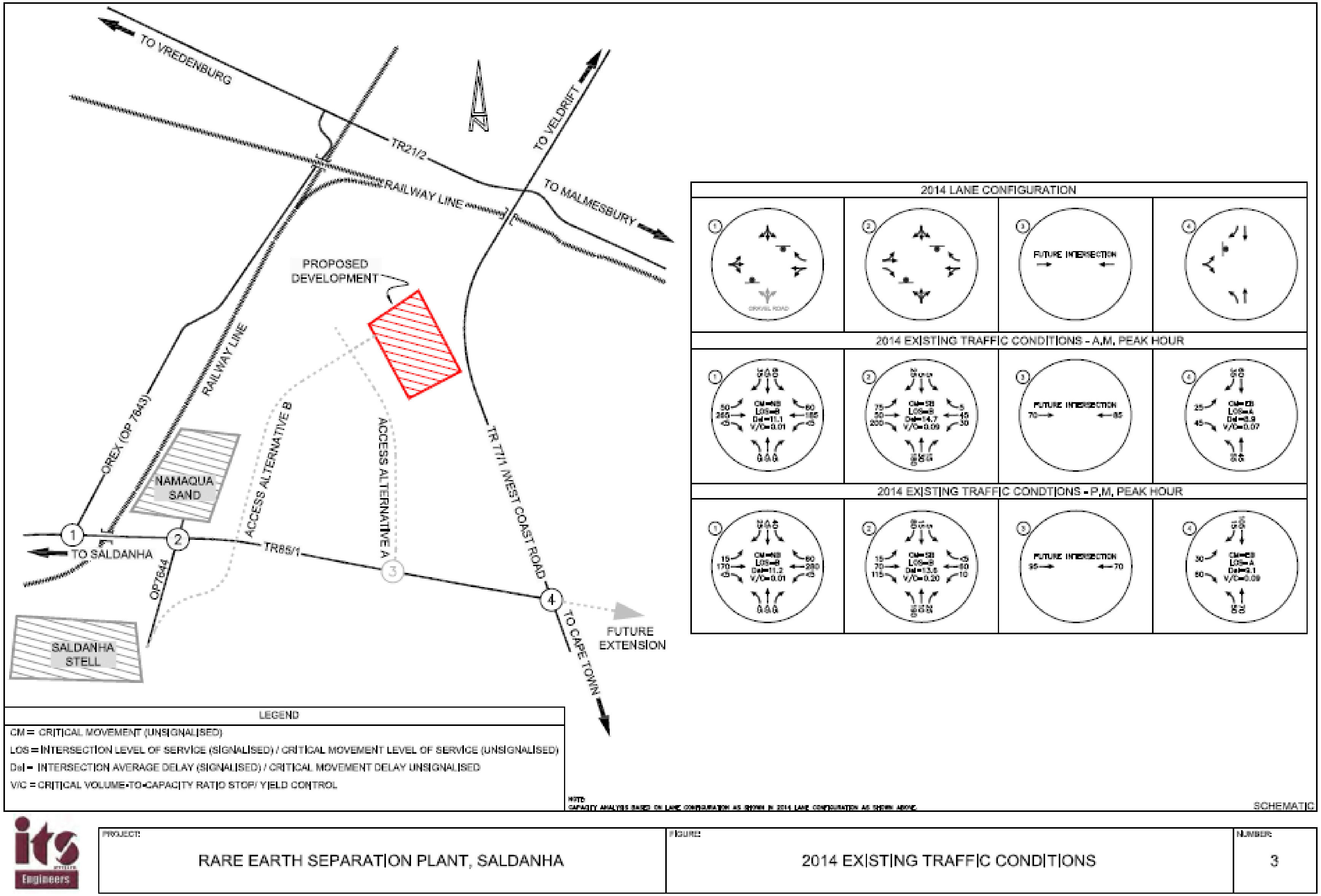


Figure 5-9 Conceptual Access Plan Sketch indicating both alternative access roads A and B

5.2.3 No-Go Alternative

One of the options to be considered as part of the EIR is that of the no development option. This would entail leaving the site in its present state and not developing the proposed plant and associated infrastructure or any of the proposed alternatives.

It is the opinion of the majority of specialists that in the event that the proposed plant is not constructed that the status quo will be maintained. The no-go alternative will imply that virtually none of the identified impacts of proceeding with the project will be incurred. But some of the environmental aspects will continue to be impacted upon even though the plant is not developed due to existing impacts currently taking place or future developments that are planned for the area. The site falls within the proposed industrial corridor; an area that is earmarked in the SDF of the Saldanha Local Municipality to become a future industrial area.

The benefit of the development of this proposed plant includes aiding the need to add value to raw materials mined within South Africa in order to realise the economic opportunities provided by the downstream processing of the raw materials. Through the “Amendment to the Broad-Based Socio-Economic Empowerment Charter for the South African Mining Industry” (Department of Minerals and Energy, 2010), the South African Government encourages the downstream beneficiation of raw materials, by the mining industry.

The no-go alternative has been assessed against impact categories as described in the sections below:

5.2.3.1 Groundwater Impacts

Should the SP not be constructed, the potential impacts identified in Section 7.7.2, namely contamination of groundwater resources will be avoided. Future surface water impacts can however not be excluded due to the plans to convert the area into an industrial development corridor.

5.2.3.2 Surface water Impacts

Since potential surface water impacts are linked to local storm water management and management of contaminated rainwater runoff, the no-go alternative will result in no immediate impacts to surface water. These impacts are however expected to be of low to negligible significance due mitigation measures that will be in place and also as there are no drainage lines, rivers or wetlands within the vicinity of the proposed site.

Future surface water impacts can however not be excluded due to the plans to convert the area into an industrial development corridor.

5.2.3.3 Fauna and Flora Impacts

The no-go alternative will result in lower levels of negative impact on the receiving ecological environment. The proposed site has been disturbed by agricultural activities and therefore the baseline ecological value for the site has been altered significantly. Future impacts to the ecological environment cannot be excluded as a result of the plans to convert the larger area into an industrial corridor.

5.2.3.4 Heritage Impacts

Due to the fact that the proposed development site is of low archaeological sensitivity, neither the no-go alternative nor the proposed development will have any significant impact on heritage resources.

5.2.3.5 Visual Impacts

The no-go alternative would result in lower levels of negative impact on the receiving visual environment. The rural character of the surrounding environment will not be altered. The ‘No-go’ Option will not change the visual impact on the area in the short term, however the long term plans of converting the area into an industrial development corridor will result in the visual impacts taking place in any case. Long term impacts to the visual environment in the absence of the proposed plant can therefore not be excluded.

5.2.3.6 Air Quality Impacts

Should the plant not be constructed, the potential air quality impacts identified during the Air Quality Impact Assessment (Appendix I will not occur. However, the no-go alternative does not imply that the impacts on air quality is not currently being experienced in the area and will in future not take place. Existing industries in the areas do impact the air quality in the vicinity of the existing industrial areas. Available ambient monitoring data indicate elevated PM_{10} concentrations in the immediate vicinity of existing industries in exceedence of NAAQS. Ambient PM_{10} levels at residential areas (Blouwater Bay and Vredenburg) are however low and compliant with NAAQS. Ambient NO_2 and SO_2 concentrations are within NAAQS.

5.2.3.7 Noise Impacts

The no-go alternative will result in no impact on the receiving noise environment, even though future industrial developments might cause future noise impacts. Important to note is that the noise impact from the plant is expected to be negligible (Section 7.9.6).

5.2.3.8 Traffic Impacts

The infrastructure planning for the industrial corridor, in particular the upgrades to the road infrastructure, are expected to take place irrespective of whether the plant is constructed or not. The planned road infrastructure will accommodate the traffic to and from the plant and will also make provision for sufficient traffic flow to and from the adjacent industries.

5.2.3.9 Socio Economic Impacts

The positive and negative impacts highlighted in the Social and Economic Assessments would not be realised should the no-go alternative be selected. This includes employment creation (450 to 600 employment opportunities during construction and 145 to 150 permanent employment opportunities during operations) and other positive impacts on the macro-economic scale as well as the local community will be lost, but also negative impacts such as HIV and gender impacts as well as impacts associated with the influx of people etc. These impacts are however also expected to be realized, although the severity might differ) once the other developments in the industrial development corridor are being constructed and become operational.

5.2.3.10 Conclusion

Possible project impacts identified during the EIA process and specialist studies have been fed back to the project engineers. These impacts have been, together with the rest of the project team taken into consideration in developing the alternatives as discussed above. These design alternatives have reduced possible impacts. The impacts rated in Section 7 of this report have been rated on the best possible design alternatives chosen for the project.

This means that the following alternatives are considered as preferred alternatives:

- Portion 6 of the farm Langeberg 188 (Alternative Site 1);
- No reverse osmosis treatment of process water;

- Sea disposal of the effluent via the Regional Marine Outfall Project; and
- Coal as boiler fuel.

Access road alternative B is preferred, but the access road is not within this EIA's perspective and is subject to a separate basic assessment (refer to Section 5.2.2.2.1). The Mixed Rare Earth Carbonate Waste will preferably be disposed of at a waste disposal facility and the final disposal method will depend on whether a market can be found, as described in Section 5.2.2.1.3.

6 DESCRIPTION OF THE RECEIVING ENVIRONMENT

This section outlines the existing environment in the project area on which the SP and its operations will have an impact. Please refer to Figure 1-3 indicating the major towns, infrastructure, rivers and streams and existing operations in the study area.

In **Figure 6-1** below photographs of the site are depicted.

6.1 Biophysical Environment

6.1.1 Geology and Soil

6.1.1.1 Regional Geology and Soil

Tertiary and Recent Deposits

The Saldanha area is mainly covered by Tertiary to recent deposits. Belts of alluvium are found parallel to large rivers. White to pink sandy soil covers extensive areas. Brackish calcareous soil near the coast represents an old elevated sea-floor.

Sand dunes along the coast usually contain small shell fragments but around Vredenburg considerable tracts of dunes consist largely of comminuted shell with a very high lime content. Gravel beds are present on raised beaches and along the large rivers. Silcrete, ferricrete and surface calcrete occur very commonly but are of limited extent. Beach-deposits of gravel, grit, sand and large quantities of shell are occasionally well consolidated.

Unconsolidated to semi-consolidated sand and clay and local beach gravel occur beneath an overburden of sandy soil. The limestone varies from a hard rock to unconsolidated lime-rich sand. It contains local layers of marine shells however shells of land snails also occur very commonly. Whenever the featureless and massive surface calcrete crust is absent, the limestone displays bedding.

The shallow water marine deposits were evidently also subject to Aeolian action. All these marine deposits are phosphatoic at some localities. The prolific marine fossils have not yet been dated.

Figure 6-1 Site Photographs

Post Nama (Saldanha Langebaan Pluton)

A number of distinct Granite types are to be found in the Saldanha area. Three of these types occur near the proposed site area namely the Vredenburg Granite, the Saldanha Quart porphyry and the Hoedjiespunt Granite.

Vredenburg Granite

The Vredenburg granite is a quartz monzonite or amandellite. It is characterized by a reddish colour and is limited to a few outcrops such as Kleinberg. Vredenburg however is located on a large outcrop of this Amandallite or Granite. The granite is mainly coarse grained and porphyritic.

Saldanha Quartz Porphyry

The Saldanha Quartz Porphyry occurs near Saldanha and also in the direction towards Vredenburg from Saldanha. Quartz Porhyry is a hard, massive rock that weathers to the prominent boulders and bold outcrops. It is a chocolate-coloured rock without any conspicuous phenocrysts and consists of a fine - to medium-grained groundmass with scattered grains of quartz, feldspar and biotite.

Hoedjiespunt Granite

This coarse grained porhyritic granite occurs mainly in a narrow strip along the coast from Hoedjiespunt at Saldanha south to Langebaan

Refer to **Figure 6-2** for a regional Geological Map.

Geology and soil at the proposed site

At the proposed SP Site calcrete is found to a depth of 8 metres. The calcrete does not form a layer that can be recognised as a uniform geology with a specific thickness. The presence of the calcrete is rather in blocks and boulders mixed with wind-blown sandy layers of different thickness and different limestone content.

Sand and clay with an expected thickness of 40 to 50 m follows. The sand and clay layers may contain gravel fine and very fine sands alternated with clay lenses.

A sandy layer consisting of black sand that may be peat is expected to be below the sand and clay layer before the Vredenburg Granite is to be found at an expected depth of 50 to 60 m.

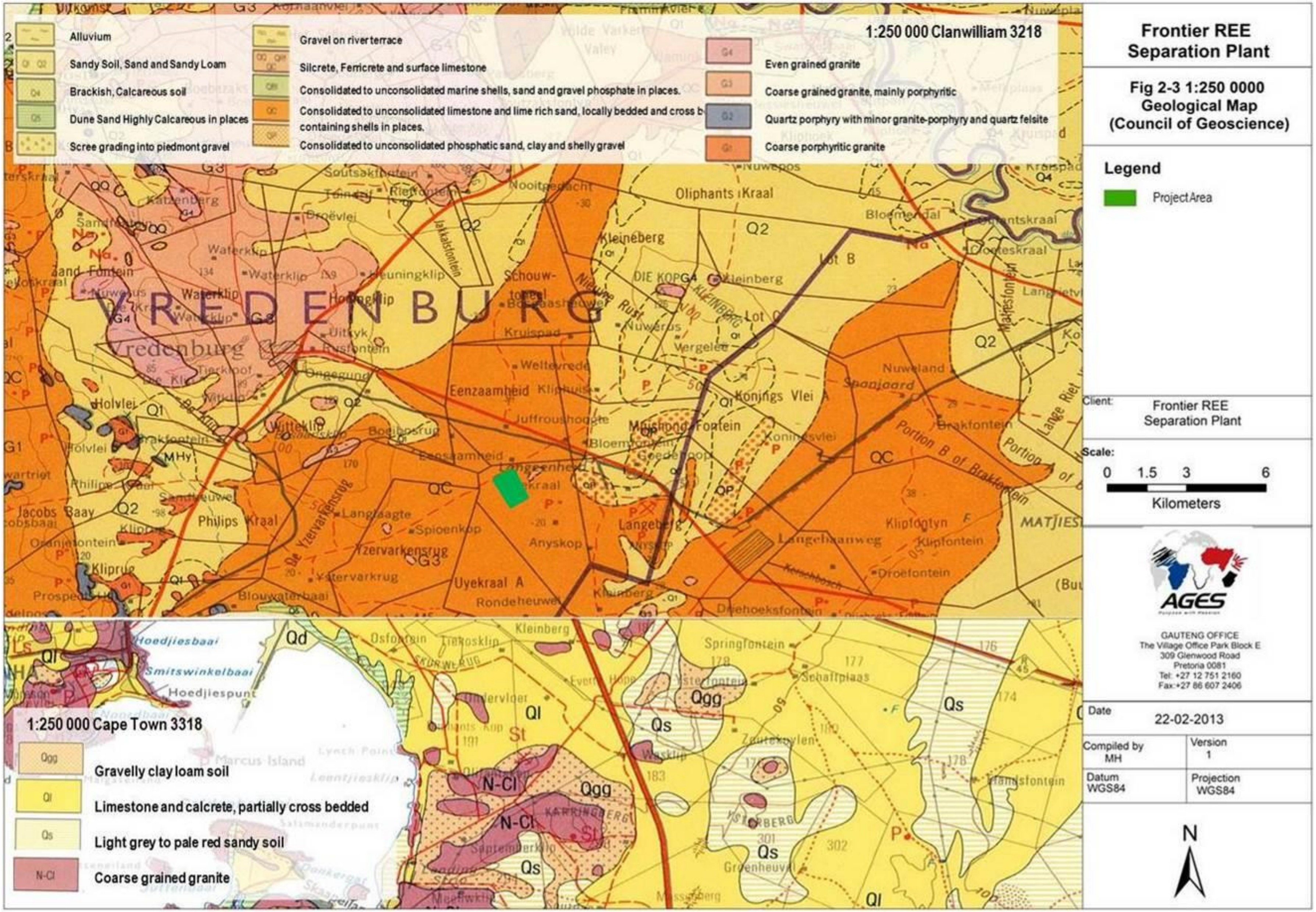


Figure 6-2 Regional Geology Map of Saldanha

Note that the two different geological maps Clanwilliam 3218 and Cape Town 3318 were combined for the image above. The geology was mapped to different levels for these maps .

6.1.2 Climate

6.1.2.1 Rainfall

Saldanha Bay falls within a winter rainfall region and receives most of its rain during June and July. The data from rainfall station 0060780 (Saldanha Bay Customs) was retrieved. The data was collected over a period of 116 years (1891 to 2007) and showed that Saldanha has a Mean Annual Precipitation (MAP) of 325 mm/annum. For average monthly rainfall figures refer to **Figure 6-3**.

The site is located in Evaporation Zone 23B which has a S-Pan Mean Annual Evaporation (MAE) of 1460 mm/a.[5]

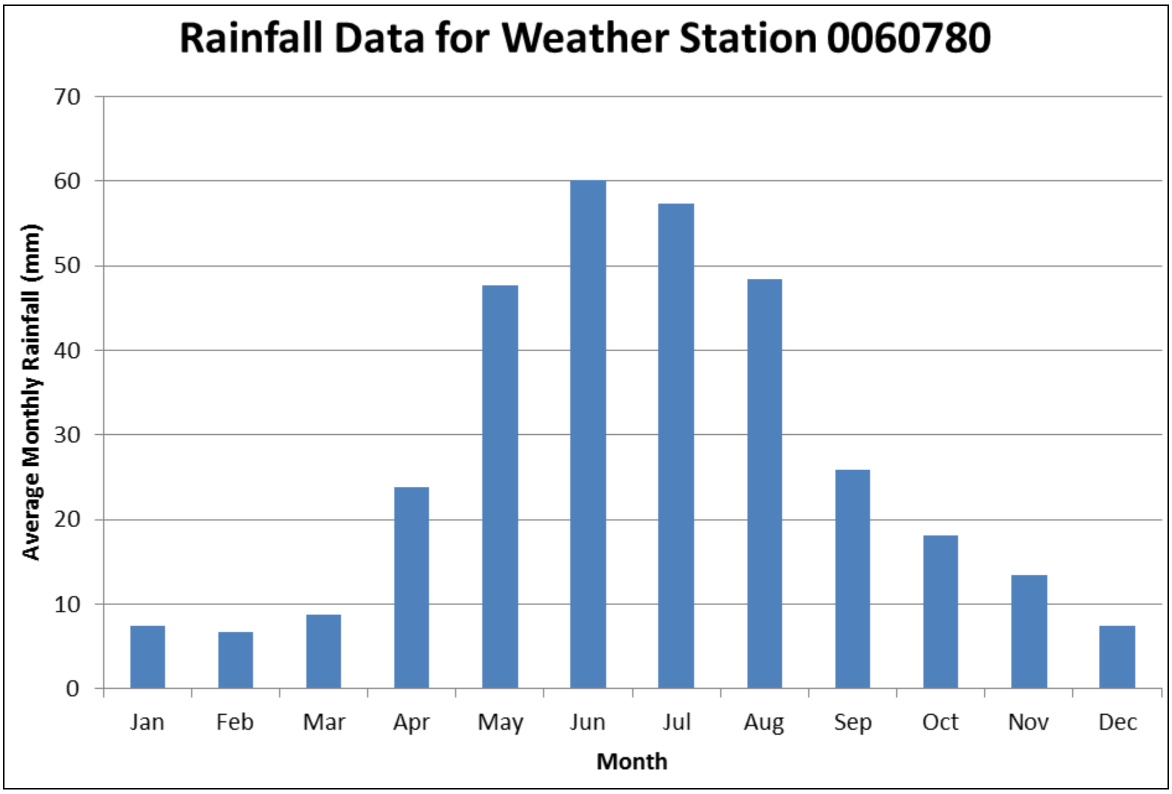


Figure 6-3 Average Monthly Rainfall figures for rainfall station 0060780 (Saldanha Bay Customs).

6.1.2.2 Temperature

Saldanha has a Mediterranean climate with highest temperatures occurring from December to March and the lowest between June and August. Data retrieved from the Langebaan Road Weather Station (1960 - 2000)[6] showed that the long-term average temperatures range from a minimum of 7ºC to a maximum of 18ºC in winter, while in

[5] *For monthly rainfall statistics for the Geelbek and Langebaanweg weather stations spanning from 2007 to 2009, please refer to Table 12-2 of the Air Quality Impact Assessment Report compiled by Airshed.*

[6] Source: *South African Weather Service*

summer the average minimum temperature is 15°C up to a maximum of 28ºC on average.[7]

6.1.2.3 Wind

The wind field is fairly uniform with frequent southerly winds and occasional winds from the north. Calm conditions prevailed 6.4% of the time (Figure 6-4) with a period average wind speed of 3.84 m/s. During day-time the wind field is mostly characterised by wind from the south-west and south-southwest and 6.1% calm conditions. Wind speed decreases during the night, increasing the occurrence of calm conditions to 6.7%. A shift in the wind field to southerly is also noted during night-time hours. The highest wind speeds (more than 6 m/s) occur during summer time and are mostly from the south south-east (Airshed, 2014).

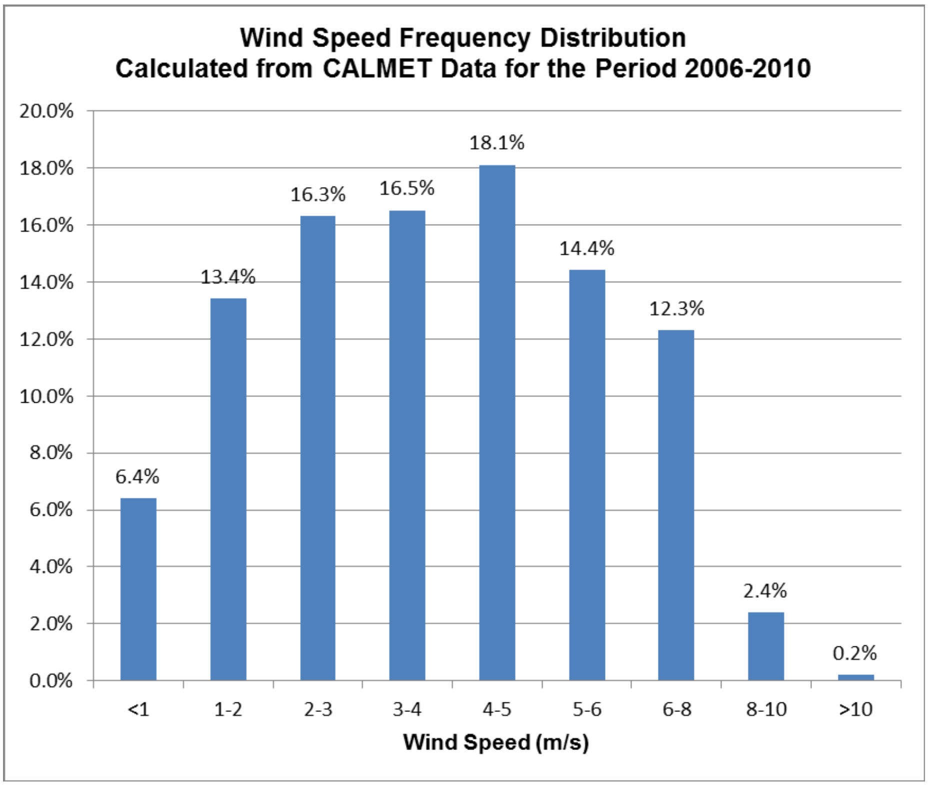


Figure 6-4 Wind speed frequency distribution (on-site CALMET data, 2006-2010) (Airshed, 2014)

[7] *For monthly temperature statistics for 2007 to 2010 for the Cape Columbine, Geelbek, Langebaanweg and Vredenburg weather stations, please refer to Table 12-1 of the Air Quality Impact Assessment Report compiled by Airshed.*

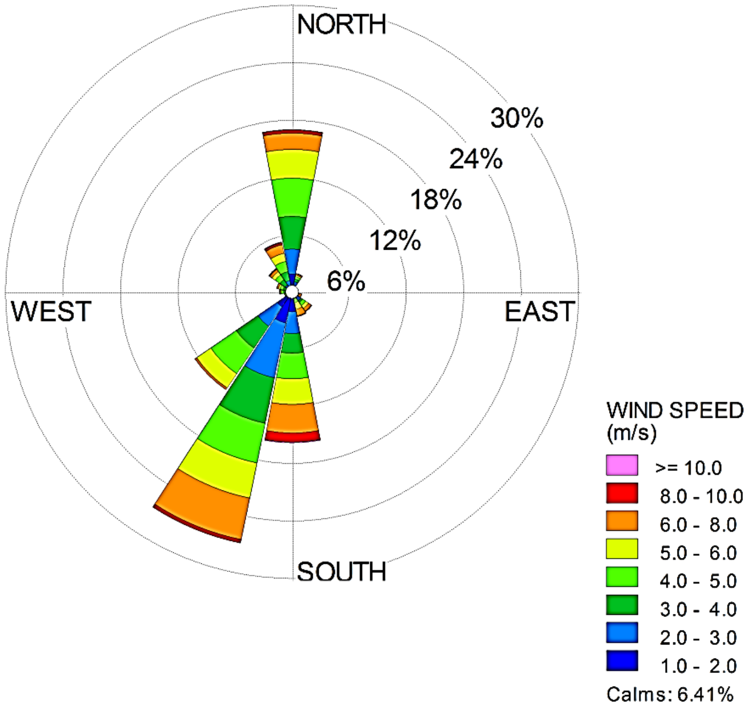
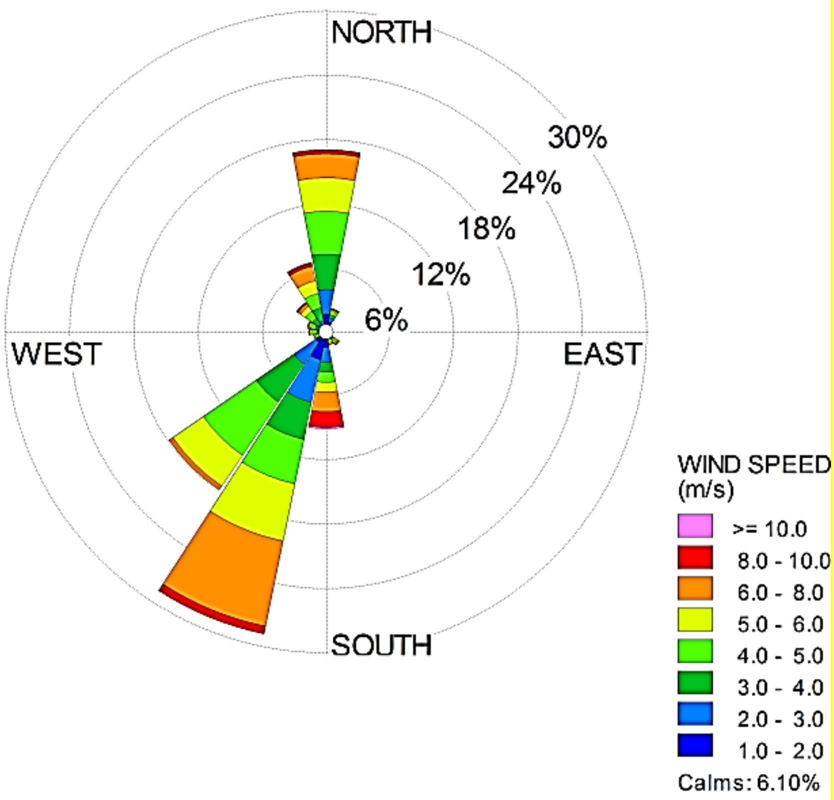


Figure 6-5 Period wind rose (on-site CALMET data, 2006-2010) (Airshed, 2014)



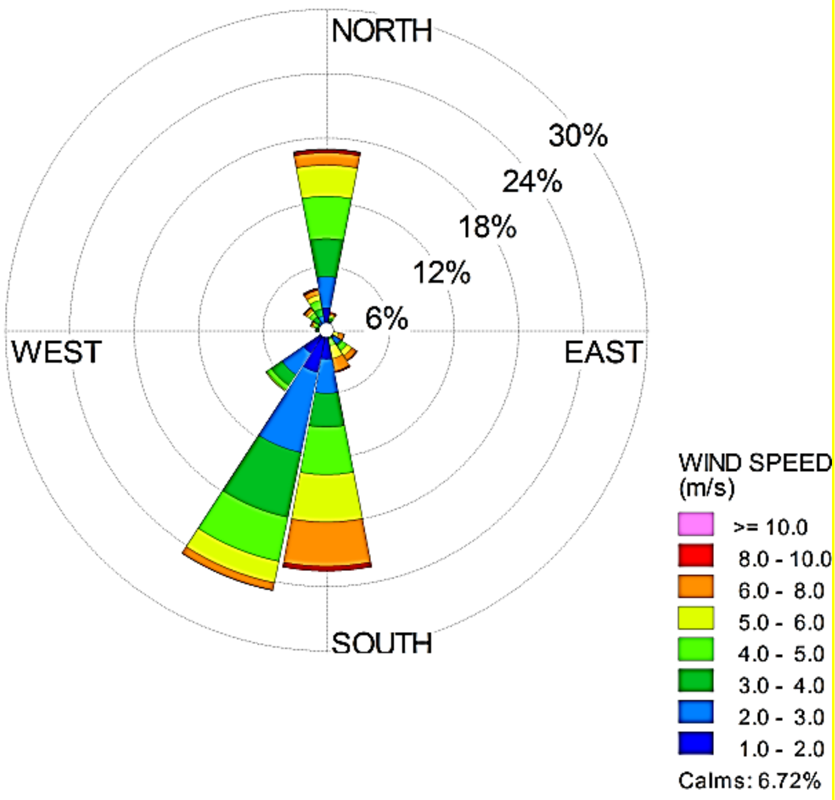


Figure 6-6 Diurnal wind roses rose (Day-time and Night-time) (on-site CALMET data, 2006-2010) (Airshed, 2014).

6.1.3 Topography and Drainage

The study area is situated between 27-29 meters above mean sea level (mamsl) within the Langebaanweg palaeo-embayment and is located on top of Langebaan Formation aeolianite and calcrete. The contours illustrate that the study area is relatively flat and slopes gently to the south, with subdued aeolianite ridges in places. To the west is the aeolianite-covered, granite-cored hill of Besaansklip. To the immediate east an outcropping granite high (G3) is crossed by the R27 road.

No drainage lines occur on or adjacent to the site.

6.1.4 Natural Vegetation (Flora)

The study area lies within the Fynbos biome and the Cape Floristic Region (CFR). The CFR is one of only six floristic regions in the world, and is the only one confined to a single country. It is also by far the smallest floristic region, occupying only 0.1% of the world's land surface, and supporting about 9000 plant species - almost 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). Most of the lowland habitats are under pressure from agriculture, urbanisation and alien plants, and thus many of the range restricted species are also under severe threat of extinction, as habitat is reduced to extremely small fragments. The latest data from the Red Data Book listing process undertaken for South Africa is that 67% of the rare or threatened plant species in the country occur only in the south-western Cape, and these total over 1800 species (Raimondo *et al*, 2009).

The study area is part of the greater West Coast region, and lies within what could be termed the Saldanha Peninsula bioregion. This bioregion has a fairly distinct flora, and a particularly high number of locally and regionally endemic plant species, as well as plant Species of Conservation Concern (Helme & Koopman, 2007).

The study area falls within the planning domain of the Saldanha Fine Scale Conservation Plan (Pence 2008). This important reference indicates that there are no terrestrial or aquatic Critical Biodiversity Areas (CBAs) found in the study area, nor immediately adjacent (**Figure 6-8**). Critical Biodiversity Areas are regarded as essential areas for the achievement of regional conservation targets, and are designed to ensure minimum land take for maximum result (Maree & Vromans, 2010).

The entire study area has been previously cultivated and has a low botanical conservation value at a regional scale. This is due to the disturbed nature of the soils in this area, the low plant diversity, and the lack of any plant Species of Conservation Concern. None of this area is a designated CBA. Conservation of this area in its current condition would contribute very little to either species or ecological process targets for the region (Helme, 2014).

Figure 6-7 The site has largely been disturbed due to agricultural activities.

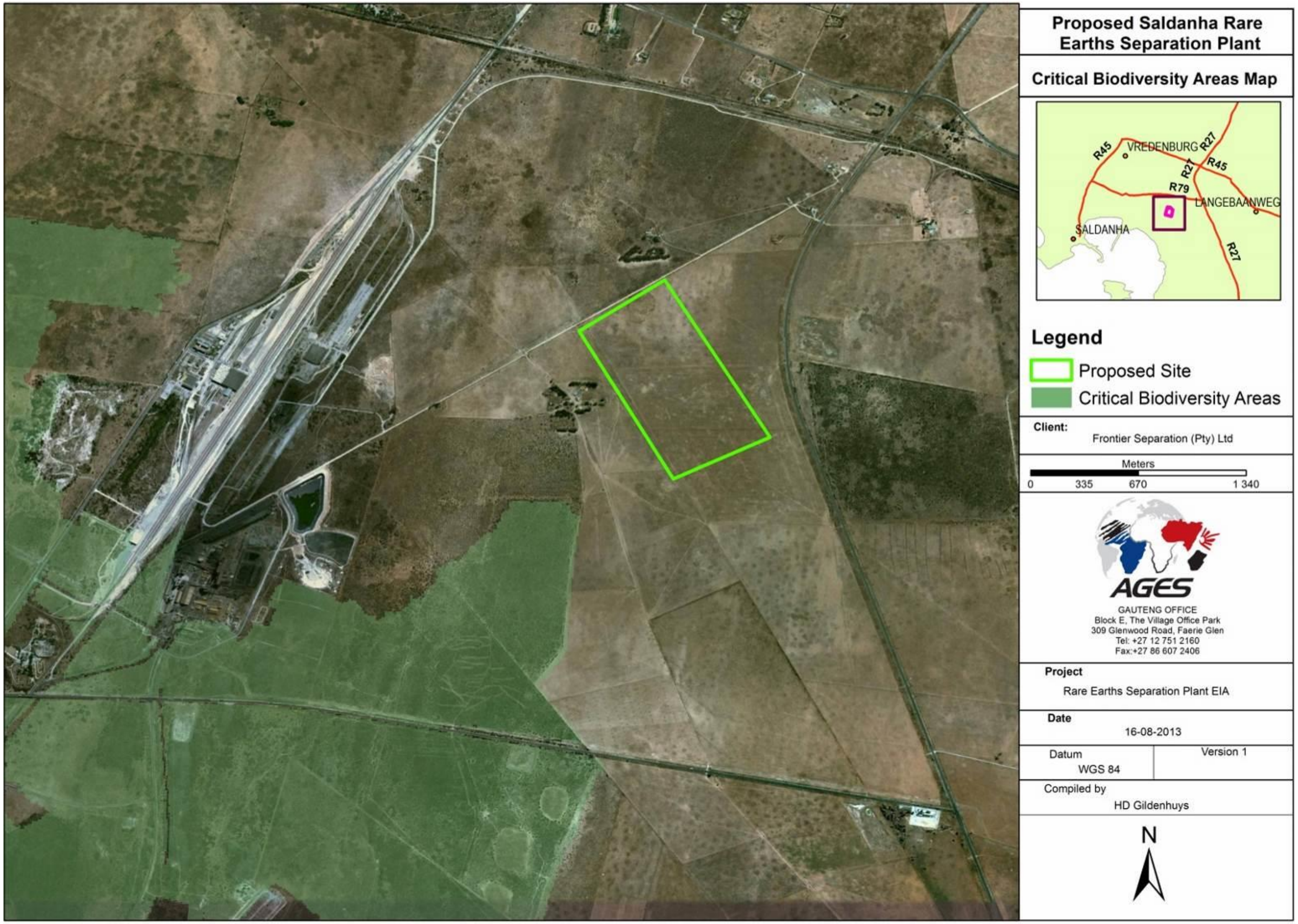


Figure 6-8 Extract of the Saldanha Municipality Fine Scale Conservation Plan (Pence 2008), showing the proposed site in relation to the identified Critical Biodiversity Areas according to the Saldanha Municipality Fine Scale Conservation Plan (Pence 2008).

6.1.5 Animal Life (Fauna)

The cultivated nature of the primary development area, and the associated loss of natural vegetation and habitat, means that the faunal diversity is much reduced in this area relative to intact, natural veld. The expansion of industrial development in the region is slowly forcing out many of the more disturbance sensitive species that were once present in the area, such as Bat eared Foxes (*Otocyon megalotis*), Korhaans and Harriers (Helme, 2014).

The avifauna is currently fairly typical of the agricultural landscape in this region, and two Species of Conservation Concern (SCC) have been recorded foraging in the vicinity of the study area, with another three passing overhead (Helme, 2014).

The avian SCC recorded foraging in the area are Black Harrier (*Circus maurus*; Near Threatened; Barnes 2000) and Blue Crane (*Anthropoides paradiseus*; Vulnerable), whilst Great White Pelican (*Pelecanus onocratalus*; Near Threatened), Lesser Flamingo (*Phoeniconaias minor*; Near Threatened) and Greater Flamingo (*Phoenicopterus roseus*; Near Threatened) have been observed flying nearby, presumably to and from the Langebaan Lagoon (to the south) and the Berg River estuary (to the north), both critically important wetlands on a national scale (Helme, 2014).

A few mammal and reptile Species of Conservation Concern could potentially occur on site, but is more likely to be found in the Medium conservation value areas of natural vegetation to the west of the site. These species include: Cape Sand Snake *Psammophis leightoni* (Vulnerable; Bates *et al* 2014); Kasner's Dwarf Burrowing Skink *Scelotes kasneri* (west-coast endemic; Near Threatened; Bates *et al* 2014); Gronovi's Dwarf Burrowing Skink *Scelotes gronovii* (west-coast endemic; Near Threatened; Bates *et al* 2014); Blouberg Dwarf Burrowing Skink *Scelotes montispectus* (Near Threatened; Bates *et al* 2014); Southern Adder *Bitis armata* (Vulnerable; Bates *et al* 2014); White-tailed Rat *Mystromys albicaudatus* (Endangered); Grant's Golden Mole *Eremitalpa granti* (Vulnerable) and Cape Golden Mole *Chrysochloris asiatica* (Data Deficient). The likelihood of any of the species occurring in viable numbers in the study area is however deemed to be very low.

The region supports large populations of Angulate Tortoise (*Chersina angulata*; Least Threatened), and at least three tortoises were seen in the study area and nearby during the site visit.

The site is unlikely to support any important frog populations, and there are no seasonal or permanent wetlands.

Faunal sensitivity is expected to largely mirror the botanical sensitivity, as it is usually dependant on available habitat.

6.1.6 Ground and surface water

The Saldanha region is located in Water Management area number 19 (the Berg). The entire Saldanha region and the SP Site are located in quaternary drainage region G10M. The site itself is very flat with no drainage features near the site. The western side of the site is slightly elevated with an elevation that range from 25 to 26.5 mamsl (Kruidenier, 2014).

The landscape naturally slopes in a South-Easterly direction at an average slope of 0.002 m/m. The incline of the natural ground level of the project area is small and does not promote high flow velocities of runoff generated during flood events (de Lange, 2013).

On the northern side of the site a borrow pit was found which is at least 1 to 1.5 metres deep. This pit is at least 50 metres in diameter. This borrow pit does not seem to fill with water during rain events. The sand and calcrete surface material seem to have the ability to absorb all rainfall events. No forms of storm water erosion channels could be found during the field visits of the site (Kruidenier, 2014).

6.1.6.1 Regional Aquifer

The SP site is located on the Langebaan Road Aquifer System (LRAS) which extend towards Vredenburg in the North-west, Velddrif in the north and Hopefield in the east. The LRAS consists of clay, sand and gravel deposits that are in the region of 50 meters thick. The LRAS stretch to the town Hopefield with the southern boundary formed between Langebaan and Hopefield.

The Elandsfontein Aquifer System (EAS) consists of a basal confined aquifer formed by sand and gravel of the Elandsfontein Formation, located below a thick sequence of clay and peat. The aquifer system is formed by a thick (90m) sequence of Cenozoic sediments deposited.

6.1.7 Aquifer Classification

Based on information collected during the hydro-census and the Aquifer Classification according to the Aquifer Classification of South Africa map, DWA, August 2012, the aquifer system in the study area can be classified as a “Non-Aquifer System”. The aquifer may be yielding in the order of 1 to 5 ℓ/s per borehole, but the classification is due to the very high salt loads in the water which render the water unacceptable. The water quality analyses of the water samples from the eight groundwater monitoring boreholes confirm the high sodium, magnesium, chloride, EC and TDS values.

The vulnerability according to the Aquifer Vulnerability of South Africa map, DWA, August 2012, is classified as low. This is due to the poor water quality. The water from the aquifer is to a large extent un-usable due to the high salt content. The water pumped from even shallow boreholes or pits will need to be treated by reverse osmosis before it can be considered for domestic use.

6.1.7.1 Hydrogeology

6.1.7.1.1 Information on existing boreholes

During the desk study, borehole related information could be retrieved from the National Groundwater Archive of the Department of Water Affairs. The data of 243 boreholes with useful information such as water level depths and lithology could be ascertained during the search.

Three field visits delivered useful hydrogeological information on 24 boreholes. During the month of June 2011, 5 boreholes of Arcelor Mittal on the farm Uyekraal were visited. During April 2012 and later in 2012, 19 boreholes were surveyed that is located specifically near the proposed SP site.

The borehole information mentioned above consisting of lithology and water level depth data was combined and used during the study to create a regional groundwater elevation map that also shows the hydrocensus positions of the boreholes used for the study (Figure 6 9 and Figure 6-11) and a Conceptual Groundwater model of the regional lithology (Figure 6-12). This groundwater altitude map together with the hydrogeological cross section explains the lithology and groundwater movement in the groundwater regime of the LRAS.

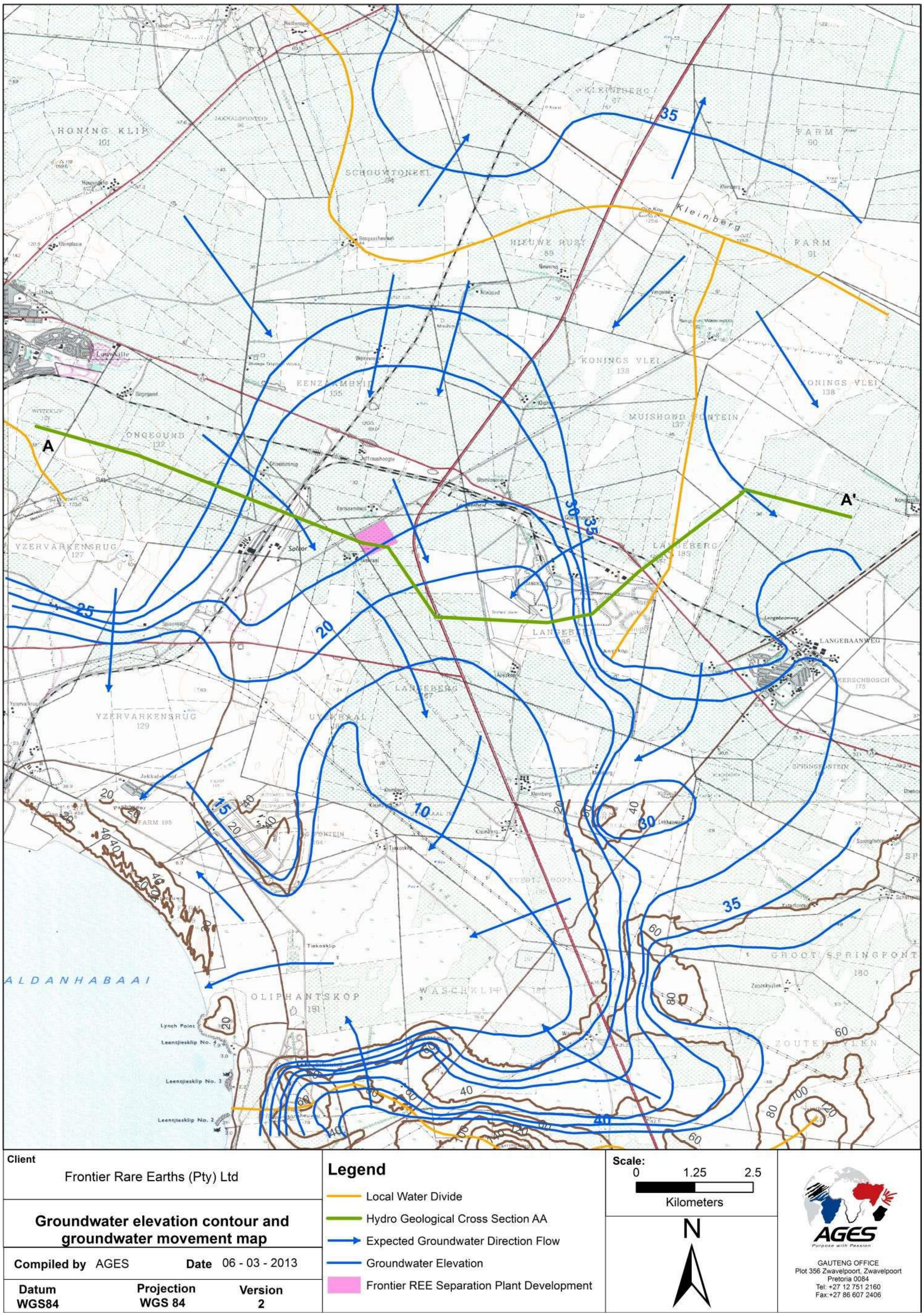


Figure 6-9 Groundwater elevation contour and groundwater movement map.

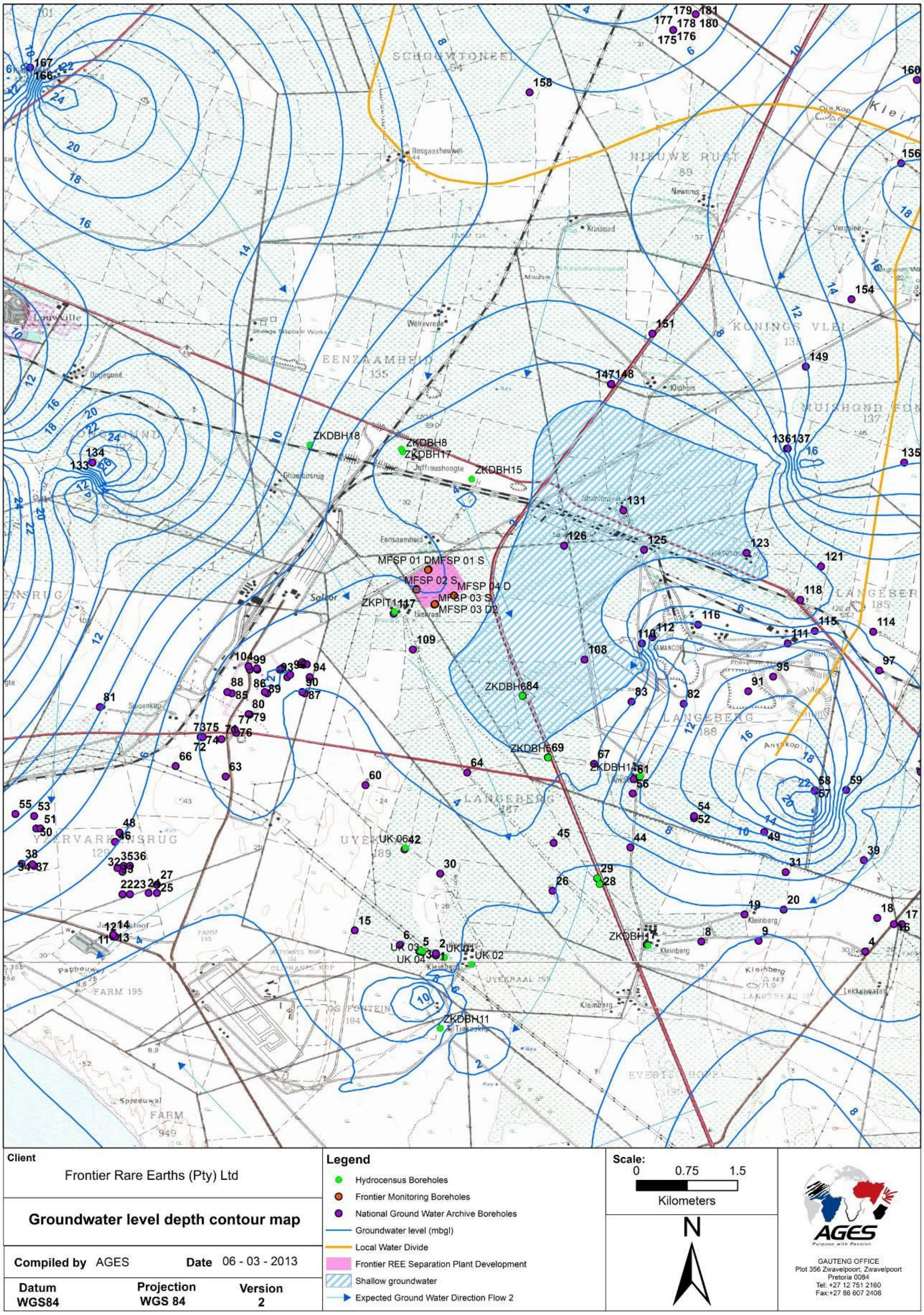


Figure 6-10 Ground water level depth contour Map

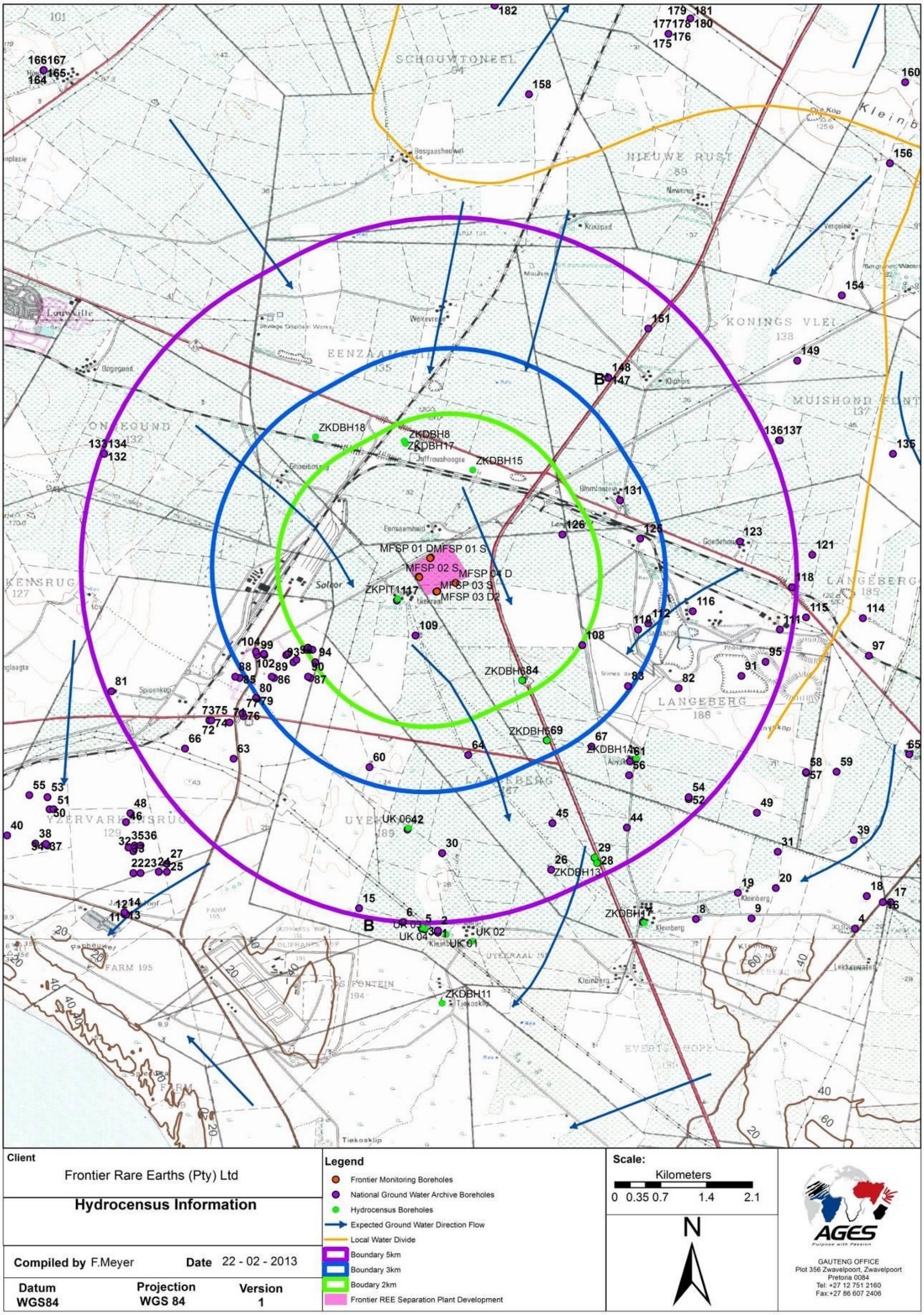


Figure 6-11 Hydrocensus Map

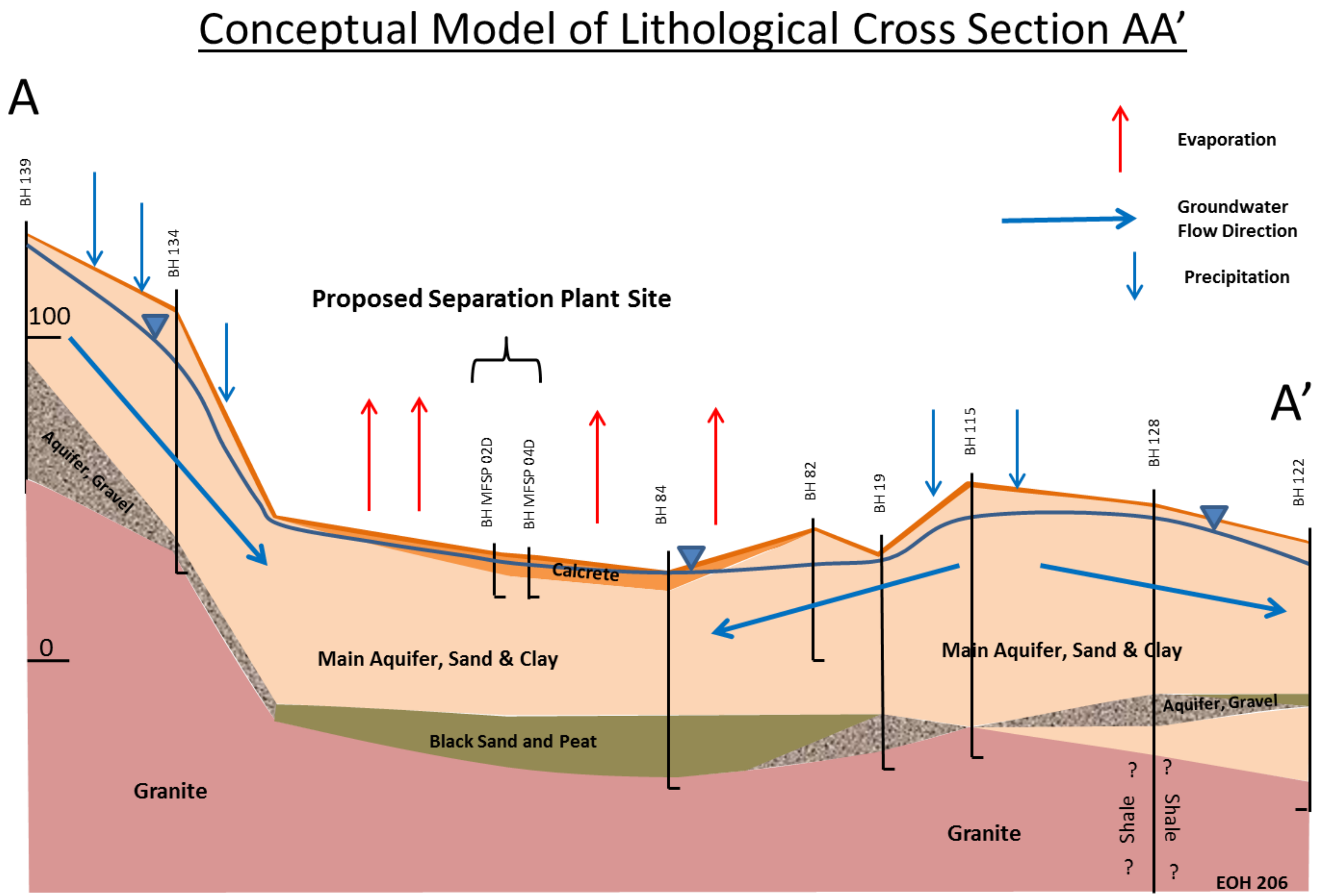


Figure 6-12 Conceptual Groundwater Model Section AA through the Langebaan Road Aquifer System (LRAS)

6.1.7.1.2 Geophysical investigation and borehole drilling

The aim of the geophysical investigation was to examine the geology of the proposed SP site as well as to place permanent groundwater monitoring facilities on or very near to the site. A geophysical study could give more insight on the geology and could guide the placing of permanent groundwater monitoring facilities.

Two traverses were completed on the proposed development site by means of the Direct Current Continuous Vertical Electrical Soundings (DC CVES) method. Please refer to Appendix H: Hydrogeological Study[8.]

Eight boreholes were developed as long term monitoring facilities.

The following borehole yield test information can be summarised from the information gathered:

- The average borehole depth is 7.47 metres below ground level;
- The average water level depth is 2.84;
- The average yield during the constant yield test was 1.73l/s;
- The average draw down during the constant yield test was 2.34 metres below static water level;
- The average early time Transmissivity value is 478 m^2/d;
- The average late time Transmissivity value is 176 m^2/d; and
- The average storativity is 0.00035

6.1.7.1.3 Site specific water level depths and groundwater altitudes

Water level depths on the proposed SP site are currently between 2.7 and 4.1 m below ground level. The water level depth on the northern side of the site is in the order of 4.1 metres below surface. On the southern side of the site the water level depth is in the order of 2.7 metres below ground level.

6.1.7.2 Water quality

Water samples were taken from 7 boreholes analysed for macro and micro chemical

8 The Hydrogeolocal Study conducted by AGES in 2014 was externally reviewed by Dr Mannie Levin from Aurecon.

constituents. From the analyses the water is chemically very similar with only borehole MFSP 04D showing slightly elevated macro determinants elevated above the rest of the other samples (Table 6-1).

6.1.7.2.1 Chemical Parameters micro-determinants

The water from all the samples is Class 1 according the micro determinants.

6.1.7.2.2 Chemical Parameters macro-determinants

All samples show elevated levels of Electrical Conductivity (EC), Total Dissolved Solids (TDS), Sodium, Magnesium, Chloride which is above Class 2 level. All the samples also show elevated Calcium and Sulphate levels elevated to Class 2 water.

It is mainly the Sodium, Chloride and Magnesium levels that are elevated above acceptable limits which also elevate the TDS and EC levels.

6.1.7.2.3 Physical and organoleptic-parameters

The physical water quality properties refer to the aesthetic quality such as taste, odour and appearance of water. The TDS and electric conductivity levels of all the boreholes are elevated to above Class 2 levels.

The average TDS level is 7410 mg/l which is 5000mg above the maximum allowed which render the water from all the boreholes unsafe for domestic and animal use. The water is unpalatable and unusable for all farming activities.

Table 6-1 Water quality information and classification according SANS 241: 2011 Drinking Water Standards

	Unit	MFSP 01D	MFSP 02D	MFSP 02S	MFSP 03D1	MFSP 03D2	MFSP 03S	MFSP 04D			Average	Low	High	Standard Deviation
pH	-	7.71	7.48	7.61	7.62	7.55	7.56	7.48	5.0 - 9.7	Operational	**7.57**	**7.48**	**7.71**	**0.082**
Electric conductivity (EC)	mS/m	1033	1054	919	1113	1181	1143	1852	< 170	Aesthetic	**1185**	**919**	**1852**	**306.29**
Total dissolved solids (TDS)	mg/l	6291	6429	5411	7033	7360	7097	12254	<1200	Aesthetic	**7410**	**5411**	**12254**	**2232.99**
Orthophosphate	mg/l	0.034	0.055	0.063	0.051	0.064	0.043	0.027	ns	-	**0.048**	**0.027**	**0.064**	**0.014**
Total hardness as CaCO3	mg/l	1377	1433	1193	1674	1653	1587	2700	ns	-	**1160**	**1193**	**2700**	**489.37**
Total alkalinity as CaCO3	mg/l	240	227	232	225	231	230	213	ns	-	**228**	**213**	**240**	**8.24**
Sodium	mg/l	1765	1784	1510	2017	2064	1932	3452	< 200	Aesthetic	**2075**	**1510**	**2075**	**635.09**
Potassium	mg/l	26.4	24.5	22.6	30.6	30	29	26.5	ns	-	**27.1**	**22.6**	**30.6**	**2.95**
Calcium	mg/l	207	227	183	253	248	239	416	ns	-	**253**	**183**	**416**	**75.81**
Magnesium	mg/l	209	210	178	253	251	240	404	ns	-	**249**	**178**	**404**	**73.36**
Chloride (Cl)	mg/l	3392	3505	2893	3805	4070	3956	7058	<300	Aesthetic	**4097**	**2893**	**7058**	**1364.56**
Sulphate (SO_4)	mg/l	547	538	481	538	556	560	769	<500	Acute health	**570**	**481**	**769**	**91.65**
Nitrate (NO3)	mg/l	0.967	2.93	3.91	1.91	2.05	1.65	0.773	<11	Acute health	**2.03**	**0.773**	**3.91**	**1.1**
Fluoride	**mg/l**	0.572	0.632	0.686	0.733	0.742	0.713	0.687	<1.5	Chronic Health	0.681	0.572	0.742	0.06
Ammonium Nitrate (NH4-N)	mg/l	0.108	0.094	0.079	0.08	0.142	0.102	0.816	ns	-	0.203	0.079	0.816	0.271
Cadmium	ug/l	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	<3	Chronic health	0.001	0.001	0.001	0
Iron	ug/l	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003	< 2000	Chronic health	0.003	0.003	0.003	0
Manganese	ug/l	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	<500	Chronic health	0.001	0.001	0.001	0
Aluminium	ug/l	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003	<300	Chronic health	0.003	0.003	0.003	0
Copper	ug/l	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	<2000	Chronic health	0.001	0.001	0.001	0
Zinc	mg/l	0.097	0.054	0.005	0.024	0.252	0.039	0.033	< 5.0	Aesthetic	0.072	0.005	0.252	0.0844
	Exceeds the limits prescribed by SANS 241:2011 Drinking water standards													

6.1.7.3 Wetlands

A survey by ecologist Nick Helme did not find any evidence of seasonal or permanent wetlands on the proposed plant site (Helme, 2014).

6.1.8 Air quality

6.1.8.1 Air pollution sources in the study area

According to baseline information provided by Airshed Planning Professionals, the main sources of existing air pollution are from the following existing activities (Airshed, 2014):

- Industrial Activities:
  - Arcelor Mittal Saldanha Steel Works;
  - Tronox (previously Exxaro) Namakwa Sands Smelter;
  - Duferco;
  - Saldanha Iron Ore Handling Facility (IOHF);
  - Saldanha Bay Oil Storage;
  - Limestone Quarry;
  - Bluewater Bay Substation; and
  - Vredenburg Waste Water Treatment Plant.
- Transportation Activities:
  - Sishen Saldanha Railway Line;
  - Transnet Salcor Yard;
  - Ships;
  - Vehicle tailpipe emissions from public roads; and
  - Entrained dust emissions from public roads.
- Agricultural Activities; and
- Wind erosion.

Ambient air quality is currently measured at various locations in the Saldanha Bay area. These include stations owned by the Transnet Saldanha Port Terminal at Blouwater Bay and Vredenburg, a station at the Saldanha Steel Works of ArcelorMittal, a station at Tronox Namakwa Sands as well as a station at Vredenburg owned by the Provincial Government of the Western Cape (Airshed, 2014).

6.1.8.2 Ambient PM_{10} Concentrations

Ambient measurements indicate annual average PM10 concentrations of 19.6 µg/m³ and 24.1 µg/m³ at Vredenburg and Blouwater Bay respectively which comply with the National Ambient Air Quality Standards (NAAQS) (40 µg/m³). The observational data at the other privately owned monitoring stations are not publically available (Airshed, 2014).

6.1.8.3 Ambient NO_2 Concentrations

NO_2 is measured at the Provincial Government of the Western Cape (PGWC) Vredenburg ambient monitoring station. Observed NO_2 concentrations were low, viz. 5.2 to 6.6 µg/m³ (2008 to 2010), and less than 17% of annual NAAQS. The hourly NAAQS limit of 200 µg/m³ was also not exceeded (Airshed, 2014).

6.1.8.4 Measured Ambient SO_2 Concentrations

Ambient SO_2 concentrations are measured at ArcelorMittal's Saldanha Steel Works station and the PGWC Vredenburg station. SO_2 concentrations were low, viz. 4.0 to 8.8 µg/m³ (2008 to 2010), and less than 18% of annual NAAQS. The daily and hourly NAAQS limit values were also not exceeded (Airshed, 2014).

In summary, the desktop assessment concluded that (Airshed, 2013):

- Available ambient monitoring data indicate elevated PM_{10} concentrations in the immediate vicinity of existing industries in exceedence of NAAQS. Ambient PM_{10} levels at residential areas (Blouwater Bay and Vredenburg) are however low and compliant with NAAQS; and

- Ambient NO_2 and SO_2 concentrations are within NAAQS.

6.1.9 Noise

The proposed SP will be located in a district where the character and levels of ambient noise are already affected by urbanisation, industrialisation and other economic activities such as (van Zyl, 2014):

- Agricultural activities on farms and smallholdings;

- Industrial activities:
    - Arcelor Mittal steel works;
    - Namakwa Sands;
    - Transnet Salcor Yard;
- Urban residential – Vredenburg and Saldanha;
- Railway lines:
    - Transnet Saldanha-Sishen Iron Ore line;
    - Freight line running in an east-west direction;
- Road traffic on the public road network, the R27, R45 and R79 roads in particular.

Except for zones in the immediate proximity of roads and industrial complexes, typical ambient levels to be expected in an area of this nature would be in the order of 50 dBA (daytime) and 40 dBA (night-time), respectively. This is 5 dB above the typical level in an undisturbed Rural District, the lowest noise category in the SANS 10103 frame of reference. The maximum impact of any 24-hour operation occurs at night when background noise characteristically drops to its lowest level (Van Zyl; 2014). Noise monitoring of three residences in close proximity (refer to **Figure 6-13**) to the SP confirmed the following night-time ambient noise levels:

Residence	Average Night-time Ambient Noise Level
Malan Residence	43 dBA
Mouton Residence	41 – 44 dBA
Thom Residence	42 dBA

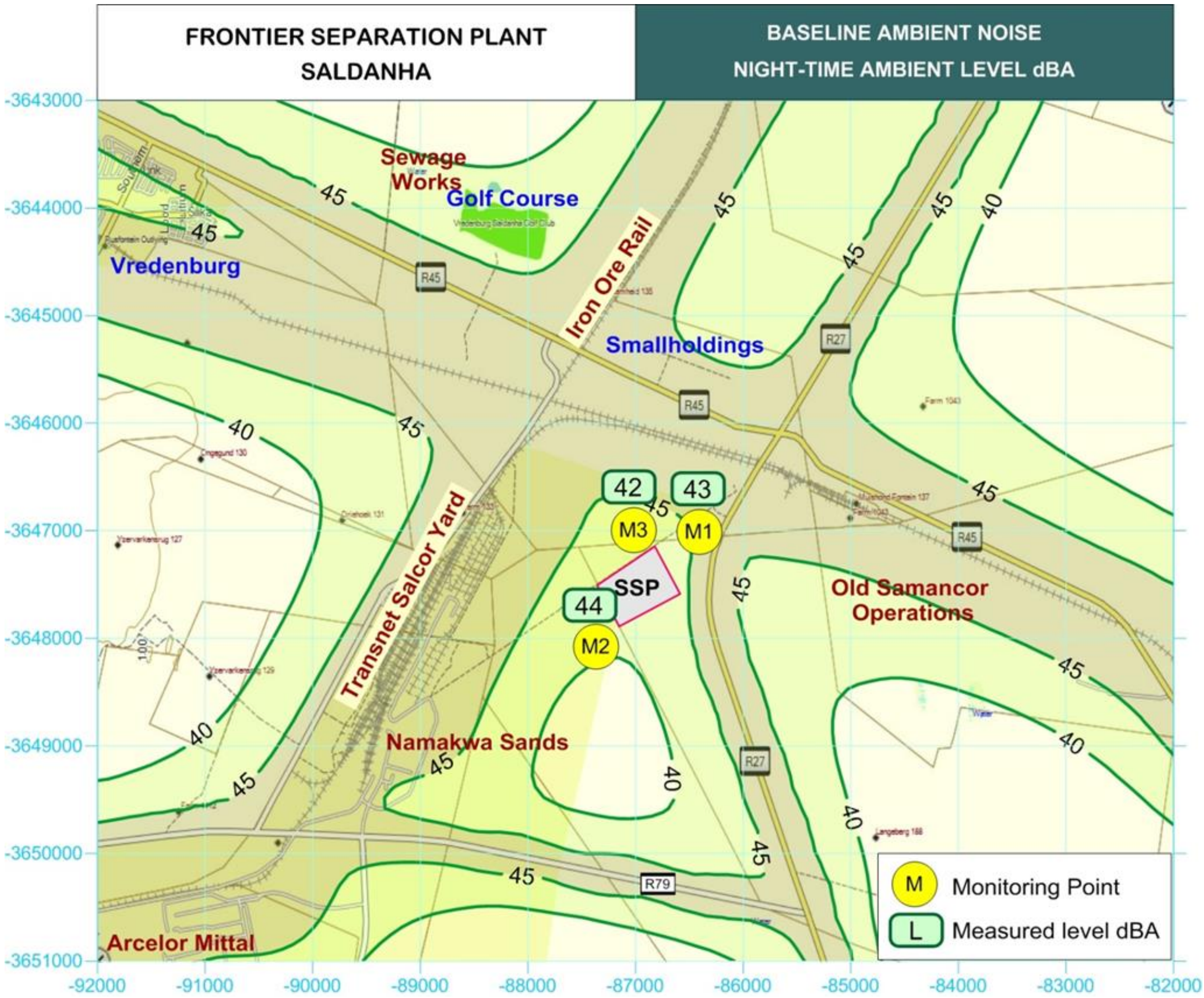


Figure 6-13 Existing ambient noise climate in the study area (van Zyl, 2014).

6.1.10 Sites of palaeontological, archaeological and cultural interest

6.1.10.1 Palaeontology

A desktop assessment by Mr John Pether indicated that beneath a thin cover of sand, the project site is underlain by calcareous aeolianites (old dune sands) and calcretes ("surface limestones") of the Langebaan Formation. These strata do not appear to be very fossiliferous, but the fossils that have been found are of profound scientific value. The Langebaan Formation aeolianites have been a prime source of information on Quaternary faunas and archaeology. Notably, some fossil finds have been made in the nearby area. Deep excavations may encounter fossiliferous marine deposits of the Uyekraal Formation.

Mitigation measures to limit impacts on palaeontological resources is recommended and should include monitoring by on-site personnel and field inspections by a palaeontologist/trained fossil excavator during construction of excavations (Pether; 2012).

6.1.10.2 Heritage

The Agency for Cultural Resource Management (ACRM) conducted a field survey on the farm Langeberg in July and August 2007 (Kaplan, 2007). Note that this was a larger study area than the area proposed for the plant's construction. The ACRM survey located a small number of quartz artefacts and a piece of weathered ostrich eggshell in a wind-deflated hollow, in a block of a larger study site. Single Earlier Stone Age (ESA) quartzite lithics as well as a Middle Stone Age (MSA) flake in quartzite were also found on the steep west facing vegetated slopes. These archaeological occurrences were been rated as having low local significance (Kaplan; 2007).

However during the recent AGES archaeological assessment, which focussed on the proposed development area within Portion 6 of the farm Langeberg, no archaeological sites were identified. No Stone Age remains were observed on Portion 6 during the later AGES survey but surface calcrete occurrences were observed in the area. Stone Age material however occurs in the larger landscape and the remains of e.g. herder sites are likely to be encountered in areas that have not been transformed by farming.

No Iron Age farmer, Historical / Colonial Period and recent times or grave sites where found during the survey (Kruger; 2014). The Archaeological Impact Assessment conducted by AGES in 2014 has been externally reviewed by Lita Webley from ACO Associates.

6.2 Socio-Economic Environment

6.2.1 Demographics of the Project Area

The following section has been sourced from the Social Impact Assessment conducted by Equispectives in 2014 and contains demographic information obtained from the Census of 2011. Please refer to Appendix N: Social impact assessment.

6.2.2 Population

The SBLM has a population of 99 193. More than half of the population of the SBLM belongs to the Coloured population. This is proportionately less than on district level where about two thirds of the population belong to the Coloured population. Proportionately more people in the SBLM belong to the Black and White population groups than on district level. On a ward level about 60% of the population belong to the White population group (Census, 2011).

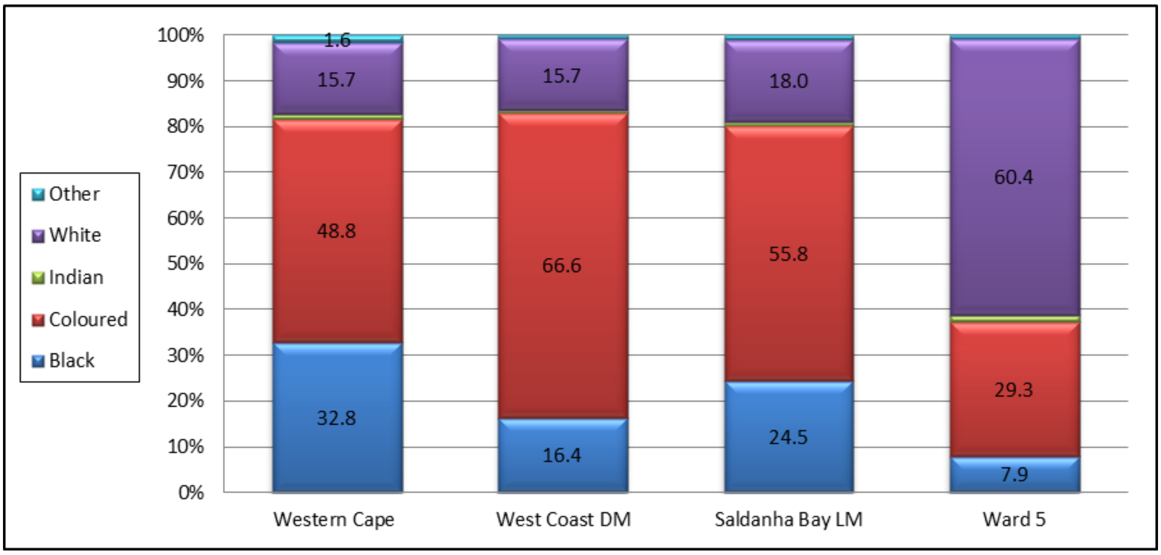


Figure 6-14: Population distribution (Source: Census 2011)

6.2.3 Age

The age distribution for the Western Cape Province and the SBLM are very similar. The WCDM has a lower proportion of people in the 25-34 year old age group, possibly indicating that a large number of people in this age category leave the district to go to other areas like Cape Town in search of employment opportunities. The site proposed for development falls within Ward 5. This ward has a lower incidence of people aged 34 years or younger than on provincial, district or local level, and a greater proportion of people older than 35 years (Census, 2011).

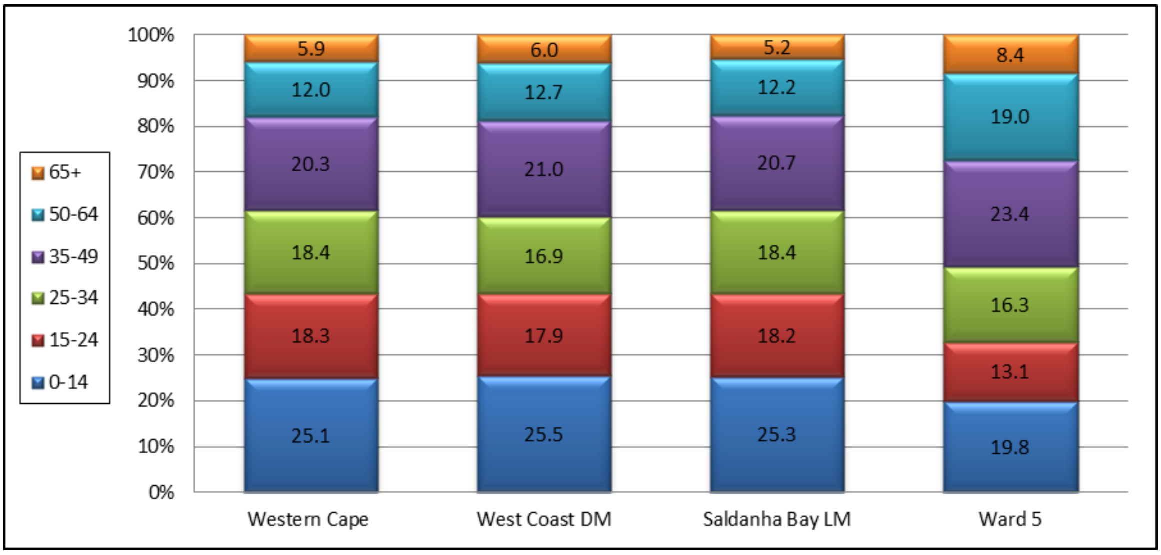


Figure 6-15: Age distribution (Source: Census 2011)

6.2.4 Gender

The gender distribution for the areas under investigation is fairly equal, with slightly more females on provincial, district and local level. Slightly more men are observed in Ward 5 which can be a result of the industrial activities in the town of Saldanha, which may in some instances favour males (Census, 2011).

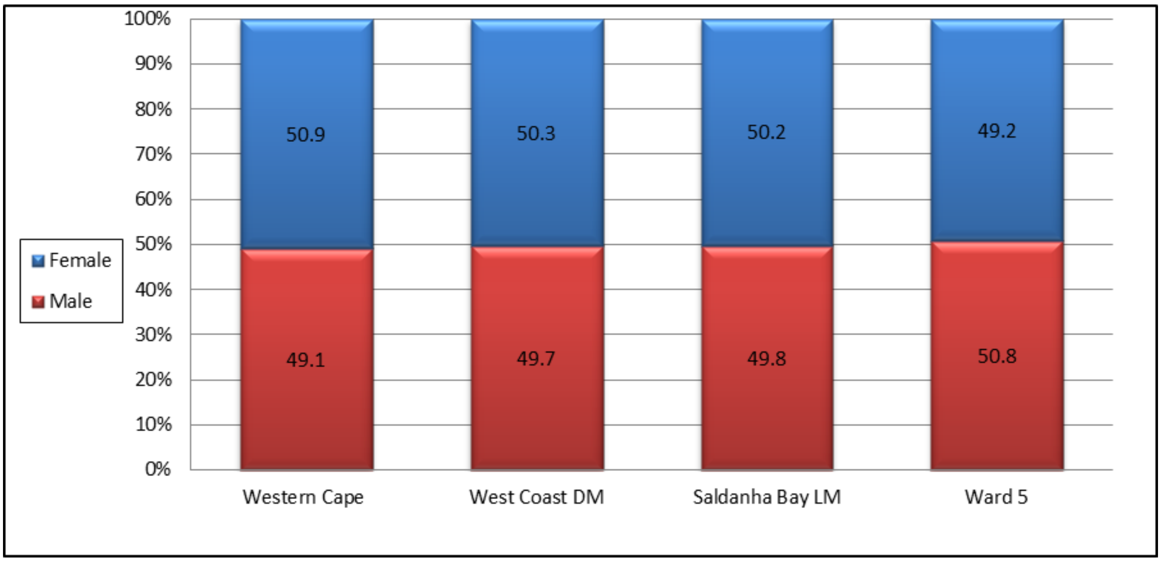


Figure 6-16: Gender distribution (Source: Census 2011)

6.2.5 Language

Afrikaans is the dominant home language on provincial, district as well as local level, followed by IsiXhosa and English. Proportionately more people have Afrikaans as home language on district and local level. Ward 5 has a higher incidence of people with English as home language than on local or district level.

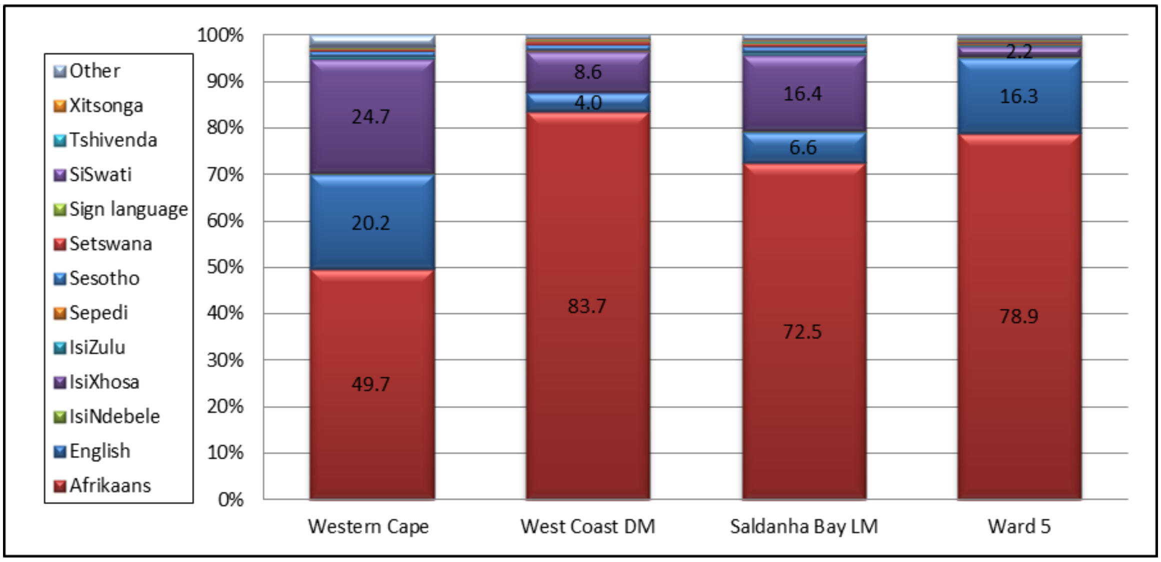


Figure 6-17: Language distribution (Source: Census 2011)

6.2.6 Education

Figure 6-18 shows the education profiles for the areas under investigation for those aged 20 years or older. Compared to those on a provincial or local level, fewer people living within in the WCDM have completed Grade 12 or higher. In Ward 5, almost 70% of the population older than 20 years have completed Grade 12 or higher. This suggests that relatively skilled labour may be available in the surrounding area.

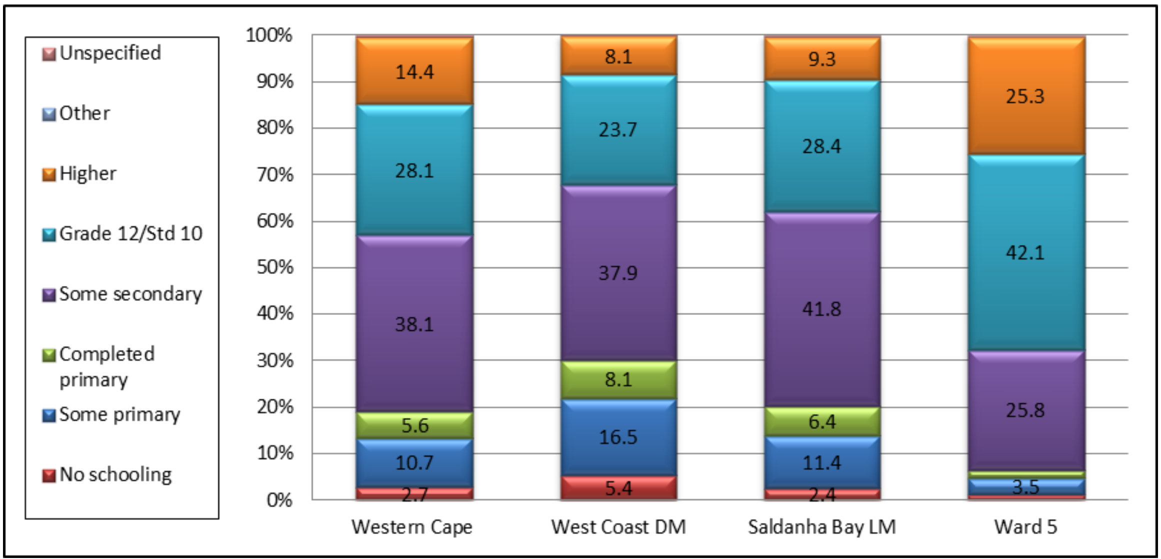


Figure 6-18: Education profiles (those aged 20 years or older, shown in percentage, source: Census 2011)

6.2.7 Employment status

Figure 6-19 shows that about half of the people of economically active age (aged between 15 years and 65 years) on provincial, district and local level are employed. In the SBLM there are proportionately slightly more people who have indicated that they are unemployed than on provincial or district level. This can be an indication that the area attracts opportunistic work seekers that don't find employment, but do not have the means to return to the areas that they came from. Almost two thirds of the population of Ward 5 have indicated that they are employed; suggesting that in most households there is at least one person that is employed.

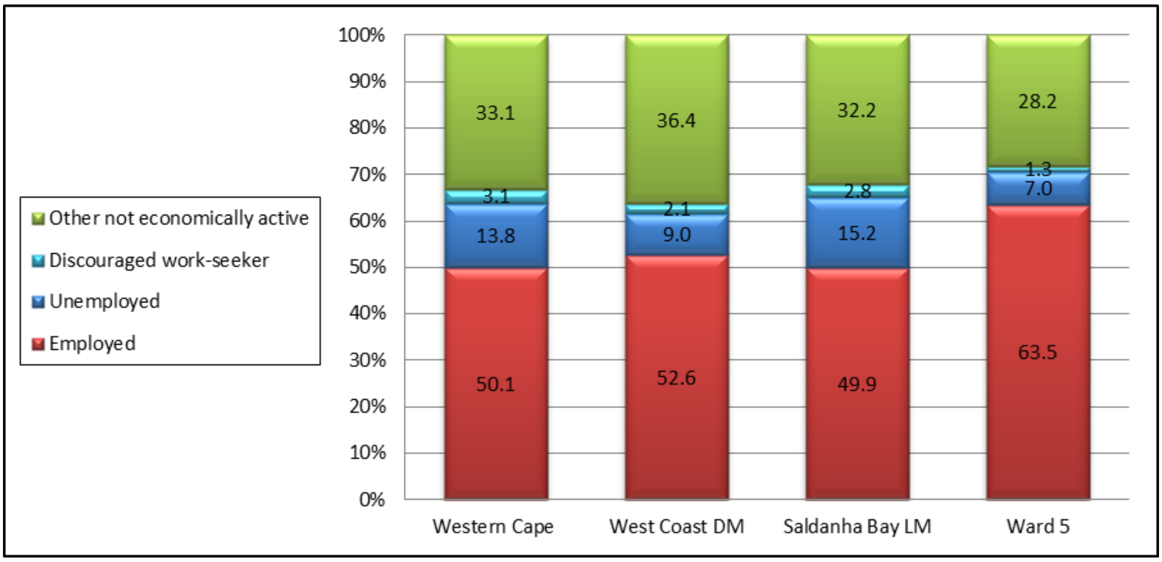


Figure 6-19 Labour status (those aged between 15 - 65 years, shown in percentage (Source: Census 2011)

6.2.8 Household Income

About 50% of households on provincial, district and local level have a household income of less than R38 201 per annum. The population of Ward 5 tend to have higher income levels, with about 50% of the households having an annual income of more than R152 800. The Saldanha Bay LM also has a greater proportion of households with an income of more than R152 800 than on district or provincial level.

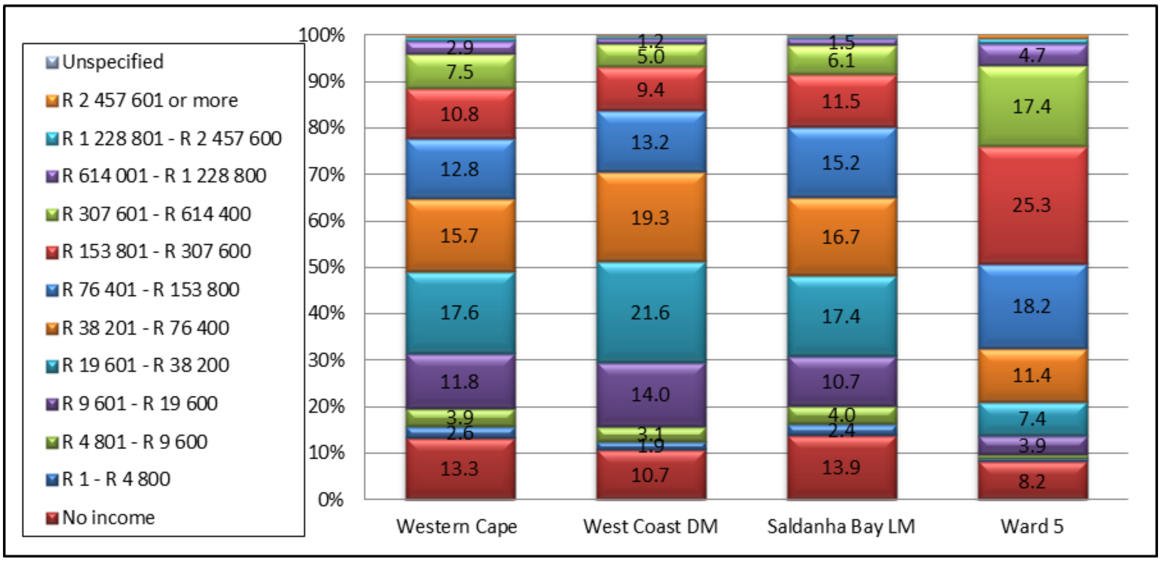


Figure 6-20 Annual household income (Source: Census 2011)

6.2.9 Access to water

More than 90% of households on a provincial and local level get their water from a regional or local water scheme. On a district level, less than 80% of households get their water from a regional or local water scheme. About 10% of households on a district level get their water from a borehole. The remainder of the district get their water mainly from a spring, dam, pool, river or stream. Almost all households in Ward 5 get their water from a regional or local water scheme.

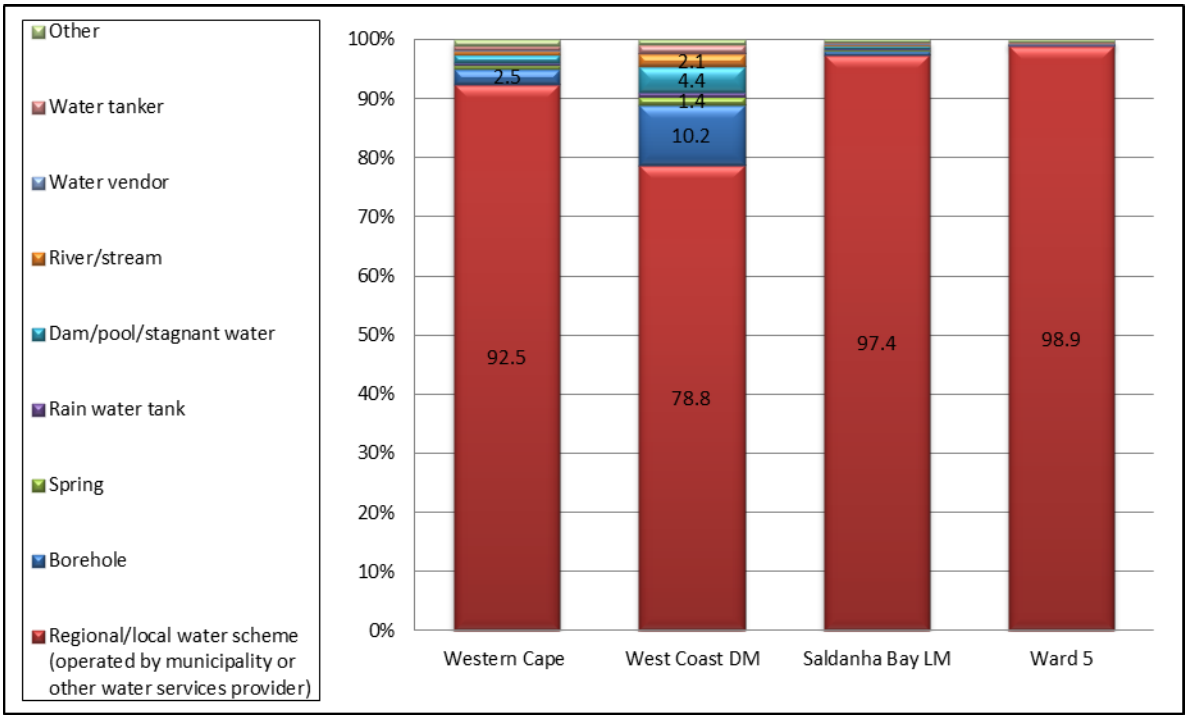


Figure 6-21 Water source (Source: Census 2011)

6.2.10 Energy

Electricity is seen as the preferred source for lighting (Noble et al, 2006), and the lack thereof should thus be considered a deprivation. Even though electricity as energy source may be available, the choice of energy for cooking may depend on other factors such as cost. More than 90% of households on provincial, district and local level use electricity as energy source for lighting (Figure 6-22). In the West Coast DM the second most used source of energy for lighting is candles. Almost all households Ward 5 use electricity for lighting purposes.

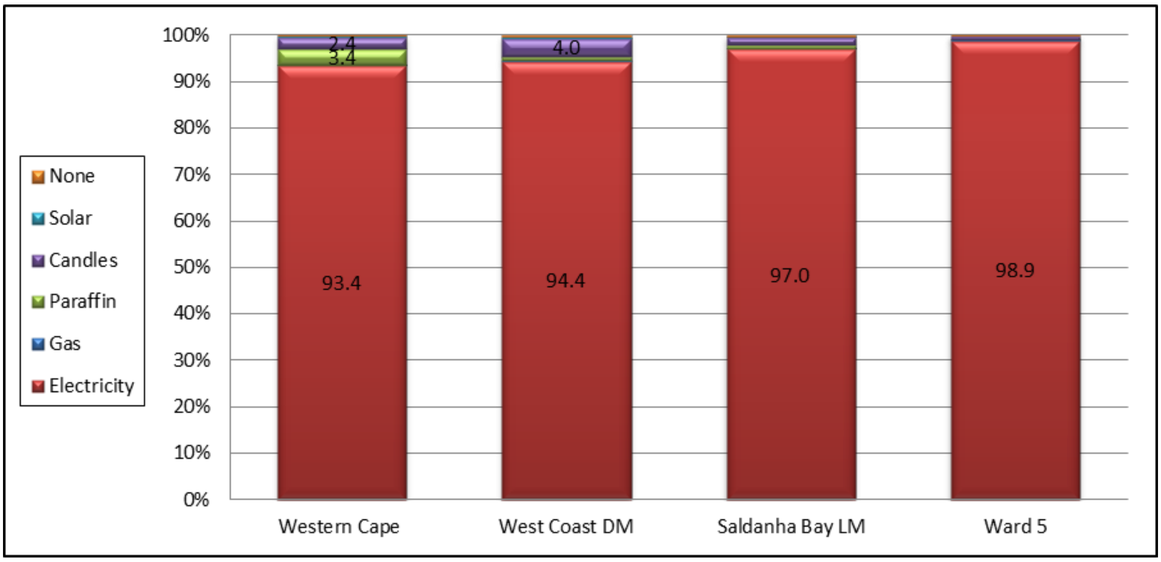


Figure 6-22 Energy source for lighting (Source: Census 2011)

6.2.11 Sanitation

The majority of households on a provincial, district or local level have access to a flush toilet that is connected to a sewerage system. Proportionately more households on a local level have access to flush toilets connected to a sewerage system than on provincial level. On a district level proportionately fewer households have access to flush toilets connected to a sewerage system, but the district has the largest proportion of households with flush toilets connected to a septic tank. This can most likely be ascribed to the large rural component of the district.

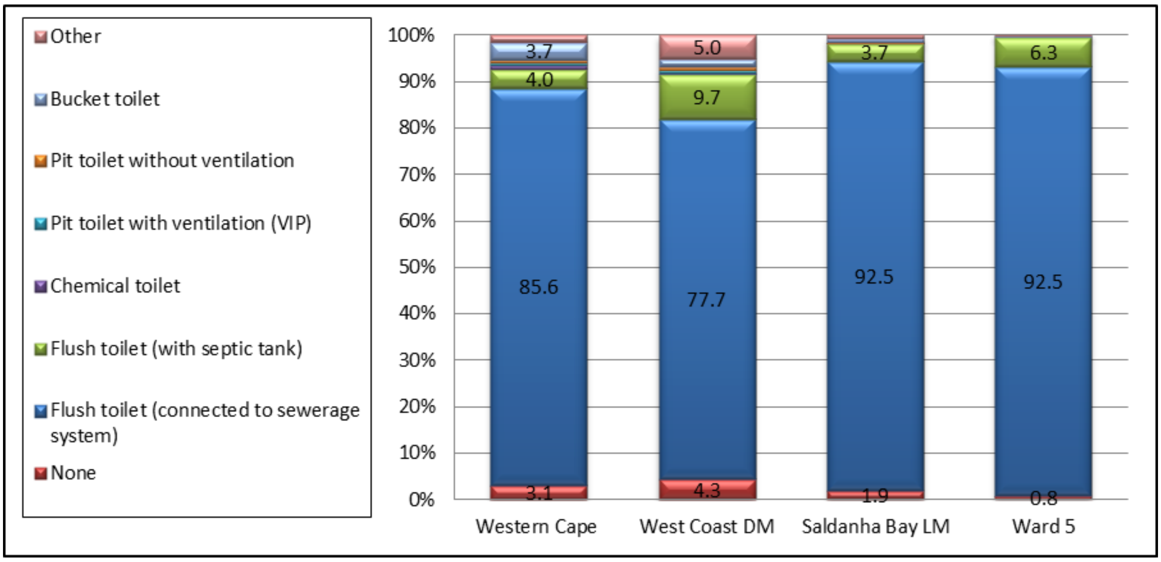


Figure 6-23 Sanitation (Source: Census 2011)

6.2.12 Refuse removal

The West Coast District has the largest proportion of households with their own refuse dumps, much larger than on local or provincial level. These are most likely households that live on farms. Households with their own refuse dumps rely mostly on backyard dumping, burial and burning. These practices adversely impact on human health and the environment.

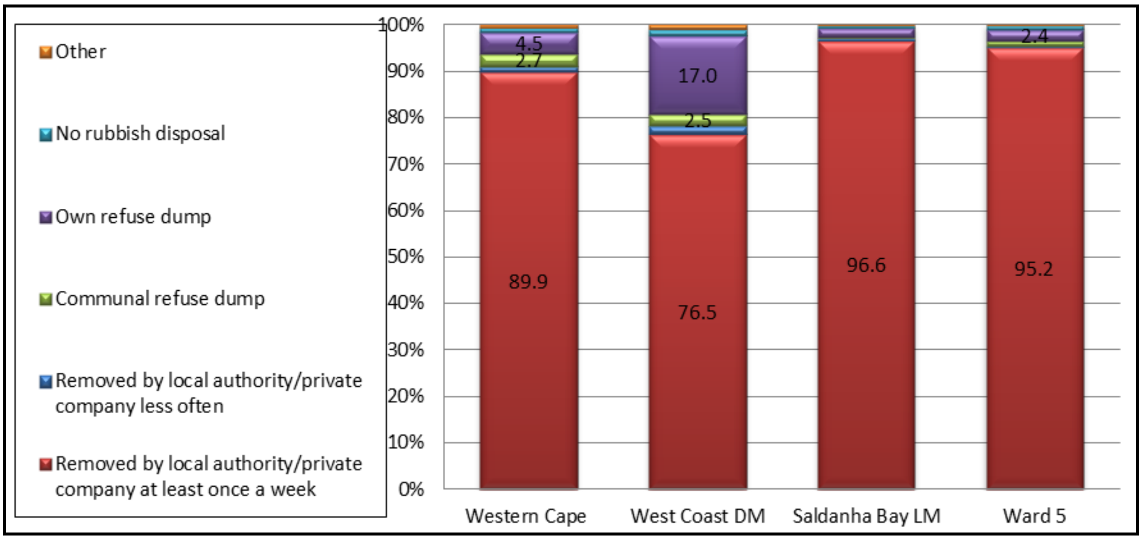


Figure 6-24 Refuse removal (Source: Census 2011)

6.2.13 Crime

The crime statistics for the SAPS are not grouped according to district municipalities, but according to SAPS regions. For this reason, the statistics will be reviewed on national and provincial level as well as for the Saldanha Bay, Langebaan and Vredenburg police precincts that are in the area around the site.

The highest frequency of crimes reported on a national level is contact crimes (crimes against the person). Contact crimes include crimes such as murder, assault, robbery and sexual crimes. On a provincial level the highest frequency of crimes reported falls in the category "Other serious crime". This category include commercial crime, shoplifting and all theft not mentioned elsewhere. On a local level, the highest frequency of crimes reported falls in the category of property-related crimes. Property-related crimes include burglary at residential and non-residential premises, theft of motor vehicles and motorcycles, theft out of or from motor vehicles and stock theft. These crimes (except in some cases of theft out of or from vehicles and burglary) mainly occur in the absence of victims (or the victims being unaware of the occurrence) and therefore involve no violence other than damage to property in some cases.

In terms of contact crimes, there is a proportionately lower incidence in the Langebaan Police Precinct than in the other police precincts. In terms of property-related crime, the incidence at the Langebaan Police Precinct is proportionately higher. The patterns for crimes heavily dependent on police action vary across the different police precincts, most likely giving an indication of police activity in the precinct with reference to these crimes (www.saps.gov.za).

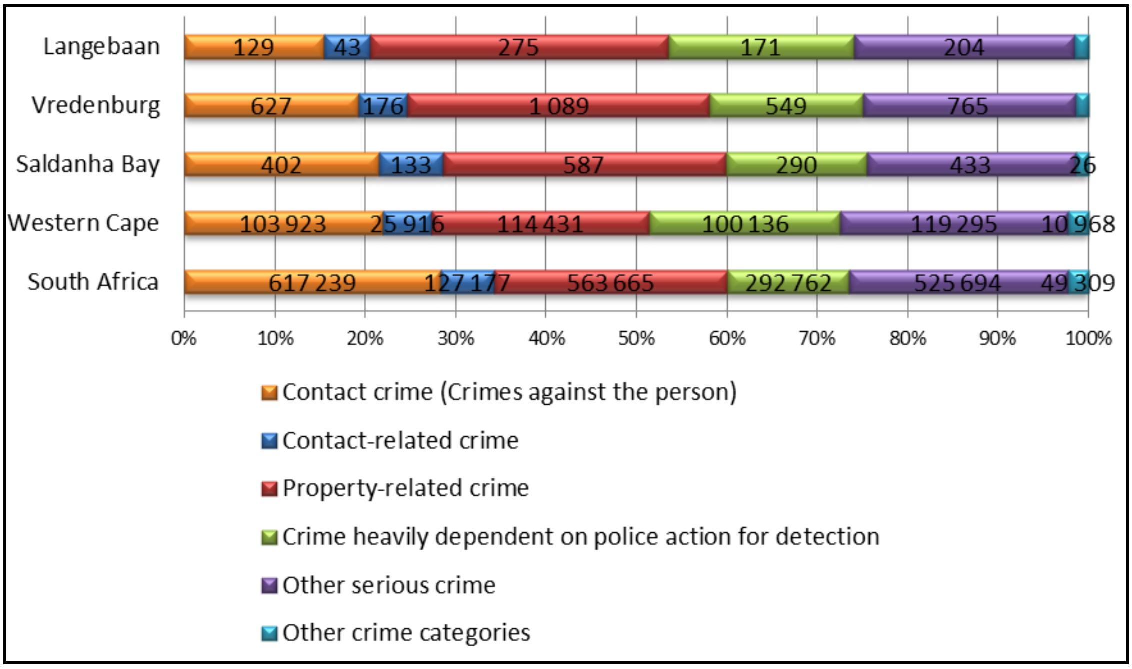


Figure 6-25 Crime for the April 2012 – March 2013 reporting period by main crime categories (source: www.saps.gov.za)

6.2.14 Economic Profile

Saldanha Bay is a very important resource for the sustainable growth and development of the Western Cape. The deep-water port and surrounding infrastructure have already encouraged the development of major industries that contribute positively to local employment and regional and national Gross Domestic Product (GDP). The size of the Saldanha Bay economy was estimated at R4.6billion in 2010. (Saldanha Bay IDZ. 2011).

The economy of SBLM is largely dependent on tertiary sector activities that account for almost three quarters (73.9%) of the local Gross Domestic Products per Region (GDP-R) and create three out of four employment opportunities in the local economy[9]. The finance and business services sector (36.9%) is the largest sector in the local economy that also provides 34% of all employment opportunities in the area. In terms of the value added created, it is followed by government services (17.7%), manufacturing (13.3%), and trade (10.1%). The transport sector generates 9.3% of the local economy's GDP-R. The general government services sector is also the second largest employer in the municipality; however, the third and the fourth position in terms of employment opportunities created belong to the trade (14.2%) sector and the agricultural sector (10.6%).

The structure of the local economy has changed significantly over the past decade. While in 2000, the manufacturing sector was the largest contributor to the economy and accounted for 30.5% of the municipal GDP-R, its current contribution dropped to 13.3%. This was attributed to the sharp decline of the manufacturing sector's production post the 2008 financial crisis and a fast paced growth of the financial and businesses services industry in lieu of the development of the other economic sectors in the area, particularly general government services and the expanses of the activities at the port of Saldanha.

The proposed establishment of a large industrial area is expected to enhance the manufacturing base of the local economy. The same applies for the proposed Saldanha REE SP that could increase the production in the area and contribute to the diversification of the manufacturing base and the development of the sector in general (Urban-Econ, 2014).

6.2.15 Health Status

An estimated 5.6 million people were living with HIV and AIDS in South Africa in 2011 (www.avert.org), the highest number of people in any country. The estimated national prevalence for HIV in 2011 was 29.5% with the Western Cape Province having the second lowest HIV prevalence, following the Northern Cape Province with 18.2%. On a district level, the West Coast District has the second lowest prevalence of HIV after the Namaqua district with 9.9%.

According to the Western Cape's Provincial Strategic Plan (PSP) for HIV and AIDS, STI's and TB 2012-2016, addressing the social, economic and behavioural drivers of HIV includes addressing challenges posed by living in informal settlements, as well as rural and hard-to-reach areas; migration and mobility; and alcohol and substance abuse. It also includes interventions to address gender norms and gender-based violence; to reduce the vulnerability of young people to HIV infection by retaining them in schools as well as increasing access to post-school education and work opportunities; to reduce HIV-related stigma; to strengthen community systems to expand access to services; and to alleviate

9 Quantec, 2013. Standardised Regional Database

poverty and strengthen food security.

The Western Cape PSP has identified the following determinants of the HIV epidemic in the Western Cape:

- Sexual debut;
- Multiple sexual partners;
- Age-disparate sexual (intergenerational) relationships;
- Alcohol and substance abuse;
- Prevention knowledge and risk perception;
- Stigma and discrimination;
- Mother-to-child transmission;
- Male circumcision;
- Other sexually transmitted infections;
- Treatment as prevention;
- Mobility and migration;
- Gender roles and norms;
- Sexual abuse and intimate partner violence.

In 2012 a total of 77 health care facilities were located in the entire West Coast district, with 14 of these being located in the Saldanha Bay LM. The primary health care facilities include 8 fixed clinics, one district hospital, two satellite clinics, one health post and two mobile clinics. One Anti-retroviral Treatment (ART) registered service point has been designated to specifically meet the needs of HIV/AIDS patients and all facilities cater for Tuberculosis (TB) treatment. Although an organisational policy for HIV/AIDS exists, the Saldanha Bay LM needs to develop a strategy for the municipal area. It can be anticipated that the strategy would be very much in line with that of the City of Cape Town. In order to mitigate the social, economic and human impact of HIV/AIDS the City of Cape Town has Multi-Sectoral Action Teams that are operational in each of its sub-districts (www.capetown.gov.za). These teams bring together local stakeholders involved in HIV/AIDS such as non-governmental organisations (NGO's), community-based organisations (CBO's), faith based organisations, local officials and the business sector so as to develop and drive a coordinated plan that addresses local needs.

7 ENVIRONMENTAL IMPACT ASSESSMENT

7.1 Assessment of Impacts

The questions, issues and responses during the stakeholder engagement process, (Appendix A: Public Participation) have been analysed using knowledge of the affected environment, available information and professional judgement, in order to identify key aspects that require further assessment. These have been investigated by specialist and are now rated in the EIA phase.

The reader should note that the classification of an issue as a key issue during the scoping phase did not necessarily imply that a significant impact will result. The significance of an impact can only be ascertained once a specialist study has been conducted.

Impact significance was assessed during the specialist studies and in this impact assessment phase using the criteria listed below.

7.2 Identification of Key Aspects

The key aspects listed in the following section have been determined through the following avenues:

- Views of interested and affected parties;
- Authorities (DEADP additional requirements as per acceptance letter in Appendix B 1: Correspondence from DEADP.
- Legislation; and
- Professional understanding of the project team, environmental assessment practitioners and specialist consultants.

Assessing the comments/concerns received during the public participation process, the DEADP review of the scoping report, applicable legislation and the input from the specialist team, it is evident that the key aspects are:

- Biodiversity impacts
  - Negative impacts on naturally occurring fauna and flora
  - Rehabilitation of disturbed areas according to best practice
- Palaeontology and archaeology
  - Need for palaeontological and archaeological surface surveys prior to any earth moving activities
  - Availability of previously conducted archaeological and palaeontological reports

  - Provision for monitoring of subsurface activity
  - Rescuing of fossil material during excavations
  - Requirement for a Heritage Impact Assessment
  - Fossil finds to be reported

- Air Quality Impacts
  - Air Pollution originating from the plant
  - The requirement for an Atmospheric Emissions Licence
  - Dust Pollution

- Soil pollution

- Noise Pollution

- Traffic Impacts
  - Increased heavy traffic impacting on the existing road infrastructure during the construction and operational phases

- Groundwater and surface water pollution and management
  - Impact on water users in the area
  - Pollution/contamination of groundwater resources
  - Lowering of the groundwater table due to abstraction of water
  - Poor storm water management that could lead to pollution of Saldanha Bay
  - Groundwater monitoring for water levels and seepage of salts
  - Water recycling

- Visual Impact
  - Requirement for a Visual Impact Assessment

- Material handling, storage and transportation
  - Usage and storage of hazardous chemicals
  - Management and disposal of solid and liquid waste
  - Processing and storage of Rare Earths
  - Development of contingence plan for transportation of residue to disposal facility

- Socio-Economic Impacts
  - Economic upliftment relating to local employment creation and employment
  - Land use impacts
  - Impacts on farming of livestock, grain and bee keeping.
  - Safety and Security
  - Supply of building material
- Health Impacts
- Economic impacts related to:

    - Rare Earth Element supply and exporting
    - Rare Earth Element wastes and recovery of these wastes if possible
    - Separation of Rare Earths and resulting products
    - Beneficiation of South Africa's natural resources, including establishing downstream electronics industries in South Africa
- Waste impacts
    - Handling and testing of sludge
    - Lining of waste settling dams/evaporation ponds
    - Capacity of waste disposal facility
    - Storage of hazardous waste
    - Disposal of hazardous waste
    - Disposal on unused products
    - Storage of raw materials
    - Disposal of waste to a disposal facility such as Vissershok
    - Disposal of non-process waste

7.3 Specialist Studies

As a result of the above-mentioned key aspects, the following specialist studies were undertaken during the EIA phase of the project:

- Air Quality Impact Assessment;
- Surface And Groundwater Impact Assessment;
- Stormwater Management;
- Archaeological Impact Assessment;
- Health Impact Assessment;
- Social Impact Assessment;
- Economic Impact Assessment;
- Noise Assessment;
- Visual Impact Assessment;
- Heritage Impact Assessment;
- Ecological Assessment;
- Palaeontological Impact Assessment;

- MHI Screening Assessment; and
- Traffic Impact Assessment.

Various studies have also been undertaken to either guide engineering designs or give feedback on the baseline environment or as part of planning for the development (operational plans):

- Storm Water Management Plan;
- Engineering Geotechnical Investigation; and
- Major Hazard Installation Screening Assessment.

7.4 Assessment Methodology

An impact can be defined as any change in the biophysical (physical-chemical and biological) as well as the socio-economic (including cultural) environmental system that can be attributed to human activities related to alternatives under study for meeting a project need. Assessment of impacts will be based on DEAT's (1998) Guideline Document: EIA Regulations. The significance of the aspects/impacts of the process will be rated by using a matrix derived from Plomp (2004) and adapted to some extent to fit this process. These matrixes use the consequence and the likelihood of the different aspects and associated impacts to determine the significance of the impacts.

The significance of the impacts was determined through a synthesis of the criteria below:

Probability. This describes the likelihood of the impact actually occurring.

Improbable:	The possibility of the impact occurring is very low, due to the circumstances, design or experience.
Probable:	There is a probability that the impact will occur to the extent that provision must be made therefore.
Highly Probable:	It is most likely that the impact will occur at some stage of the development.
Definite:	The impact will take place regardless of any prevention plans, and there can only be relied on mitigatory actions or contingency plans to contain the effect.

Duration. The lifetime of the impact

Short term:	The impact will either disappear with mitigation or will be mitigated

through natural processes in a time span shorter than any of the phases.

Medium term: The impact will last up to the end of the phases, where after it will be negated.

Long term: The impact will last for the entire operational phase of the project but will be mitigated by direct human action or by natural processes thereafter.

Permanent: Impact that will be non-transitory. Mitigation either by man or natural processes will not occur in such a way or in such a time span that the impact can be considered transient.

Scale. The physical and spatial size of the impact

Local: The impacted area extends only as far as the activity, e.g. footprint

Site: The impact could affect the whole, or a measurable portion of the above mentioned properties.

Regional: The impact could affect the area including the neighbouring residential areas.

Magnitude/ Severity. Does the impact destroy the environment, or alter its function.

Low: The impact alters the affected environment in such a way that natural processes are not affected.

Medium: The affected environment is altered, but functions and processes continue in a modified way.

High: Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases.

Significance. This is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required.

Negligible: The impact is non-existent or unsubstantial and is of no or little importance to any stakeholder and can be ignored.

Low: The impact is limited in extent, has low to medium intensity; whatever its probability of occurrence is, the impact will not have a material effect on the decision and is likely to require management intervention with increased costs.

Moderate: The impact is of importance to one or more stakeholders, and its intensity will be medium or high; therefore, the impact may materially affect the decision, and management intervention will be required.

High: The impact could render development options controversial or the project unacceptable if it cannot be reduced to acceptable levels; and/or the cost of management intervention will be a significant factor in mitigation.

The following weights were assigned to each attribute:

Aspect	Description	Weight
Probability	Improbable	1
	Probable	2
	Highly Probable	4
	Definite	5
Duration	Short term	1
	Medium term	3
	Long term	4
	Permanent	5
Scale	Local	1
	Site	2
	Regional	3
Magnitude/Severity	Low	2
	Medium	6
	High	8
Significance	**Sum(Duration, Scale, Magnitude) x Probability**	
	Negligible	≤20
	Low	≤40
	Moderate	≤60
	High	>60

The significance of each activity was rated without mitigation measures (WOM) and with mitigation measures (WM) for both construction and operational phases of the proposed development.

7.5 Impact Assessment

Impacts on the identified key aspects were assessed according to the following structure:

- *Source of the impact*: will be identified (e.g. initial vegetation clearance on site, establishment of construction camp, passage of vehicles on dirt roads, etc).

- A *Description of the impact* will describe the interaction between the activity and the environment, i.e. how and why the impact occurs and how the activity changes the environment.

- *Significance*: an explanation of the significance rating of the impact with and without mitigation, with reference to the impact assessment criteria will be provided. Impacts will be rated as highly significant, or of low significance. Fatal flaws will additionally be identified. There are no mitigation measures which can be implemented to manage a fatal flaw.

- *Mitigation:* The mitigation measures that can be implemented to eliminate or minimise negative impacts or result in the optimization of positive benefits must, wherever possible, be expressed as practical actions.

7.6 Issues identified, significance and proposed mitigation measures

The findings of the impact assessment have been consolidated in the sections below. The impacts have been classified as impacts on the biophysical environment and impacts on the socio-economic environment. The impacts are further classified in terms of the phase of the development in which they are likely to occur, namely the construction phase, the operational phase and the decommissioning phase (where applicable).

Cumulative impacts that can arise from one or more activities were also taken into account. A cumulative impact may result from an additive impact i.e. where it adds to the impact which is caused by other similar impacts or an interactive impact i.e. where a cumulative impact is caused by different impacts that combine to form a new kind of impact. Interactive impacts may either be countervailing (net adverse cumulative impact is less than the sum of the individual impacts) or synergistic (net adverse cumulative impact is greater than the sum of the individual impacts).

During their analysis, specialists were required to consider the impact significance without mitigation (WM) and with mitigation measures (WM) are implemented as well as cumulative impacts. The mitigation measures are also highlighted in this chapter and discussed in depth further in the specialist reports (see relevant Appendices as attached to this report).

The significance of residual impacts is marked according to the following colour code for ease of reference:

Colour	Significance
High	Impact of high significance
Moderate	Impact of moderate significance
Low	Impact of low significance
Negligible	Impact Unknown or Negligible
Positive	Positive Impacts

7.7 Impacts on the Bio-Physical Environment

7.7.1 Ecology

The following section was completed with the assistance of the Ecological Impact Assessment conducted by Nick Helme Botanical Surveys (Appendix I: Ecological Impact Assessment).

Source of the impact

Loss of natural or partly natural vegetation within all development footprints during the construction and operational phases, fragmentation of the current partial ecological connectivity across the site, spread of alien invasive vegetation and impact on fauna, the impact on two threatened bird species which have been observed foraging in the area.

Description of the impact

The entire study area has been previously cultivated and has a low botanical conservation value at a regional scale. This is due to the disturbed nature of the soils in this area, the low plant diversity, and the lack of any plant Species of Conservation Concern. There are no confirmed records of threatened mammals or reptiles from the exact footprint area, and it is unlikely that any persist, due to the history of cultivation.

The primary direct botanical impact would be permanent loss of the partly natural vegetation currently found on the development site (up to 40ha in extent), which would occur mostly at the construction phase.

The construction of the SP with result in a decrease of natural faunal habitat which will result in the dispersement of fauna to nearby undeveloped areas. This will be a once-off impact, however the planned development in the region will result in a more cumulative impact on fauna.

The impact of loss of foraging area is likely to be negligible for the two threatened birds (Blue Crane and Black Harrier) previously recorded foraging in the area, although the new power line infrastructure required (subject to a separate EIA) may have a negative impact on these species (which could be partly mitigated by fitting bird diverters to the new line).

The plant will result in increased dust and airborne pollutants as well as noise which may have a negative impact on the fauna in the area. In addition, noise generated by the plant may have a negative impact on the owls hunting in the vicinity of the plant.

Significance Rating

The magnitude of the botanical impact will be low at the development site. The duration of the impact will be long term and the probability of the impact occurring is considered definite. The impact is therefore of low significance.

The faunal impact is rated highly probable with a permanent duration. The magnitude of the impact is considered low and the significance is therefore low.

Project Phase	Ecological impacts: Impacts on Flora						
	Impact	Probability	Duration	Scale	Magnitude/ Severity	Significance*	
						WOM	WM
Construction Phase	Permanent loss of previously cultivated area and associate secondary vegetarian currently found on the development site – all of Low conservation value	Definite	Long term	Local	Low	Low	Low
Operational Phase	Loss of ecological connectivity, habitat fragmentation, facilitated spread of alien invasive vegetation	Highly probable	Long term	Site	Low	Low	Low

Project Phase	Ecological impacts: Impacts on Fauna						
	Impact	Probability	Duration	Scale	Magnitude/ Severity	Significance*	
						WOM	WM
Operational phase	Loss of faunal habitat, increased ambient noise levels and pollutants impacting on fauna, loss of foraging area, displacement	Highly probable	Permanent	Site	Low	Low	Low

Mitigation Measures – Construction phase

- Install subdued, down facing external lighting to minimise visual impact at night (relevant to nocturnal animals.)
- Install bird diverters on the power line to the plant.

Mitigation Measures – Operational phase

- All disturbed areas within and surrounding the development footprint should be rehabilitated with suitable locally indigenous Strandveld plant species. This should be undertaken by a rehabilitation specialist. Rehabilitation should be undertaken in the first autumn after completion of construction, just prior to the winter rainy season.
- Suitably trained personnel should be appointed to remove alien invasive vegetation from any undeveloped portion of the site, and from the road reserve area. This should be undertaken on an annual basis for at least three years after completion of construction.

7.7.2 Surface- and Groundwater

Source of the impact and mitigation measures

The sources and activities that could potentially cause impacts on surface and groundwater resources were divided into source activities and possible associated impacts during the Construction and Operational Phases as detailed below. Mitigation measures are provided per source activity.

Construction Phase

1. Storage and containment of hazardous and non-hazardous chemicals during construction phase

Potential Impact: During the final stages of the construction of the plant, filling the storage and testing of all systems may contribute to a contamination risk.

Mitigation measures:

- Storage tanks containing liquids with a high vapour pressure should be designed and built in accordance with best engineering practice and have a floating roof, and internal floating raft or an inert gas blanket to minimise the escape of vapours to the atmosphere.
- Bulk tanks should be protected by a secondary containment facility, such as a bund around an individual tank or cluster of tanks with a sump, to contain spills and leaks which may otherwise be discharged off-site.
- Secondary containment facilities should have low permeability, the capacity to contain at least the volume of liquid in the largest tank within the facility, and adequate additional capacity to contain any rain water or firewater as necessary. Pipework should not pass through the walls, but if this is unavoidable, the pipe should be sealed into the wall with a material that is resistant to attack by the chemical stored to ensure that the store remains leak proof.
- Special safety precaution needs to be taken to prevent spillages.
- In the event of a spillage it needs to be contained, removed and treated.

2. Refuelling and maintenance of construction vehicles

Potential Impact: Spillages and leakages from oil and diesel used during construction activities.

Mitigation measures:

- Refuelling must be done at a specially prepared facility with a leak proof service area such as a concrete base. Construction vehicles must be serviced in a workshop prepared with spill buckets and sealed floors. Used oil must be removed by a contractor licenced to fulfil removals of this nature.

3. Use and disposal of sewerage from temporary facilities.

Potential Impact: Groundwater contamination due to spillages from portable sanitation units.

Mitigation measures:

- During construction, portable sanitation units can be used which are available on contractual basis. These units must be serviced regularly according a contractual agreement.

4. Disposal of water in foundation excavations

Potential Impact: Should water assimilate in foundation excavations it will have to be disposed of to allow for construction activities to continue. This water might be polluted and cause water pollution.

Mitigation measures:

- Due to the formation of a shallow perched water table in the wet seasons, it is recommended that all surface beds be raised well above the present ground surface and be provided with a plastic sheeting beneath them to prevent the rising damp.

5. On site storm water containment and management

Potential Impact: Additional storm water concentrations from the large roof structures may lead to concentrated water influx into foundation structures and may form a perched aquifer.

Mitigation measures:

- A storm water management system must be planned designed and implemented on site. It must make provision for a 1 in 50 year storm event.
- Foundation construction must preferably be done during the dry period.

6. Planning of coal yard

Potential Impact: An open coal yard without proper flooring may lead to groundwater contamination.

Mitigation measures:

- The coal stock yard must be a roofed unit that is weather and wind proof with a floor that will prevent leaching of water. The stocked coal must not be allowed to get wet. A storm water network around the coal yard must be sufficient to allow for at least a one in fifty year storm event. Loading of coal must be done during low wind speed periods to prevent coal dust to escape.

7. ***Influence of fluctuating perched water table on foundation structure.***

Potential Impact: A fluctuating perched water table may have a negative corrosive influence on the stability and life of foundations.

Mitigation measures:

- Due to the formation of a shallow perched water table in the wet seasons, it is recommended that all surface beds be raised well above the present ground surface and be provided with a plastic sheeting beneath them to prevent the rising damp.

Operational Phase:

1. ***Storage and containment of hazardous and non-hazardous chemicals during operational phase, including empty and full container storage.***

Potential Impact: Contamination of groundwater from reagents such as acids and kerosene during the normal activities at the plant with filling of the storage facilities and the plant tanks. Contamination around the foundations of the buildings will jeopardize the integrity of the building foundations.

Mitigation measures:

- Regulations regarding the handling, storing and containment of hazardous and non-hazardous chemicals should be followed strictly.

2. ***Temporary disposal of the rare earth carbonate and insoluble waste at the Solid waste settling pond.***

Potential Impact: The planned solid waste settling ponds will provide onsite waste storage for up to six months and will contain insoluble solids of the SP concentrate feed and mixed rare earth carbonates of Ho/Er/Tm/Yb/Lu. Groundwater quality may be at risk if leakage does occur.

Mitigation measures:

- The settling pond will be lined for protection with a concrete seal on top to serve as mechanical seal protection. Mechanical cleaning of the pond will then be possible as and when needed.

3. ***Loading of the rare earth carbonate and insoluble waste at the Solid waste settling pond, for final disposal and potential damage to the integrity of the liner system.***

Potential Impact: Damage to the integrity of the liner system that might lead to groundwater contamination.

Mitigation measures:

- Loading of rare earth carbonate at the Solid waste settling pond must preferably be done directly and must not be stock pilled for long periods.

4. ***Continuous storage of organic waste for final disposal***

Potential Impact: Leakages and spillages at the organic waste tank.

Mitigation measures:

- Bulk tanks should be protected by a secondary containment facility, such as a bund around an individual tank or cluster of tanks with a sump, to contain spills and leaks which may otherwise be discharged off-site.
- Secondary containment facilities should have low permeability, the capacity to contain at least the volume of liquid in the largest tank within the facility, and adequate additional capacity to contain any rain water or firewater as necessary. Pipework should not pass through the walls, but if this is unavoidable, the pipe should be sealed into the wall with a material that is resistant to attack by the chemical stored to ensure that the store remains leak proof.

5. ***Storage of brine before final disposal via regional marine outfall.***

Potential Impact: Leakages and spillages at the brine storage tanks can lead to impacts.

Mitigation measures:

- The discharge of brine from the plant must meet the Recommended Effluent Standards or limits prescribed by permits and applicable laws and regulations.
- The brine must be properly treated on-site before being discharged to the marine outfall pipeline and must be discharged under proper authorization
- Testing of the brine waste water must be performed by capable and properly certified laboratories. Testing results and other operational information must be kept on file at the factory for 5 years.

6. ***Storage of storm water in storage pond.***

Potential Impact: A leaking storm water storage pond can result in ground water quality impacts.

Mitigation measures:

- The storm water storage pond needs to be constantly monitored to ensure that no leakage from this facility will elevate the regional water table. The storm water system must form part of the water balance to be implemented.

7. Storage of process water.

Potential Impact: A leaking process water storage tank might lead to an impact on groundwater quality.

Mitigation measures:

- Water will be piped to the plant and stored in an above ground storage tank (AST). The tank must be inspected regularly for integrity and for evidence of leaks. Procedures must be in place for the inspection of these facilities.

8. Storage of diesel near diesel generator.

Potential Impact: Diesel spillages could result in ground water quality impacts.

Mitigation measures:

- Bulk tank should be protected by a secondary containment facility, such as a bund around the individual tank to contain spills and leaks which may otherwise be discharge off-site.
- Secondary containment facilities should have low permeability, the capacity to contain the volume of liquid in the tank within the facility, and adequate additional capacity to contain any rain water or firewater as necessary.
- Pipework should not pass through the walls, but if this is unavoidable, the pipe should be sealed into the wall with a material that is resistant to attack by the chemical stored to ensure that the store remains leak proof.

9. Storage of coal and coal dust.

Potential Impact: An impact to the ground water quality could occur when water assimilates in the coal stock yard and needs to be discarded. Coal dust might also result in coal dust pollution with associated impacts on water quality.

Mitigation measures:

- The coal stock yard must be a roofed unit that is weather and wind proof with a floor that will prevent leaching of water. The stocked coal must not be allowed to get wet.
- A storm water network around the coal yard must be sufficient to allow for at least a one in fifty year storm event.
- Loading of coal must be done during low wind speed periods to prevent coal dust to escape.

10. ***Temporary disposal in the sewerage tank before removal by honey sucker to the Vredendal Waste Water Treatment Works.***

Potential Impact: A leaking sewerage tank might lead to an impact on groundwater quality.

Mitigation measures:

- The sewerage tank must be constantly monitored to prevent overflow or over filling of the system.

Significance rating summary:

The mitigation measures mentioned above were taken into account when rating impacts. Due to the shallow groundwater table the plant's foundation design made provision for surface beds to be raised and not to be excavated. Also noteworthy is that all areas where hazardous substances or chemicals are stored is bunded and lined. The same mitigation is relevant for the organic waste tank and brine storage tank.

Construction phase

The potential impacts in the construction phase range from "negligible" to "moderate". The activity that rate as "moderate" is:

- Refuelling and maintenance of construction vehicles.

With mitigation, the significance of this activity rate as "Low".

Operational Phase

The potential impacts in the operational phase range from "negligible" to "moderate".

The activities that rate as "moderate" are:

- Temporary disposal of the rare earth carbonate and insoluble waste at the Solid waste settling pond.

- Continuous storage of organic waste for final disposal – potential leakages and spillages.

With mitigation, the significance of these activities rate as “Low”.

The activities that rate as “low” are:

- Storage and containment of hazardous and non-hazardous chemicals during operational phase, including empty and full container storage.
- Loading of the rare earth carbonate and insoluble waste at the Solid waste settling pond, for final disposal and potential damage to the integrity of the liner system.
- Storage of brine before final disposal via regional marine outfall.
- Leakage from storm water storage pond.
- Storage of process water.
- Storage of diesel near diesel generator.

With mitigation, the significance of these activities rate as “Negligible”.

Project Phase	**Surface- and Groundwater Impact**						
	Impact	**Probability**	**Duration**	**Scale**	**Magnitude / Severity**	**Significance**	
						WOM	**WM**
Construction Phase	Filling the storage and testing of all systems may contribute to a contamination risk	Probable (WOM) Improbable (WM)	Medium Term (WOM) Short Term (WM)	Site	Medium	Low	Negligible
Construction Phase	Spillages and leakages from oil and diesel	Highly Probable (WOM) Probable (WM)	Medium Term	Site	Medium	Moderate	Low
Construction Phase	Groundwater contamination due to spillages from portable sanitation units	Probable	Medium Term	Site	Low	Negligible	Negligible

Construction Phase	Foundation structures may be impacted on negatively	Probable (WOM) Improbable (WM)	Short Term	Site	Low	Negligible	Negligible
Construction Phase	On site storm water containment and management	Probable (WOM) Improbable (WM)	Short Term	Site	Low	Negligible	Negligible
Construction Phase	An open coal yard without proper flooring may lead to groundwater contamination	Probable	Short Term	Site (WOM) Local (WM)	Medium (WOM) Low (WM)	Negligible	Negligible
Construction Phase	A fluctuating perched water table may have a negative corrosive influence on the stability and life of foundations	Probable (WOM) Improbable (WM)	Long Term	Site	Medium(WOM) Low (WM)	Low	Negligible
Operational Phase	Contamination of groundwater from reagents such as acids and kerosene during the normal activities at the plant with filling of the storage facilities and the plant tanks. Contamination around the foundations of the buildings will jeopardize the integrity of the building foundations	Probable	Long Term (WOM) Medium Term (WM)	Site	Medium (WOM) Low (WM)	Low	Negligible
Operational Phase	Groundwater quality may be at risk if leakage does occur from storage of SP concentrate feed and mixed rare earth carbonates	Highly Probable (WOM) Probable (WM)	Long Term (WOM) Medium Term (WM)	Site	Medium	Moderate	Low
Operational Phase	Groundwater quality may be at risk if leakage does occur	Probable	Long Term (WOM) Medium Term (WM)	Site	Medium (WOM) Low (WM)	Low	Negligible
Operational Phase	Potential leakages and spillages	Highly Probable (WOM) Probable (WM)	Long Term (WOM) Medium Term (WM)	Site	Medium	Moderate	Low

Operational Phase	Potential leakages and spillages	Highly Probable (WOM) Probable (WM)	Short Term	Site	Low	Low	Negligible
Operational Phase	Ground water quality impact. Perched water table	Probable (WOM) Improbable (WM)	Medium Term	Site	Medium (WOM) Low (WM)	Low	Negligible
Operational Phase	Ground water quality impact. Perched water table	Probable	Long Term (WOM) Medium Term (WM)	Site	Medium (WOM) Low (WM)	Low	Negligible
Operational Phase	Ground water quality impact	Probable	Long Term (WOM) Short Term (WM)	Site (WOM) Local (WM)	Medium (WOM) Low (WM)	Low	Negligible
Operational Phase	Ground water quality impact	Improbable	Medium Term	Local	Medium (WOM) Low (WM)	Negligible	Negligible
Operational Phase	Ground water quality impact	Probable	Short Term	Site	Low	Negligible	Negligible

7.8 Air Quality

The following section was completed with the assistance of the Air Quality Specialist Assessment conducted by Airshed Planning Professionals (Appendix J: Air quality Impact Assessment).

Emissions inventory: Source of the impact and associated activities

The establishment of an emission inventory and atmospheric dispersion modelling formed the basis for the assessment of the impacts from the proposed project on the atmospheric environment. This section summarises the emissions inventory and air quality impacts associated with the proposed plant.

The emissions inventory was based on process descriptions, flow diagrams and mass balances made available by Frontier Separation. Emissions were estimated for criteria pollutants (i.e. pollutants included in the NAAQS) associated with the rare earths separation process i.e. $PM_{2.5}$, PM_{10}, CO, NO_2 and SO_2. Although not considered criteria pollutants, HCl, and trace element emissions from the boiler and mixer settler building were also quantified. Total Suspended Particles (TSP) emissions were quantified for the calculation of dustfall rates.

It should be noted that several mitigation and air quality management measures form part of the design and these were taken into account in establishing the emissions inventory. Given the specific design specifications, the emission control efficiencies of fugitive dust emission mitigation measures were assumed to be similar to those generally specified for such operations in the Australian NPI emission estimation document for mining (NPI, 2012).

The source of each impact identified and activities associated with this source that could potentially cause an air quality impact is indicated below:

1. Transport of Raw Materials and Products to and from the plant

The REE products will be exported from the plant using trucks. Raw materials except HCl and NaOH will to be brought into the plant using 30-tonne trucks. HCl and NaOH will be brought into the plant via a pipeline from the CAPF located adjacent to the SP.

2. Fugitive Emissions at the Plant

2.1 Materials Handling Activities

Material handling points with the potential to generate dust include the off-loading and handling of raw materials delivered by road, conveyor transfer points and the loading of stockpiles. Transfer of all materials except coal will take place in buildings.

2.2 Vehicle Entrained Dust from Paved Roads

All roads on the plant will be paved. The road emissions are not proposed to be controlled thus the emissions from paved roads were calculated and modelled. HCl and NaOH will be brought in via a pipeline. All other raw materials and products will be transported in 30 tonne haul trucks along paved roads.

2.3 Windblown Dust

All stockpiles at the SP will be covered or enclosed. Although wind erosion may potentially occur at the plant these emissions were not quantified as the coal's moisture content is high and a significant amount of wind-blown dust is unlikely to result.

3. Stack Emissions at Plant

Stacks at the plant were identified from process descriptions and site layout maps. Stack emissions were based on emission factors published by the US EPA for boilers and emissions provided. Stack parameters were provided.

In Summary:

Stacks will contribute the largest amount (greater than 99%) of all particulate sources. All gaseous emissions are from the stacks (Burger *et al*, 2014).

Description of the impact

Dispersion simulations were undertaken to reflect the impacts from the sources identified above. Dispersion models compute ambient concentrations as a function of source configurations, emission strengths and meteorological characteristics, thus providing a useful tool to ascertain the spatial and temporal patterns in the ground level concentrations arising from the emissions of various sources.

The dispersion of pollutants expected to arise from current operations was modelled for an area covering 6 km (east-west) by 6 km (north-south). The area was divided into a grid matrix with a resolution of 300 m. The nearest residential areas (Malan, Mouton and Thom residences, Vredenburg, Blouwaterbay, Ongegung, Louwville, Witteklip and the Vredenburg Golf Course) were included as discrete receptors (refer to Figure 7-1).

Cumulative PM_{10}, NO_2 and SO_2 impacts were calculated from predicted incremental impacts at Blouwater Bay and Vredenburg and measured baseline PM10, NO2 and SO2 concentrations at these locations. In the absence of ambient air quality measurement data, cumulative impacts at Ongegund, Louwville and Witteklip could not be determined.

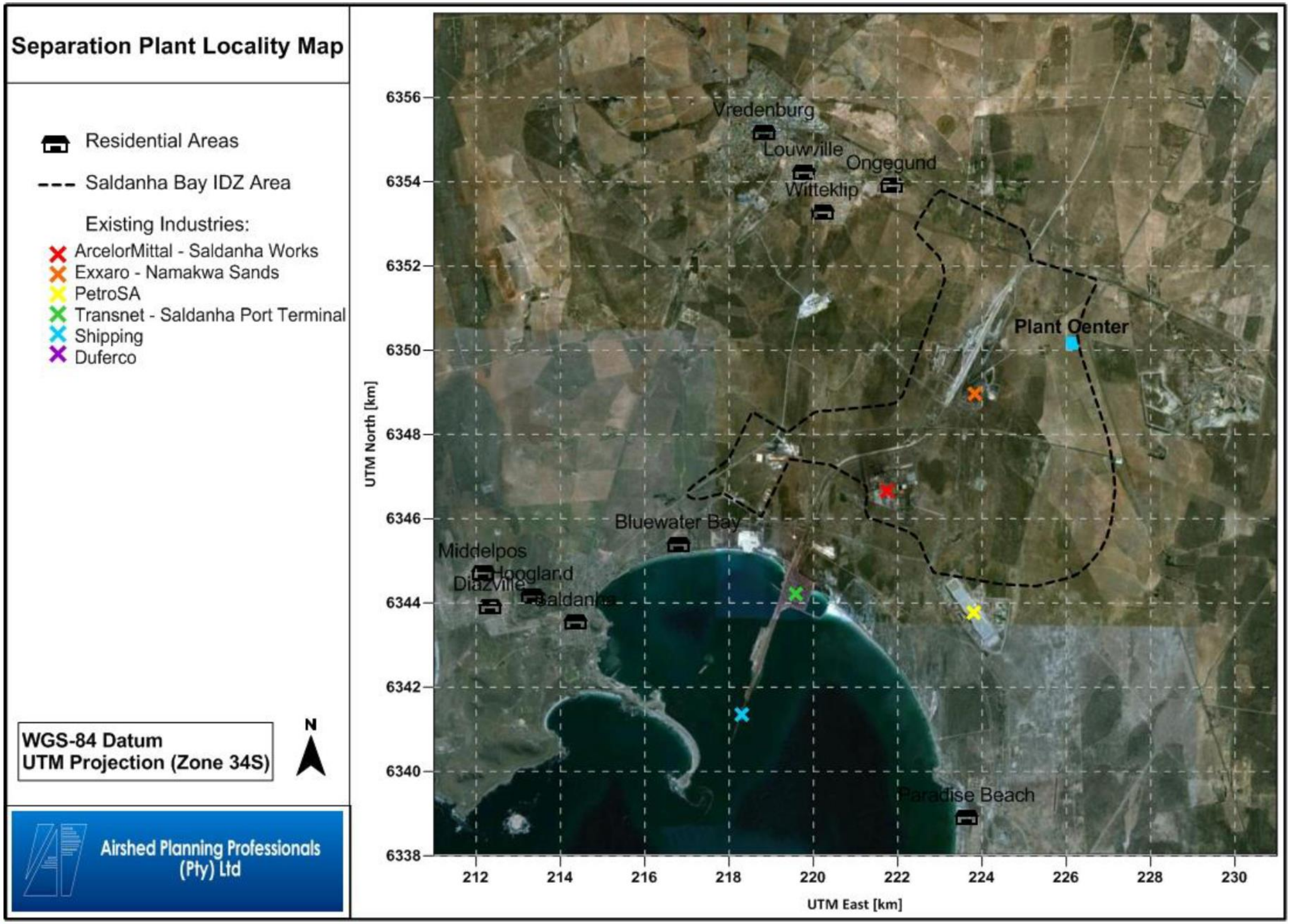


Figure 7-1 Map showing the plant's location relative to main residential areas identified as sensitive receptors in the Air Quality Impact Assessment (Airshed, 2014).

Dispersion modelling was undertaken to determine highest hourly, highest daily and annual average ground level concentrations and dustfall rates for each of the pollutants considered in the study. Averaging periods were selected to facilitate the comparison of predicted pollutant concentrations to relevant NAAQS, dustfall limits and inhalation health criteria.

Ground level concentration (GLC) isopleth plots presented in the Air Quality Impact Assessment depict interpolated values from the concentrations predicted by the atmospheric dispersion model (CALPUFF) for each of the receptor grid points specified. A few selected isopleth plots are provided in the figures below.

Predicted pollutant concentrations and dustfall rates were assessed in accordance with NAAQS, health risk thresholds and dustfall limits. The results were provided for both phase 1 (10 000 tpa production rate) and Phase 2 (20 000 tpa production rate). The results provided are for Phase 2 (maximum production capacity) and are summarised as follows:

- Stacks contribute the largest amount (greater than 99%) of all particulate sources. All gaseous emissions are from the stacks. Dryer and calciner emissions were within the Minimum Emissions Standards as defined by NEMAQA (Act No. 39 of 2004) Subcategories 4.1 and 4.2.
- Predicted $PM_{2.5}$ and PM_{10} concentrations:
    - No exceedances are predicted in terms of the annual average or daily limit values for both $PM_{2.5}$ and PM_{10} (refer to Figure 7-2 and Figure 7-3).
    - The increase in ambient PM_{10} levels is expected to be negligible at the residential areas of Blouwater Bay and Vredenburg.
- Predicted NO_2 concentrations:
    - As a conservative approach it was assumed that all NO_x will be converted to NO_2.
    - No annual average concentrations exceedances, nor exceedances of the hourly NAAQS limit value are expected.
    - Cumulatively the operations are expected to result in a negligible increase in ambient NO_2 levels at Vredenburg (Figure 7-4)
- Predicted SO_2 concentrations:
    - No exceedances of the hourly, daily or annual limit values predicted (Figure 7-4).

- Cumulatively, Phase 1 and Phase 2 operations are expected to result in a negligible increase in ambient SO_2 levels at Vredenburg.

- Predicted CO Concentrations
  - No exceedances of the hourly NAAQS limit value predicted.
- Predicted HCl Concentrations
  - The overall highest predicted HCl concentrations were compared to chronic and acute health guidelines for non-carcinogenic exposures and in the event of an exceedance flagged. No exceedances of the acute or chronic non-carcinogenic health risk criteria were predicted for HCl on or off site.
- Trace Elements Concentrations
  - No exceedances of the acute or chronic non-carcinogenic health risk criteria were predicted for any of the pollutants on or off site.
- Predicted Dustfall Rates
  - Average daily dust fallout predicted to be below the residential limit of 600 mg/m²/day
  - Average daily dust fallout predicted to be below the residential limit of 600 mg/m²/day

In summary:

- Incrementally, predicted $PM_{2.5}$, PM_{10}, CO, NO_2 and SO_2 concentrations were low and in compliance with NAAQS.
- Cumulatively, predicted PM_{10}, NO_2 and SO_2 levels were low and in compliance with NAAQS receptors.
- Incrementally, there were no predicted exceedences of the HCl acute and chronic health risk criteria on-site or off-site or at any of the residential areas.
- Predicted incremental dustfall levels did not exceed the residential dustfall limit.

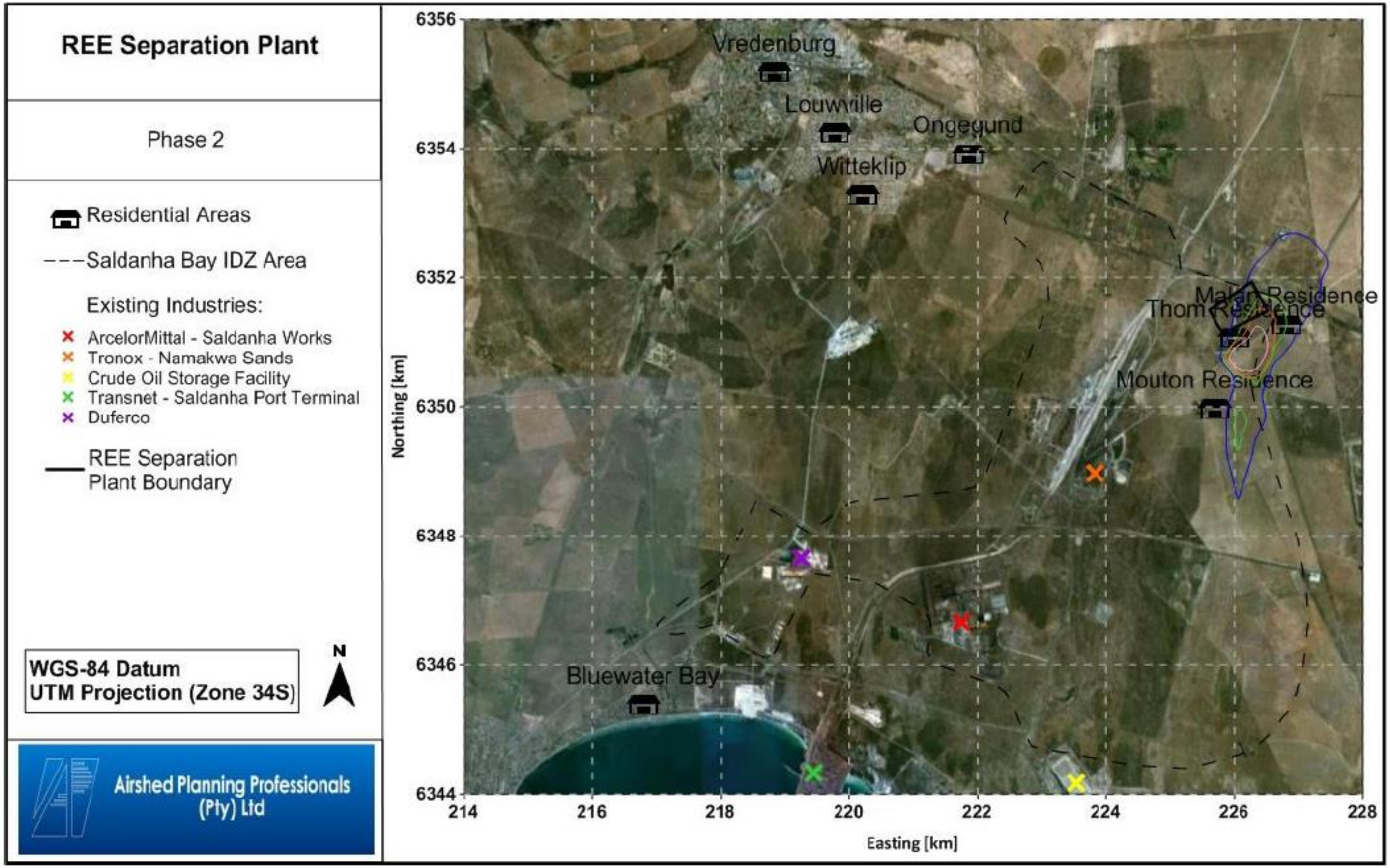


Figure 7-2 PM2.5 annual average incremental impact area (Blue: 0.3 µg/m³, Green: 0.5 µg/m³, Orange: 0.6 µg/m³, Pink: 0.8 µg/m³)

Note: the highest annual average $PM_{2.5}$ increase indicted on the isopleth is 0.8 µg/m³ indicated by the pink line. This area mostly falls within the plant's footprint. No exceedances are predicted in terms of the annual average or daily limit values.

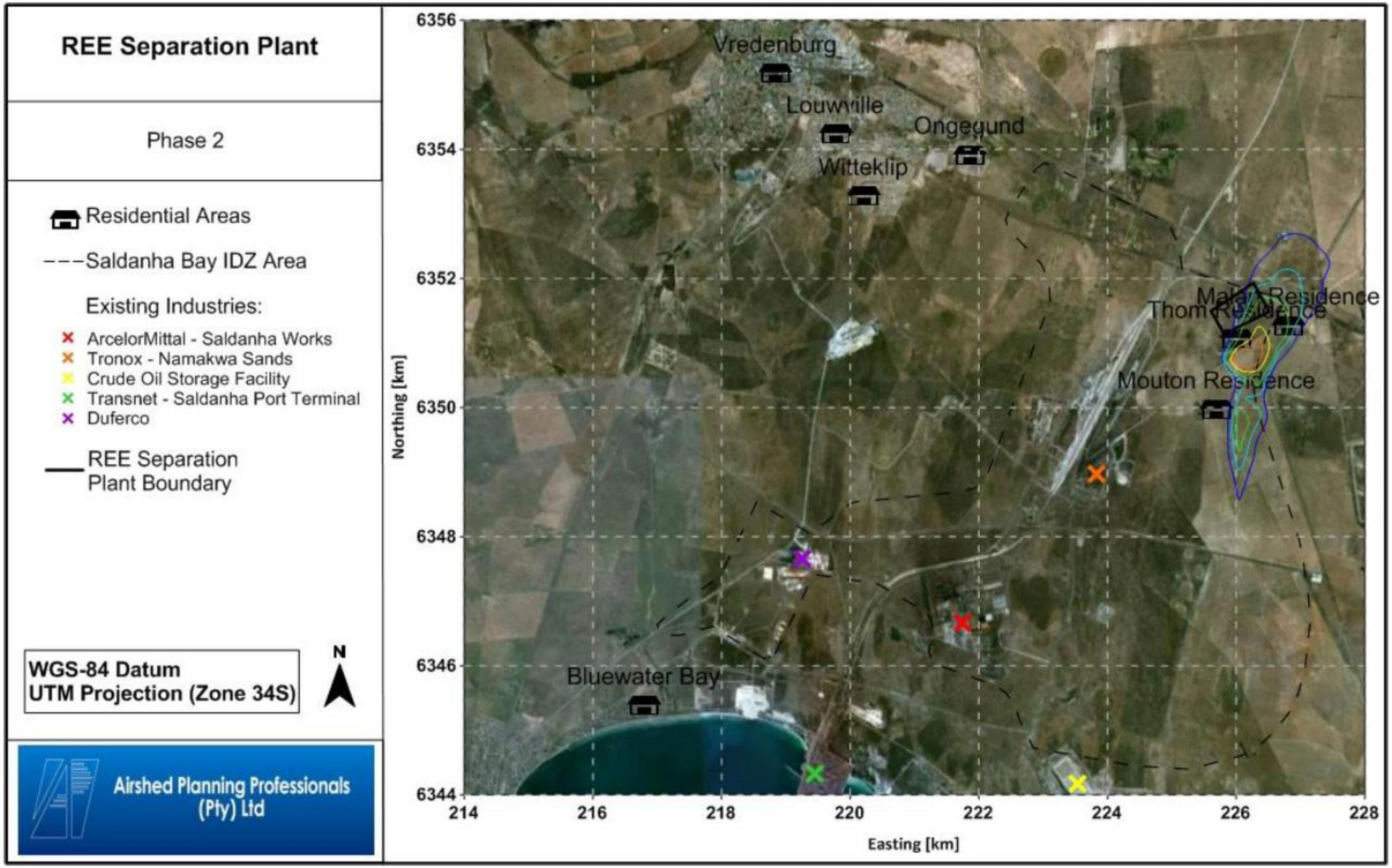


Figure 7-3 PM_{10} annual average incremental impact area (Dark Blue: 0.3 µg/m³, Light Blue: 0.4 µg/m³, Green: 0.5 µg/m³, Yellow: 0.8 µg/m³, Orange: 1 µg/m³)

Note: the highest annual average PM_{10} increase indicted on the isopleth is 1 µg/m³ indicated by the orange line. This area falls within the plant's footprint. The PM_{10} annual average NAAQS is 40 µg/m³. No exceedances are predicted in terms of the annual average or daily limit values.

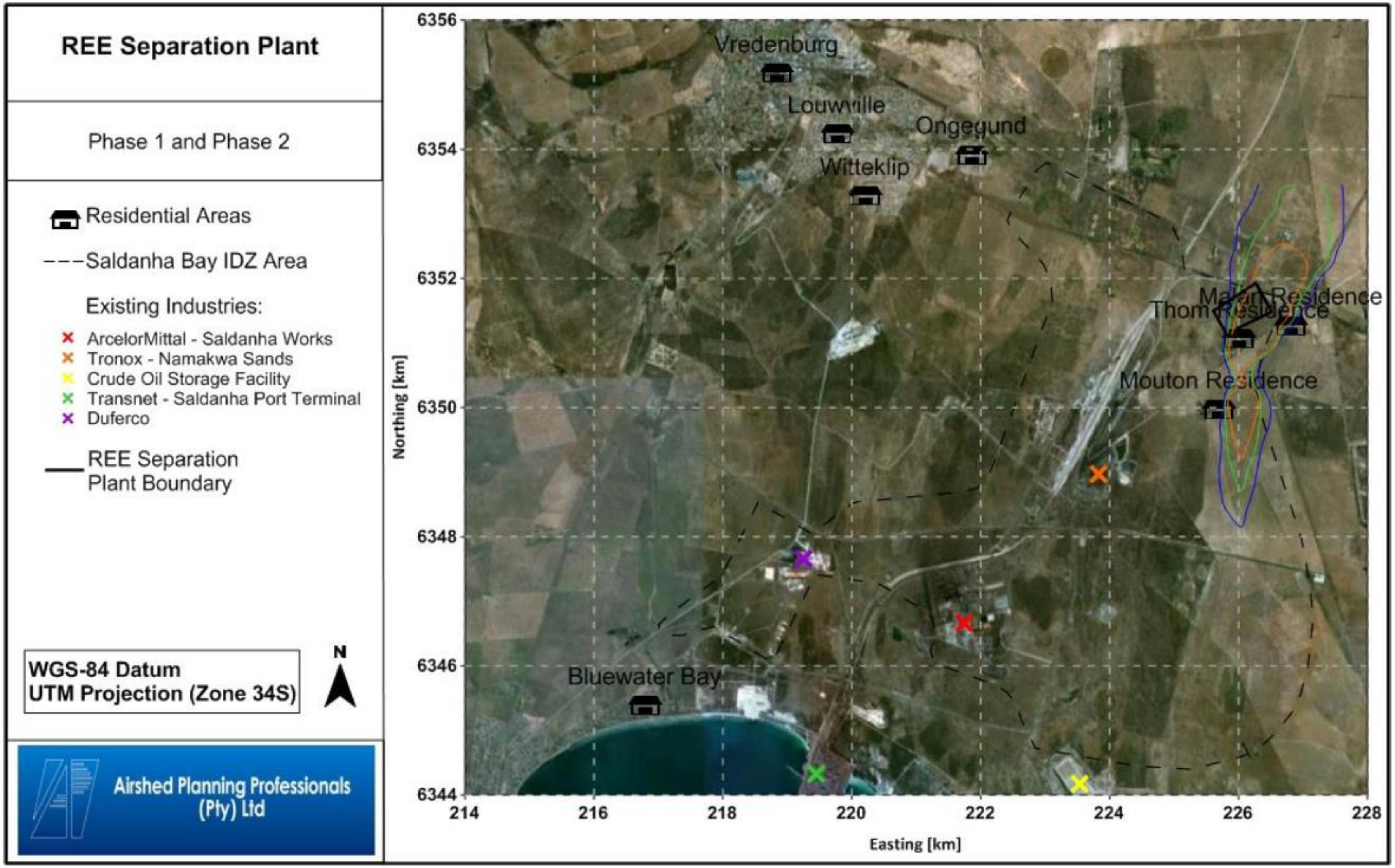


Figure 7-4 **NO_2 average annual incremental impact area (Blue: 0.5 µg/m³, Green: 0.7 µg/m³, Orange: 1 µg/m³)**

Note: NO_2 annual average NAAQS is 40 µg/m³. No annual average concentrations exceedances, nor exceedances of the hourly NAAQS limit value are expected.

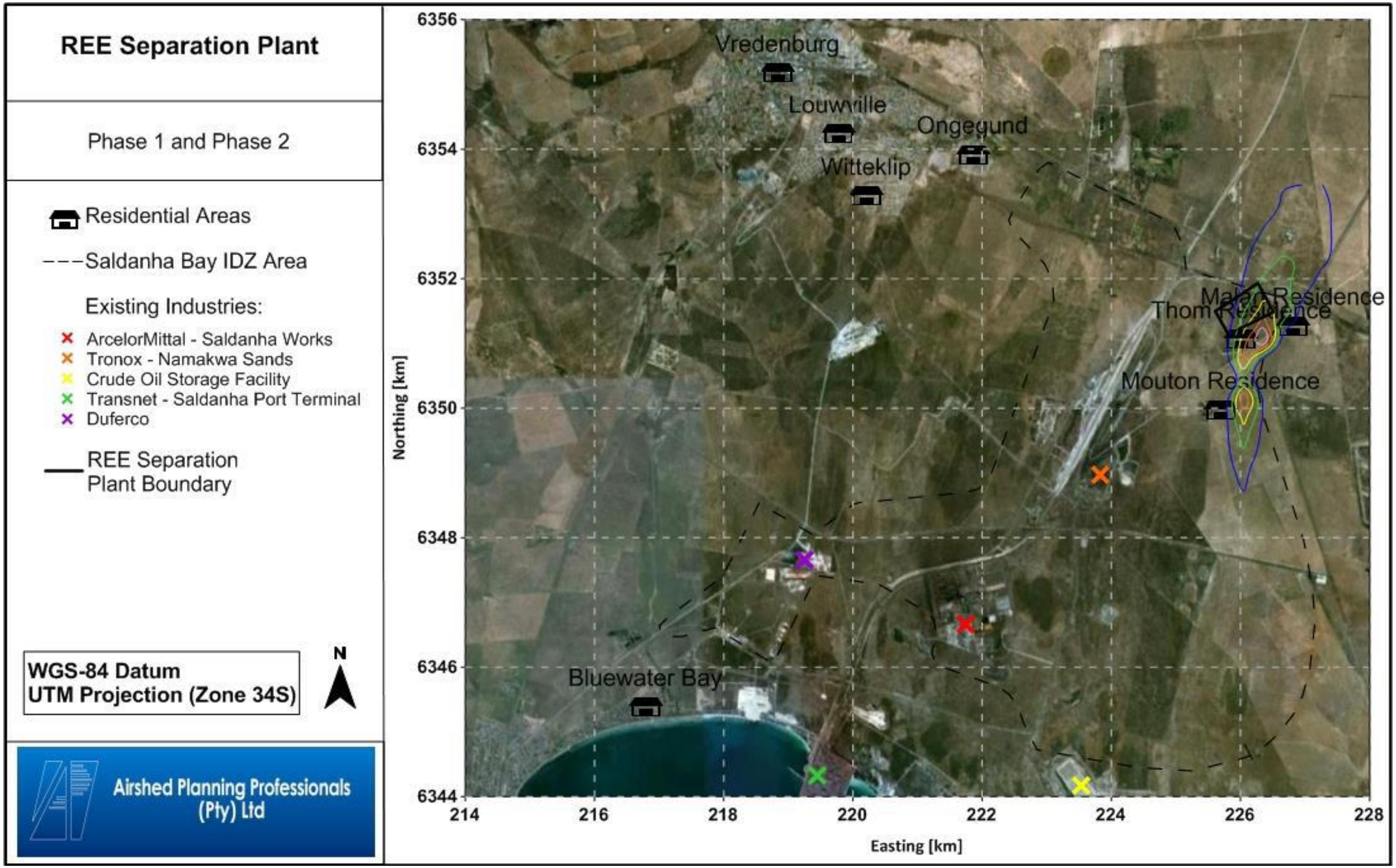


Figure 7-5 **SO2 average annual incremental impact area (Blue: 3 µg/m³, Green: 5 µg/m³, Yellow: 7 µg/m³, Orange: 9 µg/m³, Pink: 11 µg/m³)**
Note: The SO_2 annual average NAAQS is 50 µg/m³.

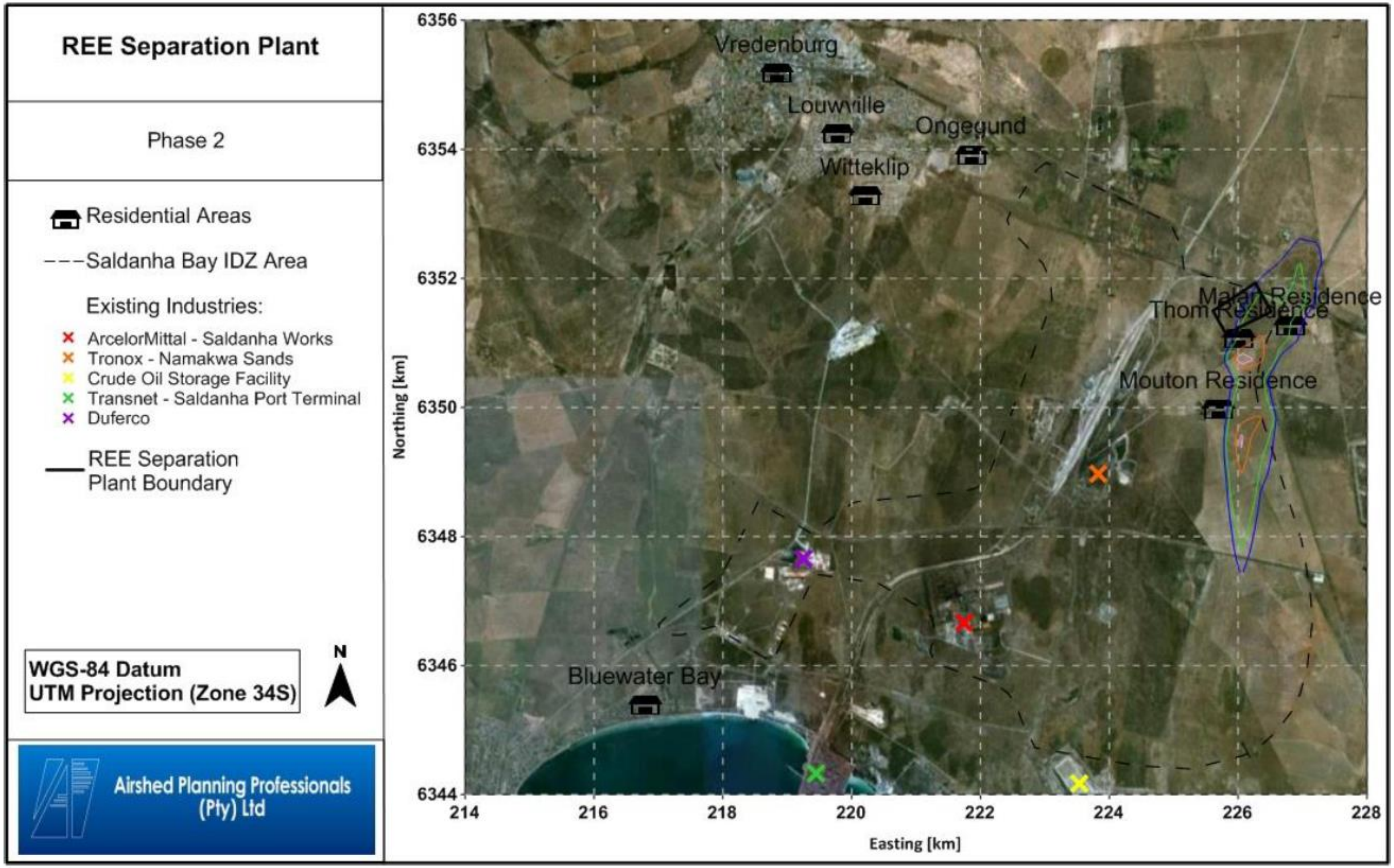


Figure 7-6 Average daily dust fallout (Blue: 0.5 mg/m²/day, Green: 1 mg/m²/day, Orange: 2 mg/m²/day, Pink: 2.5 mg/m²/day)

Significance Rating

The project will most likely not significantly increase ambient PM2.5, PM10, CO, NO2, SO2 and HCl concentrations should design mitigations be used correctly, and therefore the significance ranking of the air quality impact for the proposed SP is considered negligible.

Material handling points with the potential to generate dust include the off-loading and handling of raw materials delivered by road, conveyor transfer points and the loading of stockpiles. Transfer of all materials except coal takes place in buildings.

Materials handling emissions were calculated using the emission factor equation provided in Appendix B, Section 13.1.1 of the Air Quality Impact Assessment Report (Appendix J: Air quality Impact Assessment). A detailed list of materials handling activities, source parameters, control measures and assumed control efficiencies are provided in Table 13-1 of Appendix B of the Air Quality Impact Report.

Project Phase	**Air Quality Impact**						
	Impact	**Probability**	**Duration**	**Scale**	**Magnitude/ Severity**	**Significance**	
						WOM	**WM**
Operational Phase	Deterioration in air quality due to pollutants from all activities	Probable	Long term	Local	Low	Negligible	Negligible
	Deterioration in air quality due to pollutants from the handling of materials	Probable	Long term	Local	Low	Negligible	Negligible
	Deterioration in air quality due to vehicular emissions	Probable	Long term	Local	Low	Negligible	Negligible
	Deterioration in air quality due to wind erosion[10]	-	-	-	-	-	-
	Deterioration in air quality due to process emissions	Probable	Long term	Local	Low	Negligible	Negligible

10 *Although wind erosion may potentially occur at the plant these emissions were not quantified by the Air Quality Specialist as the coal's moisture content will be high and a significant amount of wind-blown dust is unlikely to result.*

Mitigation measures:

It is recommended that the following design mitigation measures be implemented:

- The design mitigation measures to be applied to fugitive sources are total enclosure with fabric filters for materials handling points except at the coal stockpile.
- All processing stacks to be fitted with scrubbers.
- Boiler stack will be fitted with a baghouse.

It is important that the proposed control equipment be maintained at a high level so as to result in availabilities of typically 98% and more.

The following emissions monitoring is recommended at the plant:

- Continuous monitoring of the following from stacks (with periodic monitoring by specified methods as appropriate):
  - gas volume (or alternative estimation method),
  - temperature, and
  - humidity.
- Quarterly monitoring of O2, CO, NOX, SO2 and particulate matter (opacity may be acceptable as an alternative) must be undertaken as appropriate, taking account of the nature, magnitude and variability of the emission and the reliability of the controls.
- Pressure drop indicators to be fitted to all fabric filters and continuously monitored on major sources.

7.9 Impacts on the Socio-Economic Environment

7.9.1 Health

The following section was completed with the assistance of the Health Impact Assessment conducted by Envirosim (Appendix K: Health Impact Assessment).

Source of the impact

The health risks posed to members of the public by the proposed activities at the SP was evaluated using a source-pathway-receptor analysis approach. Information from specialist study reports prepared for the project site was incorporated with toxicology data and population statistics to quantify the human health risks associated with the SP.

Information presented indicate that a complete source-pathway-receptor linkage exists for the atmospheric exposure pathway. Information on the aquatic environment, as potential exposure pathway, was not complete and a source-pathway-receptor linkage for this pathway could not be demonstrated. The potential for exposure through the atmospheric exposure pathway was evaluated for the operational life of the SP. The results from the atmospheric dispersion model indicate that the potential impact through the atmospheric pathway extends beyond the immediate vicinity of the proposed Project site. Based on the dispersion estimates, several permanently occupied homesteads, on smallholdings within a radius of 1 km from the project boundary, were identified potential sensitive receptors.

Description of the impact

Should members of the public be exposed to contaminants from the plant, in particular through the atmospheric pathway, it could have a detrimental impact on their health.

The following impacts were investigated:

- Impact to human health associated with inhalation exposure to criteria pollutants (particulates, NO2, SO2 and CO),
- Impact to human health as a result of inhalation exposure to rare earth elements associated with airborne particulate matter, and
- Impact to human health as a result of inhalation exposure to process chemical vapours.

Significance Rating

The significance of the impact associated with exposure to criteria pollutants is rated as low. Impacts from exposure to airborne REE and process chemical vapours are rated as negligible.

Project Phase	Health Impact						
	Activity	Probability	Duration	Scale	Magnitude/ Severity	Significance	
						WOM	WM
Operational Phases	Impact from criteria pollutants	Probable	Long term	Site	Medium	Low	Low
	Impact from airborne REE	Improbable	Long term	Site	Low	Negligible	Negligible
	Impact from process chemical vapour	Improbable	Long term	Site	Low	Negligible	Negligible

Mitigation Measures

- Mitigation measures as provided in the Air Quality Impact Assessment (Airshed, 2014) are recommended and where possible should be implemented at operational sources.

At this time, it is considered unnecessary to reduce the exposure to airborne REE and process chemical vapours from the Processing Plant as the significance of these impacts are low enough not to warrant further action.

7.9.2 Social Impacts

The following section was completed with the assistance of the Social Impact Assessment (SIA) conducted by Equispectives (Appendix N: Social impact assessment).

Economic Impacts

The SP will create between 450 and 600 employment opportunities in the construction phase of which 85% will be filled by local people. Between 350 and 450 of these jobs will be semi-skilled or unskilled. The operation phase will create between 145 and 150 permanent jobs of which 123 will be semi-skilled/unskilled and 95% of the unskilled jobs will be filled by local labour. In addition 37 contract-based workers will be employed, of which 28 will be semi-skilled/unskilled.

Description of the impact

Employment creation will be a significant positive social impact in the construction and operation phase.

There will also be secondary formal opportunities. Frontier Separation foresee that the following business opportunities will be made available to the local communities; catering, personnel transport, construction accommodation, security, office cleaning services, small item procurement (stationary, cleaning supplies, toiletries, PPE, etc.).

Apart from the formal economy it can be anticipated that an informal economy will also benefit from the proposed development. Provision of meals and housing, laundry services, local entertainment and communication services are examples of potential informal services that can develop in the locally affected communities. It is important to ensure that there is gender equity in the distribution of opportunities.

There may be some negative social impacts associated with economic opportunities. Unemployment is an existing problem in the area and given the shortage of opportunities community conflict about available jobs and distribution of benefits may arise. This has been a historic problem in the area. There may also be unrealistic expectations about opportunities that will be created.

During the closure of the plant, there will be job losses, which will have a negative social impact. This impact was not assessed in the SIA, as the social environment will change in 30 years and the potential impacts cannot be predicted with any level of confidence. It is recommended that a SIA specific to closure should be conducted at the time.

Significance Rating:

The significance of the positive economic social impacts due to the proposed project with mitigation is rated as being of moderate and high significance. The negative socio-economic impacts are rated as being of moderate significance. The significance of most of the impacts identified can be increased or reduced with mitigation measures, apart from where the scale does not allow for more positive changes.

Project Phase	Social impacts						
	Activity	Probability	Duration	Scale	Magnitude/ Severity	Significance	
						WOM	WM
Construction	Job creation	Definite	Short term	Regional	High	High +	High +
	Secondary job creation	Definite	Short term	Site (WOM) Regional (WM)	High	Moderate +	High +
	Conflict about jobs and benefits	Highly probable	Short term	Site	High (WOM) Medium (WM)	Moderate	Low
Operational Phase	Job creation	Definite	Long term	Regional	High	High +	High +
	Secondary job creation	Definite	Long term	Site (WOM) Regional (WM)	High	High +	High +
	Conflict about jobs and benefits	Highly probable	Medium term (WOM) Short term (WM)	Site	High (WOM) Medium (WM)	Moderate	Low

Mitigation Measures:

- Invest in skills development plans, bursaries and internships to ensure scarce skills will be available in time.
- Inform local businesses through forums run by the Chambers of Commerce/Business forums about possible opportunities.
- Develop a recruitment policy that allows equal opportunity to all people (woman, disabled) and give preference to local labour. Communicate the policy and requirements to the affected communities through the media, municipality, community leadership and a community liaison forum. Establish labour desks in easy accessible areas.
- Appoint a community liaison officer that deals specifically with the surrounding communities. Compile a community relations plan. Become a member of relevant industrial forums and participate in municipal initiatives such as the IDP process.
- Work on a strategy to actively manage expectations. This includes the sharing of relevant information in a way that is accessible to all members of the community.

Frequent communication is a key aspect in the management of expectations

- Establish a detailed grievance mechanism for communities to lodge concerns, suggestions and complaints which can be dealt with by the Project in a timely manner.

HIV and gender impacts

HIV/Aids is a national problem in South Africa. According to the SDLM SDF (2011) no accurate figures about HIV/AIDS is available, but about 40% of infected people are treated at municipal facilities and the remaining number of people are assumed to be treated privately. The bulk of the population treated in the area falls within the 15-35 age group – this is also the group from whom a significant number of the construction force would be recruited. The Community and Health Services department claims that it is evident that the disease has spread since the arrival of big industries in the area (SBLM SDF, 2011).

In general women are more vulnerable to health and social risks. Women are often largely excluded from the economic benefits generated by industrial projects due to the nature of the available jobs, or the economic benefits put them at risk, like transactional and commercial sex. In the case of pregnancies they are often left with the sole care of the baby whilst the men move after more economic opportunities.

Description of the impact

There has been a historic influx of job seekers into the area since the mid 1990's, and it is likely that this trend will continue, due to the proposed IDZ and other developments in the area such as mining and wind farms, and due to the proposed project. It is likely that the number of HIV positive people in the community will increase due to the presence of migrant workers, who come to the area looking for opportunities.

Infectious diseases such as tuberculosis are often associated with HIV, therefore there will be pressure on existing health services. There is only one facility in the area that provides people with ARV's, and apart from the risk of stigmatization, one facility may simply be insufficient.

Another important consideration is the impact of contractors bringing in materials from other provinces, especially during the construction phase. The truck drivers are often required to stop overnight. The truck stops become "hot spots" with a considerable pull factor luring people with economic opportunities, including sex work. It is difficult to manage these transient factors, but it does contribute to the spread of the disease amongst transportation routes, and it is therefore important to consider the impact.

It is assumed that people moving into the area looking for opportunities will most likely end up living in one of the informal settlements, and it is here where vulnerable young girls will be exposed to some of the potential impacts. Although it cannot be expected from Frontier Separation to mitigate this impact in the greater societal context, it can assist with internal policies and awareness formation.

Significance Rating:

The significance of the HIV and gender impacts due to the proposed project with mitigation is rated as being of moderate and high significance. The significance of most all the impacts identified can be reduced with mitigation measures.

Project Phase	Social impacts						
	Activity	Probability	Duration	Scale	Magnitude/ Severity	Significance	
						WOM	WM
Construction	Spread of infectious diseases such as HIV and TB	Highly probable	Permanent	Regional	High (WOM) Medium (WM)	High	Moderate
	Spread of HIV along transportation routes	Definite (WOM) Highly Probable (WM)	Short term	Regional	High (WOM) Medium (WM)	High	Moderate
	Pressure on existing health services	Highly probable (WOM) Probable (WM)	Medium term	Regional	High	Moderate	Low
	Specific impacts on vulnerable women in surrounding communities	Definite (WOM) Highly Probable (WM)	Short term	Site	High (WOM) Medium (WM)	Moderate	Low
Operational Phase	Spread of infectious diseases such as HIV and TB	Highly probable	Permanent	Regional	High (WOM) Medium (WM)	High	Moderate
	Spread of HIV along transportation routes	Highly probable (WOM) Probable (WM)	Long term	Regional	Medium	Moderate	Low
	Pressure on existing health services	Highly probable (WOM) Probable (WM)	Long term (WOM) Medium term (WM)	Regional	Medium (WOM) Low (WM)	Moderate	Negligible
	Specific impacts on vulnerable women in surrounding communities	Definite (WOM) Highly Probable (WM)	Long term	Site	High (WOM) Medium (WM)	High	Moderate
Decommissioning Phase	Spread of infectious diseases such as HIV and TB	Highly probable	Permanent	Regional	High (WOM) Medium (WM)	High	Moderate

Mitigation Measures:

- Form a partnership with a Non-Profit Organisation (NPO) to provide the necessary social services to people whose lives are affected by infectious diseases.
- Develop an in-house infectious diseases strategy to address health issues within the workforce. Align strategy with community HIV strategy followed by NPO. Strategy should include voluntary counselling and testing and training of peer educators.
- Develop and implement a Workforce Code of Conduct to maximise positive employee behaviour in the local community, and optimise integration.
- Inform Department of Health of development once approved
- Liaise with the Department of Health about additional health care facilities
- Establish a clinic for the employees at the plant one day a week where they can receive chronic medication and primary health care, including free anti-retrovirals (sourced from Department of Health). This service can be provided by a sub-contractor.
- Implement a Health and Safety Program on site, including safety consciousness and awareness training. The program should also include relevant health aspects, e.g. sexual health, fatigue management, social health.
- Form an AIDS Task Force for the project with representatives from unions, management, local community members and people living with HIV.
- Extend the workplace programme for HIV beyond the company's operations, and include all contractors, suppliers, transportation companies and local communities. The spread of HIV along transportation routes (roads and railways) is well documented, so this component of the project (transportation of all goods and services to and from the project site) needs special attention.
- Develop tailored behaviour change communication (BCC) materials such as mirror hanger messages and bumper stickers;
- Include condoms in the road safety kit;
- Work with truck company managers to ensure that their drivers receive adequate HIV training;
- Develop a gender-specific outreach programme for the project. It can target schools, clinics and the youth, and should also include internal awareness formation. It must be presented in a culturally sensitive manner to ensure it does not create tension inside communities.

Impacts due to an influx of people

Development or rumours of development often causes an influx of people into an area. The SBLM has been experiencing an influx of people since the mid 1990's when Saldanha Steel entered the area. A new Industrial Development Zone has just been announced, and there are new mines, wind farms and smelters planned for the area (all went through EIA processes in the last 4 years). There are significant pull-factors present in the area. Although there are high unemployment and skilled people around, the perception may be that there will be more opportunity than local demand can meet.

Description of the impact

The proposed SP contributes to the wave of development in the area. Many of the impacts associated with an influx of people are already taking place, and it is impossible to attribute a certain percentage of the impact to a specific role-player. Frontier Separation will contribute to the impact, but it cannot be held responsible for all the mitigation required. This section will discuss impacts associated with an influx of people, and mitigation measures in broad, but it must be stated that all role-players must adopt a strategic approach to the mitigation to ensure successful implementation.

The assimilative capacity (resilience) of the SBLM should be sufficient to allow for the integration of the incoming population, as change has been taking place constantly over a number of years. There may be a feeling of resentment towards newcomers to the area if they get jobs and local people do not, due to whatever reason. This may cause local tension and violence, and in extreme cases xenophobic incidents. It will be worse in areas where there are existing social challenges such as alcohol and drug abuse, shebeens, prostitution and over-crowdedness.

Frontier Separation will not make use of a construction camp, but will aim to employ local labour. People who come from outside the SBLM will be expected to source their own accommodation within the SBLM. It must be noted that the SBLM have municipal facilities for the use of construction workers. It is very likely that workers coming in from elsewhere will rent backyard rooms from locals, or live in one of the informal settlements in the area.

Another potential impact that should be managed is the creation of expectations. In tough economic times unrealistic expectations about potential project benefits easily arise. With media coverage about development in the area and recruitment numbers communicated via public processes the public often over-inflates benefits. If their expectations are not met, the developer's social license to operate will be affected and problems within the community may be created. It is therefore important to manage expectations and give realistic numbers to the public from the beginning of the project.

Significance Rating:

The significance of the impacts due to an influx of peopled due to the proposed project with mitigation is rated as being of low, moderate and high significance. The significance of most of the impacts identified can be reduced with mitigation measures.

Project Phase	Social impacts						
	Activity	Probability	Duration	Scale	Magnitude/ Severity	Significance	
						WOM	WM
Pre-construction	Unrealistic expectations of local communities	Definite (WOM) Highly probable (WM)	Short term	Regional	High (WOM) Medium (WM)	High	Moderate
Construction	Local tension and violence	Highly probable (WOM) Probable (WM)	Short term	Site	High (WOM) Medium (WM)	Moderate	Negligible
	Availability of resources (housing)	Definite (WOM) Highly probable (WM)	Short term	Site	High (WOM) Medium (WM)	Moderate	Low
	Unrealistic expectations of local communities	Definite (WOM) Probable (WM)	Short term	Regional	High (WOM) Medium (WM)	High	Low
Operational Phase	Local tension and violence	Highly probable (WOM) Probable (WM)	Long term	Site	High (WOM) Medium (WM)	Moderate	Low
	Availability of resources (housing)	Probable	Long term	Site	High (WOM) Medium (WM)	Low	Low
	Unrealistic expectations of local communities	Definite (WOM) Probable (WM)	Medium term	Regional (WOM) Site (WM)	Medium	Moderate	Low

Mitigation Measures:

- Appoint a community liaison officer that deals specifically with the surrounding communities. Compile a community relations plan that includes a strategy to manage expectations.
- Develop and implement a Workforce Code of Conduct to maximise positive employee behaviour in the local community, and optimise integration.

- Design and implement a Drug and Alcohol Management Policy, and undertake regular testing on site, to minimise negative interactions with the local community.
- Establish a detailed grievance mechanism for communities to lodge concerns, suggestions and complaints which can be dealt with by the Project in a timely manner.
- Frontier to liaise with the SBLM to enable the municipality to develop the SBLM's housing strategy.
- Compile local employment strategy with input from the SBLM and advertise strategy.
- Engage with relevant community role players like unions and recruitment agencies about number of available jobs and skills required.

Impacts on the liveability of the social environment

The proposed site is adjacent to the R27 road and not close to any residential areas. The area is still relatively unspoiled. The Weskus Spens Padstal is a small shop situated on an adjacent property, and it is unclear what the future of the shop is, but for the time being the development is seen as positive for the business. The neighbouring properties are in the process of being sold to other developers. The owners see it as commercial transactions. The area is earmarked for industrial development in the SDF of the SDLM.

Description of the impact

The plant will change the sense of place, but it is unlikely to impact on tourism. There are some bee-hives on and near the site. These hives belong to the son of one of the neighbours. This honey is reportedly only harvested once a year, and is not a big commercial venture. Bee-hives are movable structures and will be moved with the rest of the movable infrastructure on the property. There are other bee-hives in the area as well, but the local people indicated that they are moved around on a seasonal basis, depending on the quality of the flowers in the area. The removal of the bee-hives will not have livelihood implications.

Significance Rating:

The impact of the plant on the liveability of the social environment is seen as moderate and low. The significance of the impact can be reduced with mitigation measures.

Project Phase	Social impacts						
	Activity	Probability	Duration	Scale	Magnitude/ Severity	Significance	
						WOM	WM
Construction	Liveability of the social environment	Definite (WOM) Highly probable (WM)	Short term	Local	Low	Low	Negligible
Operational Phase	Liveability of the social environment	Definite (WOM) Highly probable (WM)	Permanent	Local	Low	Moderate	Low

Mitigation Measures:

- Adhere to findings of other specialist reports
- Establish or join an existing environmental forum to give feedback to affected communities twice a year regarding environmental aspects such as dust, water and noise pollution and how Frontier Separation manage and mitigate these aspects.

7.9.3 Economic Impacts

The following section was completed with the assistance of the Economic impact assessment conducted by Urban-Econ Development Economists (Appendix M: Economic Impact study).

Source of the impact

The potential sources of impact on the economic environment include both positive and negative impacts on the local and regional economies due to the construction, operation and decommissioning of the SP. The facility will also lead to the creation of employment, development of skills and increased household income, GDP-R and government revenue.

Description of the impact

The project will be associated with both positive and negative effects. The negative impact of the project is associated with two issues. The first issue is that it will increase the trade deficit due to the need to import equipment and machinery during construction, whilst the second issue is that of sterilisation of agricultural land on the site where the proposed facility will be established. The effect on the balance of payment are expected to be of low significance as they will be spread over a prolonged period and are not expected to affect the monetary policy of South Africa. As for the impact on land sterilisation, from an economic respective it will be negligible as the grazing land capability of the site is relatively low. Moreover, the positive economic impacts that will be created as a result of the plant's establishment will by far outweigh the losses associated with the loss of productive land.

Apart from the negative impact above, all economic impacts identified during construction, operational and decommissioning phases are positive and most will be of high significance. It has been determined that during construction, the proposed SP will stimulate the production in the country with a value of R15 149.9 million (2013 prices), which will generate R5 663.2 million of GDP-R and create 15 034 full-time equivalent (FTE) person-years. Once the full operational capacity is reached in 2024, the SP will create 182 permanent and contract-based employment opportunities, of which 151 will be created for semi-skilled and unskilled people, while the rest will be for skilled and highly skilled people. This means that the proposed Separation Plant will be able to reduce the current unemployment level in the Saldanha Bay LM, albeit by a small margin of about 1.4%. During operations, when impacts are sustainable and last for a period of about 30 years, the proposed Separation Plant will contribute to the creation of 3 201 jobs in the country and generate R2 603.1 million of GDP-R (2013 prices). t is expected to increase the size of the provincial economy by about 0.42% and the national economy by about 0.08%. Importantly, it will stimulate the growth in the Saldanha Bay manufacturing sector and contribute to the industrialisation of the local economy that is in line with the government objectives for the area relating to the development of the Industrial Development Zone.

From an economic perspective, the proposed project is highly beneficial for the country, the Western Cape economy, and the local municipality's economy. The proposed SP will have a significant positive effect on these economies in terms of stimulation of domestic production, job creation, and government revenue. The project also falls within the government's objective to use the SBLM to improve industrialisation in the country and establish high value-adding manufacturing activities to boost job creation and economic growth.

Significance Rating

As stated above, most impacts identified will be positive and of high significance.

Project Phase	Economic Impact						
	Impact	Probability	Duration	Scale	Magnitude/ Severity	Significance	
						WOM	WM
Construction Phase	Temporary increase in trade deficit	Highly Probable	Medium term	Regional	Low	Low	Low
	Temporary increase in production in the country	Definite	Medium term	Regional	Medium	High +	High +
	Temporary increase in country's GDP-R	Definite	Medium term	Regional	Medium	High +	High +
	Creation of employment opportunities	Definite	Medium term	Regional	Medium	High +	High +
	Temporary increase in household income	Definite	Medium term	Regional	Medium	High +	High +
	Skills development during construction	Probable (WOM) Highly probable (WM)	Medium term	Regional	Medium	Low +	Moderate +
	Increase in government revenue	Definite	Medium term	Regional	Medium	High +	High +
	Sterilisation of agricultural land	Definite	Permanent	Local	Low	Moderate	Moderate

Project Phase	Economic Impact						
	Impact	Probability	Duration	Scale	Magnitude/ Severity	Significance	
						WOM	WM
Operational Phase	Increase in production during operation	Definite	Long term	Regional	Medium	High +	High +
	Increase in GDP-R during operations	Definite	Long term	Regional	Medium	High +	High +
	Creation of sustainable employment opportunities	Definite	Long term	Regional	Medium	High +	High +
	Increase in household income during operations	Definite	Long term	Regional	Medium	High +	High +
	Development of skills during operation	Highly Probable (WOM) Definite (WM)	Long term	Regional	Medium	Moderate +	High +
	Increase of government revenue	Highly Probable	Long term	Regional	Medium	Moderate +	Moderate +

Project Phase	Economic Impact						
	Impact	Probability	Duration	Scale	Magnitude/ Severity	Significance	
						WOM	WM
Decommissioning Phase	Stimulation of the economy and job creation	Highly probable	Short term	Regional	Low	Low +	Low +

7.9.4 Heritage Resources

7.9.4.1 Archaeological Impact

The following section was completed with the assistance of the Phase 1 Archaeological Impact Assessment Study conducted by Mr Nelius Kruger from AGES in 2014[11] of Portion 6 of the Langeberg 188 (Appendix O 2: Archaeological Impact Assessment).

Source of the impact

11 The AIA conducted by in 2014 has been externally reviewed by Lita Webley from ACO Associates.

If present, archaeological sites could potentially be damaged or destroyed during construction of the plant.

Description of the impact

The ACRM survey originally focussed on an area wider than the footprint of the proposed plant and located a small number of quartz artefacts and a piece of weathered ostrich eggshell in a wind-deflated hollow within this larger study site. Single ESA quartzite lithics as well as a MSA flake in quartzite were also found on the steep west facing vegetated slopes. These archaeological occurrences were rated as having low local significance.

No Stone Age remains were observed on Portion 6 during the later AGES survey but surface calcrete occurrences were observed in the area. However, Stone Age material occurs in the larger landscape and the remains of e.g. herder sites are likely to be encountered in areas that have not been transformed by farming. No Iron Age farmer, Historical / Colonial Period and recent times or grave sites where found during the survey

Significance Rating

Since these archaeological remains have been rated as having low local significance, and due to the fact that the remains occur away from the proposed development site, the significance of the impact on the heritage resource is expected to be NEGLIBLE and this rating is expected to remain unchanged if the site is monitored if any development activities were to take place in this area.

No areas of heritage potential were observed during the AGES survey of Portion 6 of the farm Langeberg and any impact on heritage resources in this area is expected to be NEGLIBLE. This rating is expected to remain unchanged if the site is monitored during all phases of construction of the proposed Separation Plant.

Project Phase	Heritage Impact						
	Activity	Probability	Duration	Scale	Magnitude/ Severity	Significance	
						WOM	WM
Construction	Impact on heritage resources	Highly probable	Permanent	Local	Low	Low	Low

Mitigation Measures

- In view of the variety and significance of heritage resources in the Saldanha and Vredenburg area all development areas should be carefully monitored by the ECO in order to avoid the destruction of previously undetected heritage sites. Should any subsurface paleontological / archaeological / historical material and /or graves/human remains be uncovered, all activities should be suspended and the archaeological specialist should be alerted immediately.

- It should be noted that mitigation measures are valid for the duration of the development process, and mitigation measures might have to be implemented on additional features of heritage importance not detected during this Phase 1 assessment (e.g. uncovered during the construction process).

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

- As Stone Age material occurs in the area the larger landscape should be regarded as potentially sensitive in terms of possible subsurface deposits.

7.9.4.2 Palaeontological Impact

The following section was completed with the assistance of the Palaeontological Desktop Study conducted by John Pether in 2012 (Appendix O 3: Palaeontological Impact Assessment).

Source of the impact

Fossil material being uncovered, damaged or destroyed during excavations and earthworks.

Description of the impact

A desktop assessment by Mr John Pether revealed that beneath a thin cover of sand, the project site is underlain by calcareous aeolianites (old dune sands) and calcretes ("surface limestones") of the Langebaan Formation. These strata do not appear to be very fossiliferous, but the fossils that have been found are of profound scientific value. Construction activities (excavations) will result in a negative direct impact on the probable 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 them and their contexts when exposed at a particular site is irreversible.

Conversely, 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, provided that efforts are made to watch out for and rescue the fossils.

Significance Rating

The extent of the potential impacts will be limited to the immediate footprint and the magnitude of the impacts is considered medium due to profound scientific value of the fossils that occur in the area. The significance is therefore rated as low.

Project Phase	Palaeontological Impact						
	Activity	Probability	Duration	Scale	Magnitude/ Severity	Significance	
						WOM	WM
Construction	Earthworks negatively impacting on fossil material / recovery of fossil material	Probable	Permanent	Local (WOM) Regional (WM)	Medium (WOM) High (WM)	Low	Low +

Mitigation Measures

- Inform staff of the need to watch for potential fossil occurrences.
- Inform staff of the procedures to be followed in the event of fossil occurrences.
- Monitor for presence of fossils.
- Liaise on nature of potential finds and appropriate responses.
- Excavate main finds; inspect pits & record selected, key/higher-risk excavations.
- Obtain permit from Heritage Western Cape should any fossil material be uncovered during excavations.

7.9.5 Visual Aspects

The following section was completed with the assistance of the Visual Impact Assessment conducted by New World Associates (Appendix L: Visual impact assessment).

Source of the impact

The height of the tallest structures as read off plan is 13.5m to top of frame on the overhead crane structures used for loading and one overhead gantry roof at 17m which will be visible from various locations in the surrounding area. The pollution due to night lighting will also be a source of impact.

Description of the impact

The mixed rural – industrial landscape is already compromised by large-scale industries in the area. However, the visual character is still strongly rural and agricultural. It occurs on a non-scenic portion of an important tourist route linking Cape Town to Velddrif and environs. The proposed development will have a moderate impact on the landscape causing noticeable change to the visual environment.

The viewshed analysis reveals a large area of visibility for the site, as the visibility tends to fade into the distance rather than being blocked from view in many places by ridgelines. Only a couple of ridgelines occur and are largely artificial to do with railway lines near the R79 and the R27; there is also a ridgeline from mine tailings to the east at the old quarry. Other factors that create the zone of visual influence are dense tree lots along roads and railway lines and locally around farmsteads. The critical zone of visual influence is within the 1km range wherein relatively easy and recognisable visibility occurs. The R27 passes within this critical zone for under a kilometre (Figure 7-7).

The area has mixed sensitivity due to the mixed land use; on the one hand, relatively rural and agricultural, while on the other hand, industrial and quarry.

Significance Rating

The development has very high visual exposure, moderate visual absorption capacity, medium compatibility, and is highly visible. The development’s visual impact has a district extent, long-term duration, medium intensity, definite probability, and medium significance on the landscape.

The significance of the visual impact of the proposed project is rated as moderate before mitigation measures have been applied and would decrease to low after mitigation measures have been correctly implemented. Photomontages of the proposed plant without any mitigation measures are shown in Figure 7-8. A photomontage with mitigation measures proposed in the Visual Impact Assessment (Appendix L) is indicated in Figure 7-9. The proposed mitigation includes that the colouration of the infrastructure needs to be developed in coordination with a Visual Assessor and/or project Landscape Architect or Architect (refer to section below). The photomontage in Figure 7-9 provides an example of what the plant can look like when mitigation measures are implemented, however the exact colouration might differ once the plant is constructed depending on what the surrounding environment looks like at the time (also considering that the plant is proposed to be located in a future industrial area).

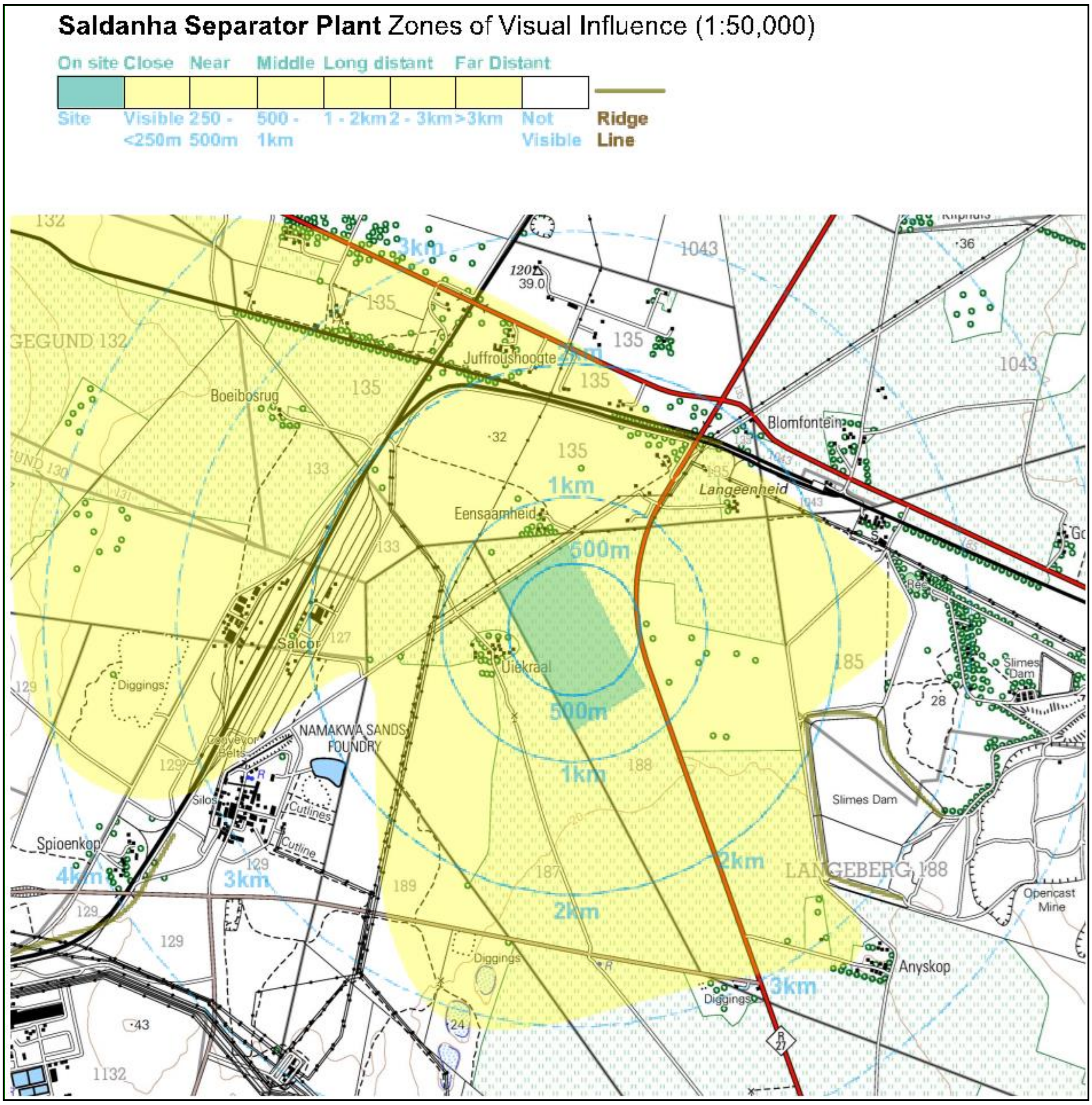


Figure 7-7 Zones of Visual Influence

Figure 7-8 Photomontages of the proposed plant without mitigation measures.

Figure 7-9 Photomontage of the proposed plant with mitigation measures that can be implemented.

Project Phase	Visual Impact						
	Impact	Probability	Duration	Scale	Magnitude/ Severity	Significance	
						WOM	WM
Construction, Operational and Decommissioning Phase	Visual impact of development on surrounding landscape	Definite	Long term	Site	Medium (WOM) Low (WM)	Moderate	Low

Mitigation measures: Planning and Design

- A Site Development Plan should be developed.
- Taller structures should be placed at the back/west of the site, or at least the centre of the site where possible.
- Commercial buildings such as administration, etc should be placed near the R27 to build a buffer against the taller more industrial plant to the rear/centre.
- Heights should be reduced wherever possible and structures should be designed sensitively with an architect and landscape architect to reduce the engineered feel/aesthetic.
- A landscape plan should early on be implemented in the site development.
- Sustainable site development and Green Building principles or standards should be employed.
- Lighting must be carefully managed to minimise excessive lighting wherever possible (see Operational mitigation measures below).
- The colouration of the infrastructure needs to be developed in coordination with a Visual Assessor and/or project Landscape Architect or Architect. Colours that blend in well with the landscape and which are not too dark, but rather light/pale sage/fynbos greens/greys where vegetation is the backdrop or pale sandy colours matching local soils, can be used.
- A professional Landscape Architect needs to prepare a Landscape Plan for the project.
- Wherever possible the greening/planting of the development needs to be maximised and not squeezed into inadequately sized edges and corners.

- Permeable paving and other sustainable practices should be incorporated into the landscape plan.
- Planting using indigenous and preferably endemic species from the area should be planned from the beginning with the exception of large trees.
- Large trees must be incorporated into the Landscape Plan and gum trees while not indigenous are the only major trees that can survive the rugged environment and achieve the necessary scale. They are also traditional cultural elements and not out of place as a result. Indigenous trees can also be planted to succeed the gums once the right environment has been created for them but this is not a visual or aesthetic necessity.
- Major blocks of tall trees as described above should be incorporated into the design to help screen and scale structures as well as capture dust. Where possible these should be on the perimeter of the project.
- Architectural/Engineering and Landscape Guidelines should be taken into consideration.
- The treatment of perimeter fencing and any signage needs to be carefully considered. Unsightly massive walls are not appropriate. If space allows, berms using topsoil saved from site can be used to screen ground level clutter. Edge treatment using clear-view fencing or similar, not palisade, is preferable. It should be coloured a dull green to match the local environment and not black, silver, brown or other unnatural, standard commercial colours.
- As noted above, where possible, endemic plants should be used with the exception of gum trees, which are permissible for practical and cultural landscape reasons.
- Maintenance of buildings, plant and landscape need to be undertaken from the outset for the duration of the project. Good site tidiness should be maintained at all times.
- The proposed Landscape Plan should be referred to a visual impact assessor for review before it is approved, to ensure that it meets the recommendations in the Visual Impact Assessment.

Mitigation measures: Construction Phase

- All parties must make every effort to control the destruction of soils and vegetation on site, especially any remnants of natural vegetation. These must not be damaged under any circumstances.
- Chemical damage by cement mixing directly on the ground and by diesel, etc spills must also be prevented at all costs, as should vandalism of the plants and accidental damage to limbs by workers and machinery. Fires must be prevented also at all costs in all areas. Penalties and incentives should be implemented as can fencing off areas.
- Monitoring of the landscape, soils and vegetation during construction is very important and must be attended to regularly. Adequate indigenous (preferably endemic) vegetation must be planted.

Mitigation measures: Operational Phase

- Lighting should be minimised and carefully controlled as part of the project's management plan. The use of green energy fittings and concepts should be encouraged and lighting developed with sensitivity to the rural landscape.
- Waterwise landscaping should be used wherever possible and green star building practices.
- Landscape Maintenance must be carried out at all times in line with these recommendations to help keep the scheme green and encouraging local biodiversity.

Mitigation measures: Decommissioning Phase

- On-going landscape maintenance and conservation management remains necessary.

7.9.6 Noise

The following section was completed with the assistance of the Noise Impact Assessment conducted by BG Van Zyl (Appendix Q: Noise Impact assessment).

Source of the impact

Construction activities will involve clearing and soil stripping, excavation and digging of foundations and building construction. In all these activities the primary source of noise will be diesel engine noise. Plant operational activities may also lead to noise disturbance and nuisance.

Description of impact

Construction activities will take place mainly on the SP site, but there will also be some road construction activities.. Most of the work will occur during the day when the environment is relatively insensitive to noise.

Considering the scale of the plant and the large numbers of equipment (e.g. motors, pumps and fans) which will operate on the SP site, the physical extent of the project's noise footprint is remarkably small. The main reason for this is that all the main units which will constitute the primary sources of noise, such as the Solvent Extraction, Precipitation and Filtering modules, will be enclosed in buildings. Although only of standard steel construction, the walls of these buildings will provide a significant degree of sound insulation and reduction of noise emission levels, compared to an open plant. Another factor which contributes to the relatively small incremental noise footprint of the SP is the imprint of existing road and industrial noise sources on the existing background noise level.

Significance Rating

Noise levels produced by general construction activities will be low and are not expected to be disturbing or even audible at the nearest receptors in the external environment and therefore no mitigation is recommended.

The Noise Impact Assessment concluded that the SP is not expected to impact significantly on the nearest residences north (Mouton Residence) and north-east (Malan Residence) of the plant during operations.

Although outside the significant impact footprint of the plant, the Mouton residence and offices will be impacted by the development. Presumably, if not displaced, the use of these buildings will change from residential to industrial. Moreover, any noise assessment which includes the access road, would show that this location will be significantly impacted by transport truck and other vehicle traffic noises.

Figure 7-10 Noise contour map (indicating impact insignificant outside the 3 dB contour and inside the 5 dB contour)

Project Phase	Noise Impact						
	Activity	Probability	Duration	Scale	Magnitude/ Severity	Significance*	
						WOM	WM
Construction Phase	Noise from construction of plant	Improbable	Medium Term	Local	Low	Negligible	Negligible
Operational phase	Cumulative noise impact from plant on the existing noise of the area	Probable	Long term	Site	Low	Negligible	Negligible
Closure Phase	Noise from decommissioning of plant	Improbable	Medium Term	Local	Low	Negligible	Negligible

Mitigation Measures for construction phase

- Assuming that that construction work will be restricted primarily to daytime hours (06:00 to 22:00), construction noise will not be disturbing and no mitigation is required.

Mitigation Measures for operational phase

The finding by the Noise Specialist that the potential noise impact of the SP at the nearest receivers (residences will be negligible, is subject to two factors which, implicitly, serve as mitigating measures:

1. Plant modules will be enclosed in steel-clad buildings; and

2. Frontier Separation will comply with the provisions of the Occupational Health and Safety Act and SANS 10083, in terms of which the 8-hour noise rating LAeq,8h in the work place (i.e. inside the SP module buildings) is not allowed to equal or exceed the hearing safety limit of 85 dBA.

Provided these two measures are implemented, no further mitigation will be required.

7.9.7 Traffic

The following section was completed with the assistance of the Traffic Impact Assessment conducted by ITS Engineers (Appendix P: Traffic impact assessment).

Source of the impact

The number of trucks and other vehicles on the roads in the vicinity of the plant is expected to increase.

Description of the impact

Based on the employment figures and operational information the facility is expected to generate the following daily / peak hour trips:

Deliveries:	**Ton / Year**	**Trips / Day**
MRECS Concentrates	30 000	6 trucks (3 in, 3 out)
Coal		2 trucks, 1 in, 1 out)
Chemicals		2 trucks a week (1 in, 1 out)
General Deliveries		6 vehicles / trucks (3 in, 3 out)
Collections:	**Ton / Year**	**Trips / Day**
REE Products	20 000	4 trucks (2 in, 2 out)
Sewage and Waste		2 trucks (1 in, 1 out)
Employees/Visitors:		**Trips / Day**
Busses		8 busses (4 in, 4 out)
Private Vehicles		50 cars (25 in, 25 out)
	TOTAL	**80 Trips / Day**

The plant will be operational 24 hours per day and employees will be working in shifts. If 45% of the already inflated traffic demand occurs during peak traffic hours, then the development will generate approximately 36 peak hour trips (18 inbound and 18 outbound).

Significance Rating

Based on the Traffic Impact Assessment, all study intersections are currently operating at acceptable Levels-Of-Service (LOS) and will continue to operate at acceptable LOS with the SP being operational. No road upgrades are proposed from an intersection capacity point of view. Based on the above, the expected transport related impact of the SP will be relatively insignificant. The proposed road upgrades are recommended form a safety point of view and not a capacity point of view. Should the recommended right-turn lanes be implemented along the TE85/1, then the impact of the development will be sufficiently mitigated.

Project Phase	Impact: Traffic impact						
	Activity	Probability	Duration	Scale	Magnitude/ Severity	Significance	
						WOM	WM
Construction and Operational	Increased traffic flow on the surrounding roads	Highly probable	Long term	Site	Low (WOM) Low (WM)	Low	Low

Mitigation Measures:

- It is recommended that the SP management arrange busses or taxi's for its employees that cannot afford their own private transport. Facilities for pedestrians could in the interim be provided at the site entrance.
- Sufficient parking will be available for cars and delivery trucks. It is recommended that 3 bus bays be provided close to the development access.
- Based on Road Access Guidelines (RAG) turning lane warrants, it is recommended that right-turn lanes be provided at the new access along the TR85/1. This right-turn lane should be designed and constructed according to the appropriate standards of the provincial roads authority.

Table 7-1 Impact Significance Rating Table

Activity	Impact	Phase	Probability		Duration		Scale		Magnitude/ Severity		Significance		
			Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	WOM	WM
Ecology													
Vegetation clearance for the construction of the plant and access road	Loss of the partly natural vegetation	Construction	5	Definite	4	Long Term	1	Local	2	Low	35	Low	Low
			5	Definite	4	Long Term	1	Local	2	Low	35		
Plant operations and vehicular movement on access road	Loss of ecological connectivity; habitat fragmentation; facilitated spread of alien invasive vegetation	Operations	4	Highly Probable	4	Long Term	2	Site	2	Low	32	Low	Low
			4	Highly Probable	4	Long Term	2	Site	2	Low	32		
Loss of faunal habitat, Plant operations, use of access road by heavy vehicles	Impact on fauna: Road kill along access road; displacement; loss of foraging areas	Construction and Operations	4	Highly Probable	5	Permanent	2	Site	2	Low	36	Low	Low
			4	Highly Probable	5	Permanent	2	Site	2	Low	36		
Hydrogeological													
Storage and containment of hazardous and non-hazardous chemicals during construction phase	During the final stages of the construction of the plant, filling the storage and testing of all systems may contribute to a contamination risk	Construction Phase	2	Probable	3	Medium Term	2	Site	6	Medium	22	Low	Negligible
			1	Improbable	1	Short Term	2	Site	6	Medium	9		
Refuelling and maintenance of construction vehicles	Spillages and leakages from oil and diesel used during construction activities	Construction Phase	4	Highly Probable	3	Medium Term	2	Site	6	Medium	44	Moderate	Low
			2	Probable	3	Medium Term	2	Site	6	Medium	22		
Use and disposal of sewerage from temporary facilities	Groundwater contamination due to spillages from portable sanitation units	Construction Phase	2	Probable	3	Medium Term	2	Site	2	Low	14	Negligible	Negligible
			2	Probable	3	Medium Term	2	Site	2	Low	14		
Disposal of water in	Foundation	Construction	2	Probable	1	Short Term	2	Site	2	Low	10	Negligible	Negligible

foundation excavation	structures may be impacted on negatively	Phase	1	Improbable	1	Short Term	2	Site	2	Low	5		
On site storm water containment and management	On site storm water containment and management	Construction Phase	2	Probable	1	Short Term	2	Site	2	Low	10	Negligible	Negligible
			1	Improbable	1	Short Term	2	Site	2	Low	5		
Planning of coal yard	An open coal yard without proper flooring may lead to groundwater contamination	Construction Phase	2	Probable	1	Short Term	2	Site	6	Medium	18	Negligible	Negligible
			2	Probable	1	Short Term	1	Local	2	Low	8		
Influence of fluctuating perched water table on foundation structure	A fluctuating perched water table may have a negative corrosive influence on the stability and life of foundations	Construction Phase	2	Probable	4	Long Term	2	Site	6	Medium	24	Low	Negligible
			1	Improbable	4	Long Term	2	Site	2	Low	8		
Storage and containment of hazardous and non-hazardous chemicals during operational phase, including empty and full container storage	Contamination of groundwater from reagents such as acids and kerosene during the normal activities at the plant with filling of the storage facilities and the plant tanks. Contamination around the foundations of the buildings will jeopardize the integrity of the building foundations	Operational Phase	2	Probable	4	Long Term	2	Site	6	Medium	24	Low	Negligible
			2	Probable	3	Medium Term	2	Site	2	Low	14		
Temporary disposal of the rare earth carbonate and insoluble waste at the Solid waste settling pond	The planned solid waste settling ponds will provide onsite waste storage for up to six months and will contain insoluble solids of the SP concentrate feed and mixed rare earth carbonates of Ho/Er/Tm/Yb/Lu. Groundwater quality may be at risk if leakage	Operational Phase	4	Highly Probable	4	Long Term	2	Site	6	Medium	48	Moderate	Low
			2	Probable	3	Medium Term	2	Site	6	Medium	22		

	does occur												
Loading of the rare earth carbonate and insoluble waste at the Solid waste settling pond, for final disposal and potential damage to the integrity of the liner system	Groundwater quality may be at risk if leakage does occur	Operational Phase	2	Probable	4	Long Term	2	Site	6	Medium	24		
			2	Probable	3	Medium Term	2	Site	2	Low	14	Low	Negligible
Continuous storage of organic waste for final disposal – potential leakages and spillages	Potential leakages and spillages	Operational Phase	4	Highly Probable	4	Long Term	2	Site	6	Medium	48		
			2	Probable	3	Medium Term	2	Site	6	Medium	22	Moderate	Low
Storage of brine before final disposal via regional marine outfall	Potential leakages and spillages	Operational Phase	4	Highly Probable	1	Short Term	2	Site	2	Low	20		
			2	Probable	1	Short Term	2	Site	2	Low	10	Low	Negligible
Leakage from storm water storage pond	Ground water quality impact. Perched water table	Operational Phase	2	Probable	3	Medium Term	2	Site	6	Medium	22		
			1	Improbable	3	Medium Term	2	Site	2	Low	7	Low	Negligible
Storage of process water	Ground water quality impact. Perched water table	Operational Phase	2	Probable	4	Long Term	2	Site	6	Medium	24		
			2	Probable	3	Medium Term	2	Site	2	Low	14	Low	Negligible
Storage of diesel near diesel generator	Ground water quality impact	Operational Phase	2	Probable	4	Long Term	2	Site	6	Medium	24		
			2	Probable	1	Short Term	1	Local	2	Low	8	Low	Negligible
Storage of coal and coal dust	Ground water quality impact	Operational Phase	1	Improbable	3	Medium Term	1	Local	6	Medium	10		
			1	Improbable	3	Medium Term	1	Local	2	Low	6	Negligible	Negligible
Temporary disposal in the sewerage tank before removal by honey sucker to the Vredendal Waste Water Treatment Works	Ground water quality impact	Operational Phase	2	Probable	1	Short Term	2	Site	2	Low	10		
			2	Probable	1	Short Term	2	Site	2	Low	10	Negligible	Negligible
Air Quality													
All activities	Deterioration in	Operations	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Negligible

	air quality due to pollutants from all activities		2	Probable	4	Long Term	1	Local	2	Low	14		
Materials handling	Deterioration in air quality due to pollutants from the handling of materials	Operations	2	Probable	4	Long Term	1	Local	2	Low	14	Negligible	N/A
			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Vehicular movement on paved roads	Deterioration in air quality due to vehicular emissions	Operations	2	Probable	4	Long Term	1	Local	2	Low	14	Negligible	N/A
			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Wind erosion	Deterioration in air quality due to wind erosion	Operations	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-		
Emissions from stacks during operations	Deterioration in air quality due to process emissions	Operations	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Negligible
			2	Probable	4	Long Term	1	Local	2	Low	14		
Heritage													
Construction activities, earthworks	Impact on heritage resources	Construction	4	Highly Probable	5	Permanent	1	Local	2	Low	32	Low	Low
			4	Highly Probable	5	Permanent	1	Local	2	Low	32		
Palaeontology													
Earthworks (excavations)	Loss of palaeontological (fossil) materials / Finding and recovery of fossil material	Construction	2	Probable	5	Permanent	1	Local	6	Medium	24	Low	Low +
			2	Probable	5	Permanent	3	Regional	8	High	32		
Social													
Job creation	Job creation	Construction	5	Definite	1	Short Term	3	Regional	8	High	60	High +	High +
			5	Definite	1	Short Term	3	Regional	8	High	60		
Job creation	Job creation	Operations	5	Definite	4	Long Term	3	Regional	8	High	75	High +	High +
			5	Definite	4	Long Term	3	Regional	8	High	75		
Secondary job creation	Secondary job creation	Construction	5	Definite	1	Short Term	2	Site	8	High	55	Moderate +	High +
			5	Definite	1	Short Term	3	Regional	8	High	60		
Secondary job	Secondary job	Operations	5	Definite	4	Long Term	2	Site	8	High	70	High +	High +

creation	creation		5	Definite	4	Long Term	3	Regional	8	High	75		
Conflict about jobs and benefits	Conflict about jobs and benefits	Construction	4	Highly Probable	1	Short Term	2	Site	8	High	44	Moderate	Low
			4	Highly Probable	1	Short Term	2	Site	6	Medium	36		
Conflict about jobs and benefits	Conflict about jobs and benefits	Operations	4	Highly Probable	3	Medium Term	2	Site	8	High	52	Moderate	Low
			4	Highly Probable	1	Short Term	2	Site	6	Medium	36		
Spread of infectious diseases	Spread of infectious diseases such as HIV and TB	Construction	4	Highly Probable	5	Permanent	3	Regional	8	High	64	High	Moderate
			4	Highly Probable	5	Permanent	3	Regional	6	Medium	56		
Spread of infectious diseases	Spread of infectious diseases such as HIV and TB	Operations	4	Highly Probable	5	Permanent	3	Regional	8	High	64	High	Moderate
			4	Highly Probable	5	Permanent	3	Regional	6	Medium	56		
Spread of infectious diseases	Spread of infectious diseases such as HIV and TB	Decommissioning	4	Highly Probable	5	Permanent	3	Regional	8	High	64	High	Moderate
			4	Highly Probable	5	Permanent	3	Regional	6	Medium	56		
Spread of infectious diseases	Spread of HIV along transportation routes	Construction	5	Definite	1	Short Term	3	Regional	8	High	60	High	Moderate
			4	Highly Probable	1	Short Term	3	Regional	6	Medium	40		
Spread of infectious diseases	Spread of HIV along transportation routes	Operations	4	Highly Probable	4	Long Term	3	Regional	6	Medium	52	Moderate	Low
			2	Probable	4	Long Term	3	Regional	6	Medium	26		
Pressure on existing health services	Pressure on existing health services	Construction	4	Highly Probable	3	Medium Term	3	Regional	8	High	56	Moderate	Low
			2	Probable	3	Medium Term	3	Regional	8	High	28		
Pressure on existing health services	Pressure on existing health services	Operations	4	Highly Probable	4	Long Term	3	Regional	6	Medium	52	Moderate	Negligible
			2	Probable	3	Medium Term	3	Regional	2	Low	16		
Specific impacts of vulnerable women in surrounding communities	Specific impacts of vulnerablewomen in surrounding communities	Construction	5	Definite	1	Short Term	2	Site	8	High	55	Moderate	Low
			4	Highly Probable	1	Short Term	2	Site	6	Medium	36		
Specific impacts of vulnerable women in surrounding communities	Specific impacts of vulnerable women in surrounding communities	Operations	5	Definite	4	Long Term	2	Site	8	High	70	High	Moderate
			4	Highly Probable	4	Long Term	2	Site	6	Medium	48		
Local tension and violence	Local tension and violence	Construction	4	Highly Probable	1	Short Term	2	Site	8	High	44	Moderate	Negligible
			2	Probable	1	Short Term	2	Site	6	Medium	18		

Local tension and violence	Local tension and violence	Operations	4	Highly Probable	4	Long Term	2	Site	8	High	56	Moderate	Low
			2	Probable	4	Long Term	2	Site	6	Medium	24		
Availability of resources	Availability of resources (housing)	Construction	5	Definite	1	Short Term	2	Site	8	High	55	Moderate	Low
			4	Highly Probable	1	Short Term	2	Site	6	Medium	36		
Availability of resources	Availability of resources (housing)	Operations	2	Probable	4	Long Term	2	Site	8	High	28	Low	Low
			2	Probable	4	Long Term	2	Site	6	Medium	24		
Management of expectations	Unrealistic expectations of local communities	Pre-construction	5	Definite	1	Short Term	3	Regional	8	High	60	High	Moderate
			4	Highly Probable	1	Short Term	3	Regional	6	Medium	40		
Management of expectations	Unrealistic expectations of local communities	Construction	5	Definite	1	Short Term	3	Regional	8	High	60	High	Low
			2	Probable	1	Short Term	3	Regional	6	Medium	20		
Management of expectations	Unrealistic expectations of local communities	Operations	5	Definite	3	Medium Term	3	Regional	6	Medium	60	Moderate	Low
			2	Probable	3	Medium Term	2	Site	6	Medium	22		
Liveability of the social environment	Liveability of the social environment	Construction	5	Definite	1	Short Term	1	Local	2	Low	20	Low	Negligible
			4	Highly Probable	1	Short Term	1	Local	2	Low	16		
Liveability of the social environment	Liveability of the social environment	Operations	5	Definite	5	Permanent	1	Local	2	Low	40	Moderate	Low
			4	Highly Probable	5	Permanent	1	Local	2	Low	32		
Health													
Health impact	Impact from criteria pollutants	Operations	2	Probable	4	Long Term	2	Site	6	Medium	24	Low	Low
			2	Probable	4	Long Term	2	Site	6	Medium	24		
Health impact	Impact from airborne REE	Operations	1	Improbable	4	Long Term	2	Site	2	Low	8	Negligible	Negligible
			1	Improbable	4	Long Term	2	Site	2	Low	8		
Health impact	Impact from process chemical vapour	Operations	1	Improbable	4	Long Term	2	Site	2	Low	8	Negligible	Negligible
			1	Improbable	4	Long Term	2	Site	2	Low	8		
Visual													
Construction activities,	Visual impact of development on	Construction, operations and	5	Definite	4	Long Term	2	Site	6	Medium	60	Moderate	Low

operational infrastructure and lighting, decommissioning of infrastructure	surrounding landscape	closure	5	Definite	4	Long Term	2	Site	2	Low	40		
Noise													
Vegetation clearing and soil stripping, excavation and digging of foundations and plant and road construction	Noise disturbance and nuisance	Construction	1	Improbable	3	Medium Term	1	Local	2	Low	6	Negligible	Negligible
			1	Improbable	3	Medium Term	1	Local	2	Low	6		
SP Operational activities	Noise disturbance and nuisance	Operations	2	Probable	4	Long Term	2	Site	2	Low	16	Negligible	Negligible
			2	Probable	4	Long Term	2	Site	2	Low	16		
Decommissioning activities	Noise disturbance and nuisance	Closure	1	Improbable	3	Medium Term	1	Local	2	Low	6	Negligible	Negligible
			1	Improbable	3	Medium Term	1	Local	2	Low	6		
Traffic													
Vehicular movement	Increased traffic flow on the surrounding roads	Construction and Operations	5	Definite	4	Long Term	2	Site	2	Low	40	Low	Low
			5	Definite	4	Long Term	2	Site	2	Low	40		
Economic													
Impact on balance of payment	Temporary increase in trade deficit	Construction Phase	4	Highly Probable	3	Medium Term	3	Regional	2	Low	32	Low	Low
			4	Highly Probable	3	Medium Term	3	Regional	2	Low	32		
Impact on production	Temporary increase in production in the area	Construction Phase	5	Definite	3	Medium Term	3	Regional	6	Medium	60	High +	High +
			5	Definite	3	Medium Term	3	Regional	6	Medium	60		
Impact on GDP-R	Temporary increase in country's GDP-R	Construction Phase	5	Definite	3	Medium Term	3	Regional	6	Medium	60	High +	High +
			5	Definite	3	Medium Term	3	Regional	6	Medium	60		
Impact on employment	Creation of employment opportunities	Construction Phase	5	Definite	3	Medium Term	3	Regional	6	Medium	60	High +	High +
			5	Definite	3	Medium Term	3	Regional	6	Medium	60		
Impact on household income	Temporary increase in household income	Construction Phase	5	Definite	3	Medium Term	3	Regional	6	Medium	60	High +	High +
			5	Definite	3	Medium Term	3	Regional	6	Medium	60		
Impact on skills	Skills	Construction	2	Probable	3	Medium Term	3	Regional	6	Medium	24	Low+	Moderate +

development	development during construction	Phase	4	Highly Probable	3	Medium Term	3	Regional	6	Medium	48		
Impact on government revenue	Increase on government revenue	Construction Phase	5	Definite	3	Medium Term	3	Regional	6	Medium	60		
			5	Definite	3	Medium Term	3	Regional	6	Medium	60	High +	High +
Loss of agricultural land due to land sterilisation	Sterilisation of agricultural land	Construction Phase	5	Definite	5	Permanent	1	Local	2	Low	40		
			5	Definite	5	Permanent	1	Local	2	Low	40	Moderate	Moderate
Impact on production	Increase in production during operations	Operational Phase	5	Definite	4	Long Term	3	Regional	6	Medium	65		
			5	Definite	4	Long Term	3	Regional	6	Medium	65	High +	High +
Impact on GDP-R	Increase in GDP-R during operations	Operational Phase	5	Definite	4	Long Term	3	Regional	6	Medium	65		
			5	Definite	4	Long Term	3	Regional	6	Medium	65	High +	High +
Impact on employment	Creation of sustainable employment opportunities	Operational Phase	5	Definite	4	Long Term	3	Regional	6	Medium	65		
			5	Definite	4	Long Term	3	Regional	6	Medium	65	High +	High +
Impact on household income	Increase in household income during operations	Operational Phase	5	Definite	4	Long Term	3	Regional	6	Medium	65		
			5	Definite	4	Long Term	3	Regional	6	Medium	65	High +	High +
Impact on skills development	Development of skills during operations	Operational Phase	4	Highly Probable	4	Long Term	3	Regional	6	Medium	52		
			5	Definite	4	Long Term	3	Regional	6	Medium	65	Moderate +	High +
Impact on government revenue	Increase of government revenue	Operational Phase	4	Highly Probable	4	Long Term	3	Regional	6	Medium	52		
			4	Highly Probable	4	Long Term	3	Regional	6	Medium	52	Moderate +	Moderate +
Decommissioning of facility	Stimulation of the economy and job creation	Decommissioning Phase	4	Highly Probable	1	Short Term	3	Regional	2	Low	24		
			4	Highly Probable	1	Short Term	3	Regional	2	Low	24	Low +	Low +

7.10 Summary of potential environmental impacts with a high significance rating

The following table contains a summary of the potential Bio-Physical and Socio-Economic Impacts with a high significance impact rating.

Table 7-2 Summary of potential impacts associated with a high significance rating

Potential Impacts	Impact Significance	
	WITHOUT MITIGATION	WITH MITIGATION
Social		
Job creation	High +	High +
Job creation	High +	High +
Secondary job creation	High +	High +
Spread of infectious diseases such as HIV and TB	High	Moderate
Spread of infectious diseases such as HIV and TB	High	Moderate
Spread of infectious diseases such as HIV and TB	High	Moderate
Spread of HIV along transportation routes	High	Moderate
Specific impacts of vulnerable women in surrounding communities	High	Moderate
Unrealistic expectations of local communities	High	Moderate
Unrealistic expectations of local communities	High	Low
Economic		
Temporary increase in production in the area	High +	High +
Temporary increase in country's GDP-R	High +	High +
Creation of employment opportunities	High +	High +

Temporary increase in household income	High +	High +
Increase on government revenue	High +	High +
Increase in production during operations	High +	High +
Increase in GDP-R during operations	High +	High +
Creation of sustainable employment opportunities	High +	High +
Increase in household income during operations	High +	High +

All of the impacts with a high significance rating are socio-economic impacts. Most of these high significance impacts are positive and benefit the economy and the social environment. Most of the negative impacts with a high significance rating can be reduced to moderate with the implementation of mitigation measures.

8 ENVIRONMENTAL MANAGEMENT PROGRAMME (EMP)

8.1 Introduction

This chapter of the EIA Report contains the environmental management plan (EMP) as required by Regulation 33 of the EIA Regulations 2010.

The EMP contains guidelines, operating procedures and rehabilitation/pollution control requirements which will ensure that the impacts of the proposed development are managed and minimised as far as possible.

In accordance with the provisions of the NEMA and EIA Regulations, Table 8-1 indicates the required contents of an EMP, and cross references the EMP requirements to relevant sections of this report.

Table 8-1 : Contents of an EMP according to NEMA

No	Requirement	Comment
33	A Draft Environmental Management Programme must comply with section 24N of the Act and include -	
(a)	Details of – (i) The person who prepared the environmental management programme; and (ii) The expertise of that person to prepare an environmental management programme	Refer to Section 1.4 and Appendix E
(b)	Information on any proposed management or mitigation measures that will be taken to address the environmental impacts that have been identified in a report contemplated by these Regulations, including environmental impacts or objectives in respect of –	
	(iii) Planning and design; (iv) Pre-construction and construction activities; (v) Operation or undertaking of the activity; (vi) Rehabilitation of the environment; and (vii) Closure	Refer to Section 8 and 8.4
(c)	A detailed description of the aspects of the activity that are covered by the draft environmental management programme;	Refer to Section 8.2
(d)	An identification of the persons who will be responsible for the implementation of the measures contemplated in paragraph (b);	Refer to Section 8.3

(e)	Proposed mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon;	Refer to Section 9
(f)	As far as is reasonably practicable, measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development, including where appropriate, concurrent or progressive rehabilitation measures.	Refer to Section 8.4
(g)	A description of the manner in which it intends to – (i) Modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;	Refer to Section 8.4
	(ii) Remedy the cause of pollution or degradation and migration of pollutants;	
	(iii) Comply with any prescribed environmental management standards or practices;	
	(iv) Comply with any applicable provisions of the Act regarding closure, where applicable;	N/A
	(v) Comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable.	N/A
(h)	Time periods within which the measures contemplated in the environmental management programme must be implemented;	Refer to Table 8-2 to Table 8-4
(i)	The process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity	Refer to Table 8-2 to

		Table 8-3
(j)	An environmental awareness plan describing the manner in which – (i) The applicant intend to inform his or her employees of any environmental risk which may result from their work; and (ii) Risks must be dealt with in order to avoid pollution or the degradation of the environment;	Refer to Section 9.8
(k)	Where appropriate, closure plans, including closure objectives.	N/A

The EMP is to act as a flexible, stand-alone document and must be implemented during all phases of the development and throughout the lifespan of the proposed activities. This document requires that responsibility and commitment to responsible environmental management be promoted at all times by the developer (project proponent), the main- and subcontractors and all responsible parties as well as the individuals in their employ.

It is essential that this document be carefully studied, understood, implemented and adhered to at all times by the responsible parties as any person responsible for infringement of the underlying management measures outlined in this document will be held accountable for non-conformity and will be dealt with consequently.

The process which was followed in compiling the EMP is in compliance with the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and the EIA Regulations (2010), and applies the principles of Integrated Environmental Management (IEM). The main objectives of Environmental Protection at the proposed development include:

- To ensure that the proposed operations do not impact on water quality or quantity available from local sources.

- To prevent where possible, or otherwise minimise soil, air, noise, surface- and groundwater pollution to acceptable levels.
- To minimise disturbance to and destruction of habitat of flora and faunal species.
- To minimise disturbances and destruction of heritage, archaeological and paleontological sites (if present).
- To minimise and control the production of waste and the effects of waste on the environment; and to minimise the risk of accidental waste release and make provisions for emergency situations.
- To ensure compliance with relevant environmental legislation.
- To ensure effective environmental management is implemented at the proposed operations throughout the project lifespan.

In order to achieve the abovementioned objectives, Table 8-2 to Table 8-4contains the management and mitigation measures that should be implemented on the development site during the various planning, construction, operational and decommissioning and rehabilitation phases of the project, as well as the relevant area and responsible party associated with each.

8.2 Project Phases

The point of departure for this EMP is to take a pro-active route by addressing potential problems before they occur. This should limit corrective measures required during the construction, operational and decommissioning phases of the proposed development.

Additional mitigation will be included throughout the project's various phases, as required and if necessary based on adaptive management implemented in reaction to the results of monitoring.

All project-related activities can be divided into one or more of the following project phases.

8.2.1 Planning Phase

The planning phase primarily entails the compilation of appropriate management plans, obtaining the required permits and authorizations, and preparing for all aspects of the proposed operations, as well as liaison with all relevant stakeholders. Continuous planning and continuous communication with stakeholders will be essential to the success of the proposed operations.

Generally, the EMP offers an ideal opportunity to incorporate pro-active environmental management measures with the goal of attaining sustainable development throughout all of the development phases. Pro-active environmental measures minimize the chance of impacts taking place during the proposed operations, and the activities that precede and follow thereupon. There is still the chance of accidental impacts taking place; however, through the incorporation of contingency plans (e.g. this EMP) during the planning phases, the necessary corrective action can be taken to further limit potential impacts.

The planning phase is also inclusive of the body of specialist investigations associated with this EIA, which means that results of environmental investigations, along with public and stakeholder engagement, have the potential to inform alternatives and influence the project so that it may be designed in the most environmentally appropriate manner possible.

The SP project was also thus duly designed with the minimization, avoidance and management of environmental impacts in mind, and pro-active measures (such as the lining of the waste settling pond, incorporation of dust suppression/containment measures in the plant design etc.) have already aided in mitigating some of the potential environmental impacts of the project.

8.2.2 Construction Phase

The construction phase commences with site establishment activities (such as clearing and preparing the lay-down and construction areas, and the establishment of the construction camp and other temporary infrastructure). The construction phase for Phase of the SP will conclude after approximately 18 to 24 months, when the plant infrastructure has been constructed and mining operations are due to commence. Temporary infrastructure associated with the construction phase must avoid areas identified as sensitive and occupy the smallest possible footprint area. Environmental impacts associated with construction will largely be negated by rehabilitation as soon as construction activities in a given area have ceased (the construction camp will be removed along with all associated temporary facilities and the area rehabilitated).

The project is planned to be constructed in two phases, each phase with a design phase of approximately 2 years and a construction period of approximately 18 to 24 months. Phase 2 is expected to become operational by year 4 (on the basis of year 1 being the commissioning of Phase 1), which means that construction phases on the proposed development site for Phase 2 will be initiated during year 3 of Phase 1 operation. Therefore, the proposed development site will see a period in its development when both construction, for Phase 2, and operational activities, for Phase 1, occur on the site simultaneously.

8.2.3 Operational Phase

By taking pro-active measures during the planning and construction phases, potential environmental impacts during the operational phase will be minimised. This, in turn, will minimise the risk of environmental degradation occurring beyond that which is expected and planned for. Monitoring of environmental impacts that may actually be occurring on the site during the operational phase will be of the utmost importance for early detection and immediate remediation measures. Monitoring results will also potentially inform any adjustments that need to be made to operational methods, monitoring protocols, training, environmental incident handling as well as the required restorative measures.

The management measures stipulated in this EMPR will be implemented during each of the phases, along with all other management and mitigation measures that may be identified at a later stage during the operational phase.

The operational phase of the proposed facility is 30 years, by far the longest duration of any of the project phases, and thus inevitably associated with potentially significant impacts. Because of the long duration, the operational phase of a development is often the most challenging to manage, as the responsible parties are likely to change over time. It is essential to understand that the implementation of the management measures stipulated in this report (refer specifically **Table 8-2** to **Table 8-4**) are imperative for the duration of the lifecycle of the plant, even though they may be added to / amended in terms of adaptive management under the required approvals from the environmental authorities.

8.2.4 Decommissioning and Closure phases

The key objectives of this phase are to ensure that the closure of the proposed plant is planned in such a way that it is in line with generally accepted industry best practice principles. This will ensure that a positive legacy is left behind at closure that contributes to sustainable development.

The decommissioning and closure phases will be associated with the following main activities:

- Removal of all buildings, workshops, offices etc. (all buildings not incorporated into the post closure land use)[12];
- Removal of all roads that will not be used for aftercare and maintenance of the site or handed over to a local authority or community[11];
- Ensuring that the environment is left in a stable and safe state and that the site is returned to a state as close as possible to its intended post-closure land use. Please note that the site is located within a proposed industrial corridor and therefore the post-closure land use will be industrial use.

The decommissioning/closure phase overlaps with the rehabilitation phase, which also in a sense overlaps with all other project phases as concurrent rehabilitation actions will be implemented where possible.

8.2.5 Rehabilitation and aftercare phase

Appropriate remedial action including rehabilitation measures need to be implemented throughout all development phases where appropriate, but most importantly after decommissioning of the plant in order to restore any affected areas to a viable pre-determined land use. The post closure land use proposed for

[12] Should the property be purchased by another party, the said party must be engaged to determine if the plant and related structures can be used for their purposes and should remain. In this instance rehabilitation of the entire site will not be necessary. This will also be applicable for the internal access roads and paved areas.

the project area is to continue using the property for industrial purposes as it will most probably still be situated within an industrial area.

8.3 Responsible Parties

A number of role-players will be responsible to ensure responsible environmental practices as described in this report are implemented on the proposed development site throughout each of the project cycles and throughout the project lifespan.

Key individuals are briefly discussed in this section, and are identified in the table below where specific responsibility is assigned to each.

8.3.1 The Project Proponent (Frontier Separation (Pty) Ltd)

The project proponent is ultimately responsible to ensure that activities associated with the proposed facility operations occur in accordance with the approved EMPR under NEMA and all other relevant legislation, authorizations and best practice guidelines. Many of these responsibilities are delegated to representatives, employees or agents of Frontier Separation, but the holder of an environmental authorization (for which Frontier Separation has applied) remains ultimately responsible to ensure legal compliance and environmental best practice occurs.

Frontier Separation will be liable for restoring the environment in the event of negligence leading to damage to the environment. Frontier Separation must therefore ensure that the EMP is included in tender documentation so that any sub-contractors appointed are bound to the conditions of the EMP.

The project proponent must also appoint an Environmental Officer (EO) prior to commencement of any of the project phases and for the duration of the operational activities to oversee all the environmental aspects relating to the development (Refer to Section 8.3.4).

Additionally and in consultation with the relevant Department (DEADP), the project proponent will have to appoint an independent environmental control officer to conduct periodic inspections at the facility operations to verify whether the measures stipulated in the EMP are sufficient, and are being sufficiently implemented, and to ensure that the objectives of the EMP are being met at the facility operations and surrounding environment. (Refer to Section 9)

8.3.2 The Plant Manager

The plant manager is an indirect representative / employee of the project proponent, who is immediately responsible for all of the activities that may occur on the proposed SP site, including the implementation of this EMP. The plant manager is furthermore tasked with facilitating the establishment of a community forum for the operations if required, so that concerns of the surrounding community may be addressed timeously and effectively and to ensure that impacts occurring are recorded and addressed.

8.3.3 The Safety, Health and Environmental (SHE) Officer

The individual appointed as SHE officer at the proposed operations is directly responsible for all environmental matters relating to the proposed development. The SHE officer should also be involved in the Community Forum and aid the Plant Manager in addressing environmental issues, as well as environmental concerns or complaints of the surrounding community.

8.3.4 The Environmental Control Officer

An Environmental Control Officer (ECO) should be appointed to periodically verify compliance to the EMP and provisions of relevant legislation at the operations. The ECO should be an independent individual or company who is not associated with the proposed SP operations or project proponent, and does not stand to gain by the success of the facility operations (other than remuneration received for work carried out to ensure environmental compliance on the proposed development site).

The ECO should have the right to enter the site and do monitoring and auditing at any time, subject to the health and safety requirements applicable to the site. It is proposed that the ECO conduct site inspections bi-annually at the operations, and that these inspections are scheduled one in winter and one in summer. The ECO should also be involved in post-rehabilitation monitoring. In the event that non-compliances are observed, the ECO may advise the plant manager on reaching compliance, but will also be responsible for reporting non-compliances to the relevant authorities

Additionally, the ECO can assist in conducting environmental awareness workshops with the plant employees if the project proponent decides not to appoint a specialist subcontractor to undertake this work. The ECO is also responsible for liaison with relevant authorities as well as contractors and the community on matters relating to environmental management (in consultation with the SHE Officer).

8.3.5 Contractors and Sub-contractors

All contractors have the responsibility to implement and adhere to the EMP and ensure that the factors which may compromise the achievements of the objectives of sustainable development and environmentally responsible operations are brought to the attention of the project leaders. The contractor must comply with all orders pertaining to environmental management issues (whether verbal or written) given by the ECO, SHE Officer or Plant Manager, or directly by the project proponent.

Contractors also have the responsibility to ensure that their employees are fully cognizant of, and abide by the EMP.

It is the service provider's responsibility to ensure that the works will comply with the specifications as set out in the management plan. Operators should be properly trained and informed of operational and maintenance responsibilities and environmental liabilities.

8.4 Management and Mitigation Measures

The following table forms the core of this EMPR for the planning, construction, operational and decommissioning and rehabilitation phases of this proposed project. This table is to be used as a checklist on site throughout all phases of the proposed development by the SHE Officer and by the ECO.

Table 8-2: Management and Mitigation Measures – Construction Phase

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
7.7.1	**Ecology**													
	– Install subdued, down facing external lighting to minimise visual impact at night (relevant to nocturnal animals.)	Once-off							X					X
	– Install bird diverters on the power line to the plant.								X					X
7.7.2	**Surface and Groundwater**													
	– Storage tanks containing liquids with a high vapour pressure should be designed and built	Once-off	X											

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	in accordance with best engineering practice and have a floating roof, and internal floating raft or an inert gas blanket to minimise the escape of vapours to the atmosphere.													
	– Bulk tanks should be protected by a secondary containment facility, such as a bund around an individual tank or cluster of tanks with a sump, to contain spills and leaks which may	Once-off	X											

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	otherwise be discharged off-site.													
	– Secondary containment facilities should have low permeability, the capacity to contain at least the volume of liquid in the largest tank within the facility, and adequate additional capacity to contain any rain water or firewater as necessary. Pipework should not pass through the walls, but if this is unavoidable, the	Once-off	X											

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	pipe should be sealed into the wall with a material that is resistant to attack by the chemical stored to ensure that the store remains leak proof.													
	– Special safety precaution needs to be taken to prevent spillages.	Continuous	X											
	– In the event of a spillage it needs to be contained, removed and treated.	Continuous	X											

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	– Refuelling must be done at a specially prepared facility with a leak proof service area such as a concrete base. Construction vehicles must be serviced in a workshop prepared with spill buckets and sealed floors. Used oil must be removed by a contractor licenced to fulfil removals of this nature.	Continuous			X				X					
	– During construction, portable sanitation units can be used	Continuous					X							

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	which are available on contractual basis. These units must be serviced regularly according a contractual agreement.													
	– Due to the formation of a shallow perched water table in the wet seasons, it is recommended that all surface beds be raised well above the present ground surface and be provided with a plastic sheeting beneath them to prevent the rising	Once-off	X						X					

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	damp.													
	– A storm water management system must be planned designed and implemented on site. It must make provision for a 1 in 50 year storm event.	Once-off					X							
	– The coal stock yard must be a roofed unit that is weather and wind proof with a floor that will prevent leaching of water. The stocked coal must not be allowed to get wet. A storm water	Once-off / continuous		X										

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	network around the coal yard must be sufficient to allow for at least a one in fifty year storm event. Loading of coal must be done during low wind speed periods to prevent coal dust to escape.													
7.8.2	**Social**													
	– Invest in skills development plans, bursaries and internships to ensure scarce skills will be available in time.	Once-off								X				

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	– Develop a recruitment policy that allows equal opportunity to all people (woman, disabled) and give preference to local labour. Communicate the policy and requirements to the affected communities through the media, municipality, community leadership and a community liaison forum. Establish labour desks in easy accessible areas.									X				X

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	– Inform local businesses through forums run by the Chambers of Commerce/Business forums about possible opportunities.									X				
	– Appoint a community liaison officer that deals specifically with the surrounding communities. Compile a community relations plan. Become a member of relevant industrial forums and participate in	Continuous								X				

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	municipal initiatives such as the IDP process.													
	– Work on a strategy to actively manage expectations. This includes the sharing of relevant information in a way that is accessible to all members of the community. Frequent communication is a key aspect in the management of expectations.									X				
	– Establish a detailed grievance									X				X

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	mechanism for communities to lodge concerns, suggestions and complaints which can be dealt with by the Project in a timely manner.													
	– Form a partnership with a Non-Profit Organisation (NPO) to provide the necessary social services to people whose lives are affected by infectious diseases.	Once-off								X				
	– Develop an in-house infectious diseases strategy									X				X

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	to address health issues within the workforce. Align strategy with community HIV strategy followed by NPO. Strategy should include voluntary counselling and testing and training of peer educators.													
	– Develop and implement a Workforce Code of Conduct to maximise positive employee behaviour in the local community, and optimise									X				X

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	integration.													
	– Implement a Health and Safety Program on site, including safety consciousness and awareness training. The program should also include relevant health aspects, e.g. sexual health, fatigue management, social health.									X				X
	– Establish a clinic for the employees at the plant one day a week where they can receive chronic									X				

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	medication and primary health care, including free anti-retrovirals (sourced from Department of Health). This service can be provided by a sub-contractor.													
	– Form an AIDS Task Force for the project with representatives from unions, management, local community members and people living with HIV.									X				

Section No.	Technical and Management Commitment	Scheduling	Action Areas: Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Duties: Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	– Extend the workplace programme for HIV beyond the company's operations, and include all contractors, suppliers, transportation companies and local communities. The spread of HIV along transportation routes (roads and railways) is well documented, so this component of the project (transportation of all goods and	Continuous								X				

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	services to and from the project site) needs special attention.													
	– Develop tailored behaviour change communication (BCC) materials such as mirror hanger messages and bumper stickers.									X				
	– Include condoms in the road safety kit.													X
	– Work with truck company managers to ensure that their drivers receive													X

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	adequate HIV training.													
	– Inform Department of Health of development once approved.	Once-off								X				
	– Liaise with the Department of Health about additional health care facilities.									X				
	– Develop a gender-specific outreach programme for the project. It can target schools, clinics and the youth, and should also include									X				

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	internal awareness formation. It must be presented in a culturally sensitive manner to ensure it does not create tension inside communities.													
	– Develop and implement a Workforce Code of Conduct to maximise positive employee behaviour in the local community, and optimise integration.									X				X
	– Design and implement a Drug	Monthly								X				X

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	and Alcohol Management Policy, and undertake regular testing on site, to minimise negative interactions with the local community.													
	– Establish a detailed grievance mechanism for communities to lodge concerns, suggestions and complaints which can be dealt with by the Project in a timely manner.	Once-off								X				X
	– Frontier to liaise									X				

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	with the SBLM to enable the municipality to develop the SBLM's housing strategy.													
	– Compile local employment strategy with input from the SBLM and advertise strategy.									X				X
	– Engage with relevant community role players like unions and recruitment agencies about number of available jobs and skills required.									X				X

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	– Appoint a community liaison officer that deals specifically with the surrounding communities. Compile a community relations plan that includes a strategy to manage expectations.	Once-off								X				
	– Adhere to findings of other specialist reports	Continuous								X				
	– Establish or join an existing environmental forum to give feedback to	Bi-annually								X				

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	affected communities twice a year regarding environmental aspects such as dust, water and noise pollution and how Frontier manage and mitigate these aspects.													
7.8.4.1	**Heritage**													
	– In view of the variety and significance of heritage resources in the Saldanha and Vredenburg area all development areas	Continuous							X				X	X

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	should be carefully monitored by the ECO in order to avoid the destruction of previously undetected heritage sites. Should any subsurface paleontological / archaeological / historical material and /or graves/human remains be uncovered, all activities should be suspended and the archaeological specialist should be alerted													

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	immediately.													
	– It should be noted that mitigation measures are valid for the duration of the development process, and mitigation measures might have to be implemented on additional features of heritage importance not detected during this Phase 1 assessment (e.g. uncovered during the construction process).								X				X	X

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	– As Palaeontological remains occur where bedrock has been exposed, all geological features should be regarded as sensitive.								X				X	X
	– Water sources such as drainage lines, fountains and pans would often have attracted human activity in the past. As Stone Age material the larger landscape should be regarded as potentially sensitive in terms of possible subsurface								X				X	X

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	deposits.													
7.8.4.2	**Palaeontology**													
	– Inform staff / contractors of the need to watch for potential fossil occurrences.	Continuous							X				X	X
	– Inform staff of the procedures to be followed in the event of fossil occurrences.								X				X	X
	– Monitor for presence of fossils.								X				X	X
	– Liaise on nature of potential finds and												X	X

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	appropriate responses.													
	– Excavate main finds; inspect pits & record selected, key/higher-risk excavations.								X				X	
	– Obtain permit from Heritage Western Cape should any fossil material be uncovered during excavations.								X	X				
7.8.5	**Visual**													
	– All parties must make every effort to control the destruction of soils	Continuous							X				X	X

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	and vegetation on site.													
	– Chemical damage by cement mixing directly on the ground and by diesel, etc spills must also be prevented, as should vandalism of the plants. Fires must be prevented also at all costs in all areas. Penalties and incentives should be implemented as can fencing off areas.	Continuous							X				X	X

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	– Monitoring of the landscape, soils and vegetation during construction is very important and must be attended to regularly. Adequate indigenous (preferably endemic) vegetation must be planted.	During construction phase							X				X	
7.8.6	**Noise**													
	– Construction work will be restricted primarily to daytime hours (06:00 to 22:00)	During construction phase							X					X

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
7.8.7	**Traffic**													
	– Initial planning for access to the separation plant made use of access at 1.44km west of the TR77_1/TR85_1 intersection. However, the recent AECOM planning recommended access at a position 2.84km west of the TR77_1/TR85_1 intersection and the final access position should be confirmed with the	Once-off								X				

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	Provincial Roads Authority during the design stage of the project.													
	– It is recommended that the separation plant management arrange busses or taxi's for its employees that cannot afford their own private transport. Facilities for pedestrians could in the interim be provided at the site entrance.								X	X				
	– Sufficient parking will be available for cars and delivery								X					X

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	trucks. It is recommended that 3 bus bays be provided close to the development access.													
	– Based on Road Access Guidelines (RAG) turning lane warrants, it is recommended that right-turn lanes be provided at the new access along TR85/1. This right-turn lane should be designed and constructed according to the appropriate standards of the									X				

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	provincial roads authority.													

Table 8-3: Management and Mitigation Measures - Operational Phase

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
7.7.1	**Ecology**													
	– All disturbed areas (around the development footprint, and along the access road) should be rehabilitated with suitable locally indigenous Strandveld plant species. This should be undertaken by a rehabilitation specialist). Rehabilitation should be undertaken in the first autumn after completion of construction.	Once-off / As required							X		X		X	

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	– Suitably trained personnel should be appointed to remove alien invasive vegetation from any undeveloped portion of the site, and from the road reserve area. This should be undertaken on an annual basis for at least three years after completion of construction.	Continuous							X		X	X		
7.7.2	**Surface and Groundwater**													
	Regulations regarding the handling, storing and containment of hazardous and non-hazardous chemicals should be followed strictly.	Continuous	X											

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	– The settling pond will be lined for protection with a concrete seal on top to serve as mechanical seal protection. Mechanical cleaning of the pond will then be possible as and when needed.	Once-off						X						
	– Loading of rare earth carbonate at the Solid waste settling pond must preferably be done directly and must not be stock pilled for long periods.	Continuous						X						
	– Bulk tanks should be protected by a secondary containment facility, such as a bund	Once-off	X												

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	around an individual tank or cluster of tanks with a sump, to contain spills and leaks which may otherwise be discharged off-site.													
	– Secondary containment facilities should have low permeability, the capacity to contain at least the volume of liquid in the largest tank within the facility, and adequate additional capacity to contain any rain water or firewater as necessary. Pipework should not pass through the walls, but if this is unavoidable, the pipe should be sealed into	Once-off	X											

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	the wall with a material that is resistant to attack by the chemical stored to ensure that the store remains leak proof.													
	– The discharge of brine from the plant must meet the Recommended Effluent Standards or limits prescribed by permits and applicable laws and regulations.	Continuous				X								
	– The brine must be properly treated on-site before being discharged to the marine outfall pipeline and must be discharged under proper	Continuous				X								

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	authorization.													
	– Testing of the brine waste water must be performed by capable and properly certified laboratories. Testing results and other operational information must be kept on file at the factory for 5 years.	Continuous				X								
	– The storm water storage pond needs to be constantly monitored to ensure that no leakage from this facility will elevate the regional water table. The storm water system must form part of the water balance to be	Continuous					X							

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	implemented.													
	– Water will be piped to the plant and stored in an above ground storage tank (AST). The tank must be inspected regularly for integrity and for evidence of leaks. Procedures must be in place for the inspection of these facilities.	Continuous	X											
	– Bulk tank should be protected by a secondary containment facility, such as a bund around the individual tank to contain spills and leaks which may	Once-off			X									

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	otherwise be discharge off-site.													
	– Secondary containment facilities should have low permeability, the capacity to contain the volume of liquid in the tank within the facility, and adequate additional capacity to contain any rain water or firewater as necessary.	Once-off			X									
	– Pipework should not pass through the walls, but if this is unavoidable, the pipe should be sealed into the wall with a material that is resistant to attack by the chemical stored to ensure that	Once-off			X									

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	the store remains leak proof.													
	– The coal stock yard must be a roofed unit that is weather and wind proof with a floor that will prevent leaching of water. The stocked coal must not be allowed to get wet.	Once-off		X										
	– A storm water network around the coal yard must be sufficient to allow for at least a one in fifty year storm event.	Once-off					X							

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	– Loading of coal must be done during low wind speed periods to prevent coal dust to escape.	Continuous		X										
	– The sewerage tank must be constantly monitored to prevent overflow or over filling of the system.	Continuous					X							
7.7.3	**Air Quality**													
	– All material handling points should be totally enclosed with fabric filters (except at the coal stockpiles).	Once-off		X							X			
	– All processing stacks to be fitted with scrubbers.	Once-off		X							X			

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	– Boiler stack will be fitted with a baghouse.	Once-off		X							X			
7.8.1	**Health**													
	– Mitigation measures as provided in the Air Quality Impact Assessment (Airshed, 2014) are recommended and where possible should be implemented at operational sources.	See above		X							X			
7.8.2	**Social**													
	– Invest in skills development plans, bursaries and internships to ensure scarce skills will be	As required								X				

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	available in time.													
	– Develop a recruitment policy that allows equal opportunity to all people (woman, disabled) and give preference to local labour. Communicate the policy and requirements to the affected communities through the media, municipality, community leadership and a community liaison forum. Establish labour desks in easy accessible areas.	Once-off / As required								X	X			
	– Inform local businesses through forums run by the Chambers of	Once-off / As required								X	X			

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	Commerce/Business forums about possible opportunities.													
	– Appoint a community liaison officer that deals specifically with the surrounding communities. Compile a community relations plan. Become a member of relevant industrial forums and participate in municipal initiatives such as the IDP process.	Once-off								X	X			
	– Work on a strategy to actively manage expectations. This includes the sharing of relevant information in a way that is accessible	Continuous								X				

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	to all members of the community. Frequent communication is a key aspect in the management of expectations.													
	– Establish a detailed grievance mechanism for communities to lodge concerns, suggestions and complaints which can be dealt with by the Project in a timely manner.	Once-off / As required									X			
	– Form a partnership with a Non-Profit Organisation (NPO) to provide the necessary social services to people whose lives are	Once-off / As required								X				

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	affected by infectious diseases.													
	– Develop and implement a Workforce Code of Conduct to maximise positive employee behaviour in the local community, and optimise integration.	Once-off									X			
	– Implement a Health and Safety Program on site, including safety consciousness and awareness training. The program should also include relevant health aspects, e.g. sexual health, fatigue management, social health.	Once-off / As required									X			

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	– Form an AIDS Task Force for the project with representatives from unions, management, local community members and people living with HIV.	Once-off								X	X			
	– Extend the workplace programme for HIV beyond the company's operations, and include all contractors, suppliers, transportation companies and local communities. The spread of HIV along transportation routes (roads and railways) is well documented, so this component of the project (transportation	Once-off / As required									X			

Section No.	Technical and Management Commitment	Scheduling	Action Areas								Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	of all goods and services to and from the project site) needs special attention.													
	– Develop tailored behaviour change communication (BCC) materials such as mirror hanger messages and bumper stickers.	Once-off / As required								X	X			
	– Include condoms in the road safety kit.	As required									X	X		
	– Work with truck company managers to ensure that their drivers receive adequate HIV training.	As required									X	X		

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	– Inform Department of Health of development once approved.	Once-off								X				
	– Liaise with the Department of Health about additional health care facilities.	As required								X				
	– Establish a clinic for the employees at the plant one day a week where they can receive chronic medication and primary health care, including free anti-retrovirals (sourced from Department of Health). This service can be provided by a sub-contractor.	Once-off / weekly									X	X		

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	– Develop a gender-specific outreach programme for the project. It can target schools, clinics and the youth, and should also include internal awareness formation. It must be presented in a culturally sensitive manner to ensure it does not create tension inside communities.	Once-off / As required								X	X			
	– Develop and implement a Workforce Code of Conduct to maximise positive employee behaviour in the local community, and optimise integration.	Once-off / As required								X	X			

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	– Design and implement a Drug and Alcohol Management Policy, and undertake regular testing on site, to minimise negative interactions with the local community.										X	X		
	– Establish a detailed grievance mechanism for communities to lodge concerns, suggestions and complaints which can be dealt with by the Project in a timely manner.										X			
	– Compile local employment strategy with input from the									X	X			

Section No.	Technical and Management Commitment	Scheduling	Action Areas: Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Duties: Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	SBLM and advertise strategy.													
	– Engage with relevant community role players like unions and recruitment agencies about number of available jobs and skills required.									X	X			
	– Appoint a community liaison officer that deals specifically with the surrounding communities. Compile a community relations plan that includes a strategy to manage expectations.	Once-off								X	X			
	– Adhere to findings of	Bi-annually									X	X		

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	other specialist reports.													
	– Establish or join an existing environmental forum to give feedback to affected communities twice a year regarding environmental aspects such as dust, water and noise pollution and how Frontier manage and mitigate these aspects.										X	X		
7.8.5	**Visual**													
	– Lighting should be minimised and carefully controlled as part of the project's management plan. The use of green energy fittings and concepts should be encouraged and lighting	Continuous							X		X			

Section No.	Technical and Management Commitment	Scheduling	Action Areas: Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Duties: Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	developed with sensitivity to the rural landscape.													
	– Water wise landscaping should be used wherever possible and green star building practices.								X		X			
	– Landscape Maintenance must be carried out at all times in line with these recommendations to help keep the scheme green and encouraging local biodiversity.								X		X			
7.8.6	**Noise**													
	– Plant modules must be enclosed in steel-clad	Once-off	X								X			

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	buildings.													
	– Frontier must comply with the provisions of the Occupational Health and Safety Act and SANS 10083, in terms of which the 8-hour noise rating LAeq,8h in the work place (i.e. inside the SSP module buildings) is not allowed to equal or exceed the hearing safety limit of 85 dBA.	Continuous	X								X	X		
7.8.7	**Traffic**													
	– It is recommended that the separation plant management arrange busses or taxi's for its employees that cannot	Once-off / As required							X		X			

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	afford their own private transport. Facilities for pedestrians could in the interim be provided at the site entrance.													
	– Sufficient parking will be available for cars and delivery trucks. It is recommended that 3 bus bays be provided close to the development access.								X		X			
	– Based on Road Access Guidelines (RAG) turning lane warrants, it is recommended that right-turn lanes be provided at the new access along TR85/1. This right-turn lane should be designed and									X				

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	constructed according to the appropriate standards of the provincial roads authority.													
	Waste management													
	– The lining material of the waste settling ponds will be covered with a capping layer consisting of a selected aggregate or polymer concrete. In this manner mechanical machinery, for example a small bobcat “skid steer loader”, can be supported without damaging the liner. The waste will be left to dry to a moisture content of 10% to 5% minimising	Once-off						X			X			

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	dust generation and loaded onto a truck to be sold or to be disposed of.													
	– Organic waste will be collected and temporarily stored in a tank, and picked up on demand by external approved contractors for disposal.	As required	X						X		X			
	– Domestic waste will be recovered, reused and recycled where possible. Waste will be sorted according to the different categories for recycling (e.g. metals, paper, plastic, glass and organic). Waste will only be disposed to a	Continuous							X		X			

Section No.	Technical and Management Commitment	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	landfill as a last resort. Domestic waste will be collected on site by an approved contractor and discharged to municipal facilities.													

Table 8-4: Management and Mitigation Measures - Closure and Rehabilitation Phase

Section No.	Management and Mitigation	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
7.8.2	**Social**													
	– Form a partnership with a Non-Profit Organisation (NPO) to provide the necessary social services to people whose lives are affected by infectious diseases.	Once-off								X				
	– Develop an in-house infectious diseases strategy to address health issues within the workforce. Align strategy with									X	X			

Section No.	Management and Mitigation	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	community HIV strategy followed by NPO. Strategy should include voluntary counselling and testing and training of peer educators.													
	– Develop and implement a Workforce Code of Conduct to maximise positive employee behaviour in the local community, and optimise integration.									X	X			
	– Implement a Health and Safety Program on site, including										X	X		

Section No.	Management and Mitigation	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	safety consciousness and awareness training. The program should also include relevant health aspects, e.g. sexual health, fatigue management, social health.													
	– Form an AIDS Task Force for the project with representatives from unions, management, local community members and people living with HIV.										X	X		
7.8.5	**Visual**													

Section No.	Management and Mitigation	Scheduling	Action Areas							Duties				
			Plant, Laboratory, Product and Material Storage	Boilers, Stacks and Coal Storage	Generator and Diesel Storage	Brine Storage	Water treatment, Sewage and Stormwater Storage	Waste Settling Pond	All areas	Project proponent	Plant manager	SHE Officer	ECO	Contractor / Subcontractor
	– On-going landscape maintenance and conservation management remains necessary.	Continuous							X		X		X	

9 ENVIRONMENTAL MONITORING AND AUDITING

DEAT (2004) defines environmental auditing as "a process whereby an organisation's environmental performance is tested against its environmental policies and objectives." Monitoring and auditing is an essential environmental management tool which is used to assess, evaluate and manage environmental and sustainability issues:

In order to ensure that the objectives of sustainable development and integrated environmental management are met and in order to obtain data which can inform continuous improvement of environmental practices at the site (adaptive management), monitoring and reporting will be an essential component of the proposed operations.

Monitoring and management actions associated with the project are contained in Section 9 of this report as well as in the various specialist reports associated with this project. This section provides a summary of the critical monitoring aspects per specific environmental field.

9.1 General Monitoring and Management

The appointment of a suitably qualified **on-site environmental officer** (EO) is essential to the successful implementation of this project, although this role can be fulfilled by the SHE Representative. The EO will be responsible for the implementation of the EMP, applicable environmental legislation and any stipulations/conditions set by the relevant competent authorities (including but not limited to the DEADP and DWA). The Environmental officer will conduct **formal monthly site inspections** and conduct an **internal annual audit**.

An **independent Environmental Control Officer (ECO)** should also be appointed to conduct **annual audits** of the success and effective implementation of the environmental management measures stipulated by applicable legislation, the EIA, and EMP, and any conditions set by the competent authorities. Following each site visit, the ECO should submit a report to the DEADP documenting the success/failure of the implementation of the management measures at the operations.

Biennial (once every two years) external audits are to be conducted on the compliance with the conditions of all licenses, permits and authorizations applicable to this project. A suitably qualified and independent **audit team** must be appointed to conduct these audits. A report documenting the results of the audit shall be submitted to the relevant competent authorities every two years within one month of completing the Audit.

9.2 Specific Monitoring Requirements

Monitoring of the proposed SP operations (both on site and where appropriate in the surrounding environments) should be considered a high priority and should be conducted in accordance with the relevant specialist recommendations as summarized below:

9.3 Air Quality Monitoring

9.3.1 Ambient Air Quality Monitoring

Since the particulates impacts are predicted to be insignificant continuous particulate monitoring or fallout buckets it is not required near the plant.

Since the plant is not expected to result in significant ground level concentrations of SO2 and NO2, it is not necessary to conduct monitoring of the pollutants using passive diffusive sampling techniques during the operation of the plant.

However should the air concentration levels of particulates, SO2 and NO2 be found to increase significantly at locations with baseline measurements, i.e. within 50% of the NAAQS, continuous monitoring is then recommended near the plant.

9.3.2 Stack Gas Emissions Monitoring

Emissions monitoring recommended at the stacks in the plant are as follows:

- Continuous monitoring of the following from stacks (with periodic monitoring by specified methods as appropriate):
  - gas volume (or alternative estimation method);
  - temperature; and
  - humidity.

- Quarterly monitoring of O2, CO, NOX, SO2 and particulate matter (opacity may be acceptable as an alternative) as appropriate, taking account of the nature, magnitude and variability of the emission and the reliability of the controls.

- Pressure drop indicators to be fitted to all fabric filters and continuously monitored on major sources.

9.4 Noise Monitoring

Noise during the construction phase is not expected to be audible at any of the noise-sensitive locations in the study area. No noise monitoring is required.

A noise survey should be conducted after commissioning of the Plant. Such a survey should cover the following:

- A noise survey should be carried out after commissioning of the plant, with the plant running.

- Using baseline reference points shown on the map in Figure 9-1 and Table 9-1 as a guideline, revise the list of most relevant locations to be used for noise monitoring, taking into account the locations of the nearest remaining residences relative to the SP after project completion and commissioning, as well as the complaints history, if any.

- Measure noise levels at the selected set of reference points.

- If possible, conduct measurements during normal operation as well as during a shut-down period. Ideally, such measurements should be conducted on a night during which the Plant is temporarily shut down completely for a period of two hours.

- Measure the A-weighted equivalent continuous noise level in a sequence of 10-minute intervals covering a period of preferably 24 hours, but at least the night-time period from 22:00 to 06:00.

- Process the data and determine the increase in ambient level caused by the SP operation.

- Assess the noise impact of the Plant and present the findings in a report. If applicable, make recommendations for steps required to mitigate excessive noise.

- Monitoring locations and procedures for annual surveys must be revised prior to each survey, taking the findings of previous surveys into account.

- Equipment, calibration and measurement procedures must comply with the requirements laid down in SANS 10103.

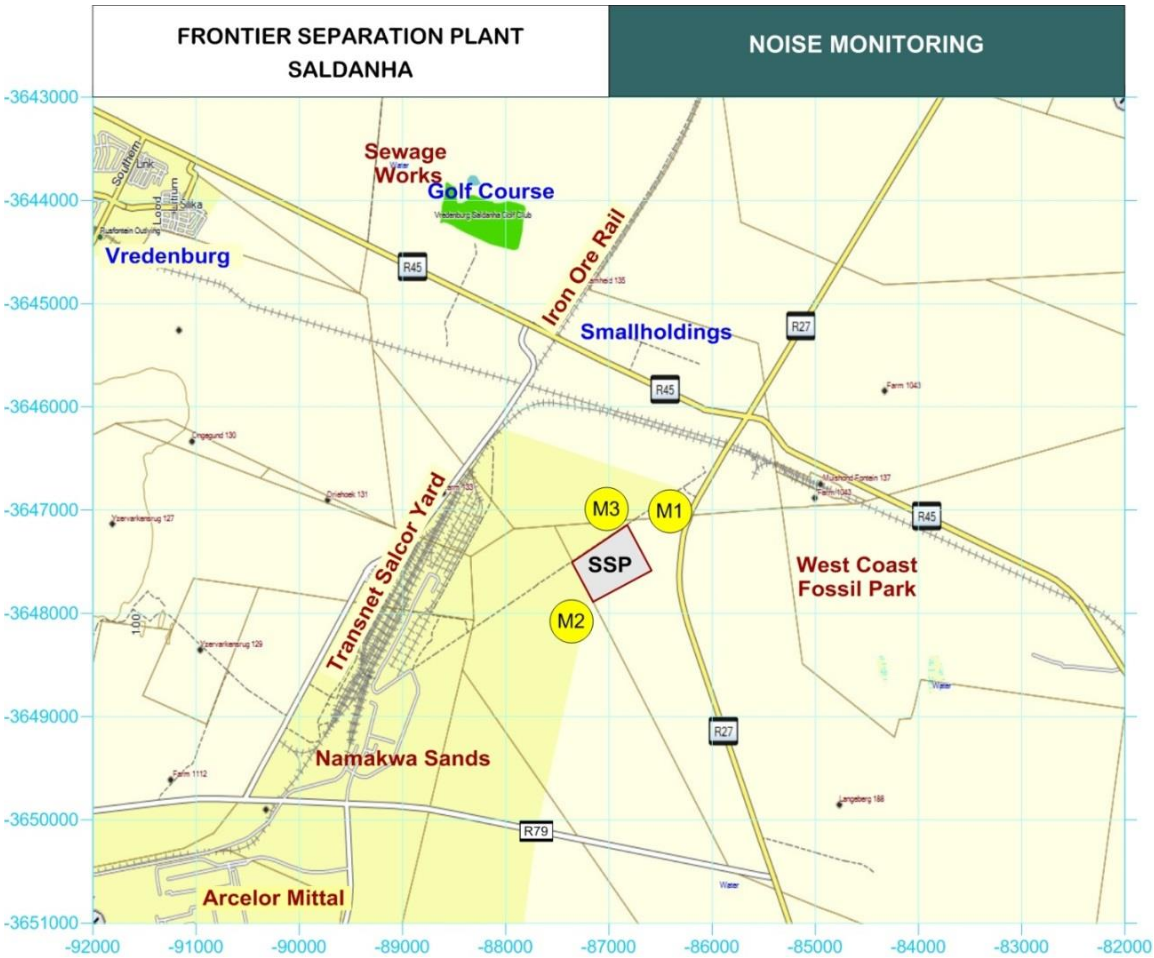


Figure 9-1: Noise Monitoring Locations Map

Table 9-1 Noise Monitoring Locations Coordinates

Monitoring location		Coordinate
M1	Residence Malan	S32 56 40.9 E18 04 33.9

M2	Residence Mouton	S32 57 15.0 E18 03 56.4
M3	Residence Thom	S32 56 40.1 E18 04 10.1

9.5 Surface and Ground Water Monitoring

9.5.1 Possible pollution sources

Potential pollution sources include the following:

1. Reagents such as hydrochloric acid, sodium hydroxide, oxalic acid, naphtenic acid, P507 and kerosene.
2. Brine and process water storage tanks
3. Solid waste settling pond.
4. Diesel storage tanks.
5. Sewage tank and drain networks.

9.5.2 Receiving environment

The following hydrological units may be impacted by the project and related activities:

- Thin calcrete layer on top of the LRAS.
- The underlying saturated LRAS.

9.5.3 Monitoring Network

There are no surface water bodies near the proposed Separation Plant site that need sampling. The sampling points is made up of existing boreholes recorded during the hydro-census and the 8 newly drilled groundwater monitoring boreholes drilled on the proposed plant site, strategically positioned to monitor the groundwater regime directly next to the plant. Twelve boreholes should be monitored as part of this monitoring protocol. They are situated on and around the proposed separation plant site. Coordinates for the monitoring points is listed below in Table 9-2.

Table 9-2 Monitoring Network

Site Name	Latitude	Longitude	Site Status	Description
84 (ZKDBH 5)	-32.96476	18.08165	Hydrocensus Borehole	Recorded during Hydro-census
109	-32.95859	18.06699	Borehole	National Groundwater Archive
117 (ZKPIT)	-32.95378	18.06444	Well	Recorded during Hydro-census
ZKDBH17	-32.93183	18.06545	Hydrocensus Borehole	Recorded during Hydro-census
MFSP 01 D	-32.94790	18.06909	Monitoring facility	Newly Drilled Borehole
MFSP 01 S	-32.94794	18.06901	Monitoring facility	Newly Drilled Borehole
MFSP 02 D	-32.95049	18.06744	Monitoring facility	Newly Drilled Borehole
MFSP 02 S	-32.95058	18.06750	Monitoring facility	Newly Drilled Borehole
MFSP 03 D1	-32.95258	18.06985	Monitoring facility	Newly Drilled Borehole
MFSP 03 D2	-32.95250	18.06997	Monitoring facility	Newly Drilled Borehole
MFSP 03 S	-32.95253	18.06991	Monitoring facility	Newly Drilled Borehole
MFSP 04 D	-32.95136	18.07247	Monitoring facility	Newly Drilled Borehole

9.5.4 Monitoring frequency

All groundwater positions should be sampled according Table 9-3 and Table 9-4 and analysed for parameters listed. Water levels at boreholes should be taken quarterly and two monthly as listed in Table 9-3 and Table 9-4.

Table 9-3: Monitoring Frequency

Site name	Chemistry Sampling	Water Level Measurements
84 (ZKDBH 5)	Bi-annually before construction start, Quarterly afterwards	Quarterly
109	Bi-annually before construction start, Quarterly afterwards	Quarterly
117 (ZKPIT)	Bi-annually before construction start, Quarterly afterwards	Quarterly
ZKDBH17	Bi-annually before construction start, Quarterly afterwards	Quarterly
MFSP 01 D	Bi-annually before construction start, Monthly afterwards	Two-monthly
MFSP 01 S	Bi-annually before construction start, Monthly afterwards	Two-monthly
MFSP 02 D	Bi-annually before construction start, Monthly afterwards	Two-monthly
MFSP 02 S	Bi-annually before construction start, Monthly afterwards	Two-monthly
MFSP 03 D1	Bi-annually before construction start, Monthly afterwards	Two-monthly
MFSP 03 D2	Bi annually before construction start, Monthly afterwards	Two-monthly
MFSP 03 S	Bi annually before construction start, Monthly afterwards	Two-monthly
MFSP 04 D	Bi-annually before construction start, Monthly afterwards	Two-monthly

9.5.5 Sampling parameters

An accredited laboratory, with the necessary quality assurance, must carry out analysis of key samples. Quality control measures should be in place and may include blanks, standards, duplicates, caution-anion balances etc. This will ensure consistency in monitoring and the verification and validation of water quality data. Data from groundwater quality monitoring must be stored together electronically to enable trend analysis and waste load calculations to be carried out.

Table 9-4: Sampling parameters

Sample Type	Sampling Cycle	Laboratory analysis: Chemical and Bacteriological
Ground water	Monthly for the eight monitoring boreholes on site. Quarterly for the off site boreholes.	pH, TDS, SO4, NO3, Fe and Mn, E.Coli, Total Plate Count, hydrochloric acid, sodium hydroxide, oxalic acid, naphtenic acid, P507, Total Organic Carbons and Hydrocarbons
Ground water	Yearly for the twelve monitoring boreholes	pH, TDS, NO_3 Cl, SO_4, PO_4-P, HCO_3, K; Na, Ca, Mg, Total Alkalinity; TDS, F, Fe, Mn, U, Se, Cd, Al, pH, TDS, E.Coli, Total Plate count, hydrochloric acid, sodium hydroxide, oxalic acid, naphtenic acid, P507, Total Organic Carbons and Hydrocarbons
Ground water	If a Sulphate, Hydrocarbon or Organic Carbon Plume is detected then a full suite analyses must be done on a 2 monthly basis	pH, TDS, NO_3 C,; SO_4, PO_4-P, HCO_3, K; Na, Ca, Mg, Total Alkalinity; TDS, F, Fe, Mn, U, Se, Cd, Al, pH, TDS, E.Coli, Total Plate count hydrochloric acid, sodium hydroxide, oxalic acid, naphtenic acid, P507, and Total Organic Carbons and Hydrocarbons

9.5.6 Sampling procedures

The sampling procedure for groundwater should be done according to the protocol by Weaver, 2007. The actions can be summarised as follows:

1. Calibrate the field instruments before every sampling run. Read the manufacturers manual and instructions carefully before calibrating and using the instrument.
2. Purging a borehole can be done in the following ways:
   a. With a portable pump
   b. With an already installed submersible pump
   c. By lowering a bailer into the hole
3. Prior to sampling, measure the water level and record.
4. Install the pump (If not equipped) with the inlet close to the static water level.

5. Set up the EC, pH and temperature meter.

6. Start pumping and record the pumping rate in ℓ/s.

7. Continuously measure the pH and EC values.

8. If the field chemistry stabilizes the borehole is purged. Note that approximately three columns of water should be removed. The volume of water to be removed is calculated using the following formula:

   Volume of standing water(ℓ) = π $r^2 \times h \times 1000$, where

   r= radius of borehole in meter

   h= height of water column in meter

9. Some boreholes are low yielding and go dry when purging. Leave the borehole to recover for a few hours. When returning, install the pump with the inlet close to the static water level and continue with the next step. Alternatively, bail the borehole.

10. Record the purging and sampling procedure; inclusive of pumping rates, duration of purging, volume of water removed and sampling times

Sampling for Inorganic Constituents

11. Sample for chemical constituents – remove the cap of the plastic 1 litre sample bottle, but do not contaminate inner surface of cap and neck of sample bottle with hands. Fill the sample bottle without rising.

12. Leave sample air space in the bottle (at least 2.5 cm) to facilitate mixing by shaking before examination.

13. Replace the cap immediately.

14. Complete the sample label with a water resistant marker and tie the label to the neck of the sample bottle with a string or rubber band. The following information should be written on the label

    a. An unique sample number and description

    b. The date and time of sampling

c. The name of the sampler

15. Place sample in a cooled container (e.g. cool box) directly after collection. Try and keep the container dust-free and out of any direct sunlight. Do not freeze samples.

16. Complete the data sheet for the borehole

17. See to it that the sample gets to the appropriate laboratory as soon as possible. Samples for chemical analysis should reach the laboratory preferably within seven days.

Sampling for the analysis of hydrocarbons

18. Lower a clear sided bailer and collect a sample at the water-table. Check for free phase. Even a haze of hydrocarbon is regarded as free phase. If no free phase is present proceed to (19). If a free phase is present go to (20).

19. If no free phase is present, measure the water level, purge the borehole, collect the water sample and preserve at 4^{o}C.

20. If a free phase is present, then the hydrocarbon must be identified. Use a bailer and collect samples from the interface until about 500 mL has been collected. Collect the floating product in a clean amber glass jar and preserve at 4^{o}C.

21. Complete the data sheet for the borehole

Sampling for the analysis of microbiological constituents

22. When sampling a borehole for microbiological analysis; follow the borehole purging procedure as described in (4)-(8).

23. When collecting the water sample from any source, open the bottle and keeping the cap in one hand, hold the bottle under the discharge pipe, leave some air-space and then replace the cap. Do not rinse the bottle: just fill it up and close it. Be very careful not to touch the inside of the cap or the bottle.

24. When collecting from a sampling tap, or any other pipe permanently in place, the orifice must be flame-sterilised. Using tweezers to hold the

cotton wool, dip some cotton wool in alcohol, set alight and play the flames around the orifice.

25. Sterilized 1ℓ glass or plastic bottles must be used for sample collection. These bottles should be sourced from a laboratory.

26. Record the time and date of sampling on the sample bottle.

27. Store the filled bottles on ice (4^0C) and in darkness.

28. The samples should reach the laboratory within 24 hours. The maximum holding time of the sample is 48 hours.

9.6 Visual Monitoring

The following types and timing of monitoring are recommended:

- Inspection: site inspection (random, at completion), routine inspection (possibly annually), clean-up inspection (after completion of clean-up of the accident incident).
- Monitoring: observation (and photography).
- Review: review of reports, plans and design.

The Monitoring Plan has been tabulated for easy reference in the Table 9-5 below:

Table 9-5 Visual Monitoring Plan

Project Component and Activity	Monitoring	Investigation	Reporting	Responsible Party
PLANNING PHASE				
VIA Report	Review	Physical and Recommendation	Recommendation	Planning Authorities
Planning and Design	Review	Physical and Recommendation	Recommendation	Authorities, Developers and Designers
CONSTRUCTION PHASE				
Construction	Site and Routine Inspection	Physical and Recommendation	Recommendation	ALL
OPERATION PHASE				
Lighting	Routine Inspection	Physical and Recommendation	Routine, *Ad hoc* Meeting	Owners, Authorities
Conservation Management	Routine	Physical and	Routine, *Ad*	Owners, Authorities

and Landscape Maintenance	Inspection	Recommendation	*hoc* Meeting	
DECOMMISSIONING				
Refurbishment	Site Inspection	Physical and Recommendation	Routine, *Ad hoc*	Owner, Authorities

The following types of analyses are recommended:

- Physical: on site and by photography.
- Recommendation: check against Visual Impact Assessment recommendation.

The following methods of recording and reporting are recommended:

- Recommendation: report or design recommendation.
- Routine: log (daily, monthly, activity), report (quarterly), certificate, minutes.
- Ad hoc: report (incident, closing).
- Meetings: routine meeting (weekly), follow-up (incident), pro-active meeting (ad hoc).

9.7 Environmental incidents

An environmental incident is defined as any unplanned event that results in actual or potential damage to the environment, whether of a serious or non-serious nature. An incident may involve non-conformance with environmental legal requirements, the requirements of the EMP, or contravention of written or verbal orders given by the ECO or relevant authority.

In the event of any incident, an Environmental Incident Log should be completed and these reports should be kept on file by the SHE Officer (or EO). Such reports should provide the following details:

- Date of the Incident (and time if relevant)
- Description of the nature of the incident (what happened)
- Explanation for current conditions (why it happened), responsible person, supporting photographs etc.

- Description of corrective actions taken

Corrective action to mitigate the impact (appropriate to the nature and scale of the incident) should be conducted immediately and affected parties notified.

In the case of serious incidents or emergencies, the incident report should be sent to the relevant authority as soon as possible after the incident has been recorded.

9.8 Environmental awareness

Environmental awareness training is critical for two primary reasons:

a) The workforce must understand how they can play a role in achieving the objectives specified in the EMP; and

b) The workforce must understand their obligations in terms of the implementation of the EMP and adherence to environmental-legislative requirements.

This section of the report contains the environmental awareness plan which is aimed at ensuring that employees, contractors, subcontractors and other relevant parties are aware of and able to meet their environmental commitments. This plan is to be updated on a yearly basis during the construction and operational phases of the project in light of operational changes, learning experiences and identified training needs.

All full time staff and contractors are required to attend an induction session when they start at the plant, which session should include environmental aspects. Any contractor, who works at the plant for a period of 24 hours or more, is also required to undergo induction training which should also be inclusive of environmental aspects.

It is therefore recommended that the EO be involved in induction training (if this entity is separate from the SHE rep). The induction sessions may be modified / adapted based on the audience attending the specific session, but it should ensure that all employees gain a suitable understanding of:

- Environmental requirements of the project, and how these will be implemented and monitored, including each employee's responsibilities with respect to environmental issues;

- Contents and commitments of the EMP, including no-go areas, employee conduct, pollution prevention (prohibitions against littering, unauthorized fires, loud music, entry to adjacent properties, road conduct etc.);

- Environmentally sensitive areas on and around the project site, including why these are deemed important and how these are to be managed. Employees will also be made aware of protected species found on the site and how these are to be conserved, as well as alien invasive species potentially found on the site and how these should be managed; and

- Incident identification, remediation and reporting requirements: what constitutes an environmental incident (spillages, fire etc.) and how to react when such an incident occurs.

Environmental training will not be restricted to induction training sessions alone, but will be conducted on an on-going basis throughout the lifecycle of the plant as and when required. Records are to be kept of the type of training given (matters discussed and by whom), date on which training was given and the attendees of each training session.

10 CONCLUSIONS AND RECOMMENDATIONS

In terms of the baseline environment, the study concluded that there are no disqualifying factors that render the project unfeasible. Sensitive areas were delineated and were used to inform the detailed layout for the site as well as the selection of the preferred layout alternative.

A number of alternatives were evaluated by the environmental consultant (AGES) as well as various specialist consultants in order to propose the most acceptable alternative from an environmental and risk perspective. An iterative process was followed that already commenced prior Scoping to assess the most feasible location alternative.

The results and recommendations from the baseline specialist assessments and MHI screening study were evaluated by the engineering team and taken into account when the layout of the facility was designed. The impacts identified in this report have therefore been assessed and rated on the optimal design, service and layout alternatives.

The public consultation process has been rigorous and extensive, and every effort has been made to include representatives of all stakeholders within the process. The main concerns that were raised during the public participation process and the DEADP review of the scoping report were:

- Biodiversity impacts
  - Negative impacts on naturally occurring fauna and flora
  - Rehabilitation of disturbed areas according to best practice
- Palaeontology and archaeology
  - Need for palaeontological and archaeological surface surveys prior to any earth moving activities
  - Availability of previously conducted archaeological and palaeontological reports
  - Provision for monitoring of subsurface activity
  - Rescuing of fossil material during excavations
  - Requirement for a Heritage Impact Assessment
  - Fossil finds to be reported
- Air Quality Impacts
  - Air Pollution originating from the plant

    - The requirement for an Atmospheric Emissions Licence
    - Dust Pollution

- Soil pollution

- Noise Pollution

- Traffic Impacts
    - Increased heavy traffic impacting on the existing road infrastructure during the construction and operational phases

- Groundwater and surface water pollution and management
    - Impact on water users in the area
    - Pollution/contamination of groundwater resources
    - Lowering of the groundwater table due to abstraction of water
    - Poor storm water management that could lead to pollution of Saldanha Bay
    - Groundwater monitoring for water levels and seepage of salts
    - Water recycling

- Visual Impact
    - Requirement for a Visual Impact Assessment

- Material handling, storage and transportation
    - Usage and storage of hazardous chemicals
    - Management and disposal of solid and liquid waste
    - Processing and storage of Rare Earths
    - Development of contingence plan for transportation of residue to disposal facility

- Socio-Economic Impacts
    - Economic upliftment relating to local job creation and employment
    - Land use impacts
    - Impacts on farming of livestock, grain and bee keeping.
    - Safety and Security
    - Supply of building material
- Health Impacts
- Economic impacts related to:
    - Rare Earth Element supply and exporting
    - Rare Earth Element wastes and recovery of these wastes if possible

  - Separation of Rare Earths and resulting products
  - Beneficiation of South Africa's natural resources, including establishing downstream electronics industries in South Africa
- Waste impacts
  - Handling and testing of sludge
  - Lining of waste settling dams/evaporation ponds
  - Capacity of waste disposal facility
  - Storage of hazardous waste
  - Disposal of hazardous waste
  - Disposal on unused products
  - Storage of raw materials
  - Disposal of waste to a disposal facility such as Vissershok
  - Disposal of non-process waste

The abovementioned concerns were assessed by means of numerous specialist studies and mitigation measures were proposed in order to reduce or eliminate identified impacts. The significance of an identified impact was rated by taking into account its duration, scale, severity (magnitude) and the probability that the impact may occur. The findings of the specialist studies undertaken during this EIA provide an assessment of both the benefits and potential negative impacts anticipated as a result of the proposed project. The study concluded that most of the negative impacts will be mitigated to be of negligible or low significance and most of the positive impacts will be enhanced to be of moderate to high significance, by implementing the mitigation measures described in Section 8. All the impacts which were rated as of high significance following mitigation are positive impacts. The following <u>negative impacts of moderate significance</u> following mitigation were identified:

- Social Impacts:
  - Spread of infectious diseases such as HIV and TB
  - Spread of HIV along transportation routes
  - Specific impacts of vulnerable women in surrounding communities
  - Unrealistic expectation of local communities
- Economic Impacts

- Sterilisation of agricultural land

No negative impacts of high significance after mitigation were identified.

The following positive impacts of high or moderate significance after mitigation are expected for the development:

- Social Impacts
  - Job creation
  - Secondary job creation
- Economic Impacts
  - Temporary increase in production in the area
  - Temporary increase in the country's GDP-R
  - Creation of employment opportunities
  - Temporary increase in household income
  - Skills development during construction
  - Increase in government revenue
  - Increase in production during operations
  - Increase in GDP-R during operations
  - Creation of sustainable employment opportunities
  - Increase in household income during operations
  - Development of skills during operations
  - Impact on government revenue

The findings conclude that provided that the recommended mitigation and management measures are implemented there are no environmental disqualifying factors that should prevent the proposed project from proceeding.

In order to achieve appropriate environmental management standards and ensure that the findings of the environmental studies are implemented through practical measures, the mitigation measures detailed in the specialist studies have been captured in Section 8.

This EMP will form part of the contract with the contractors appointed to construct and maintain the proposed plant and associated infrastructure. The EMP would be used to ensure compliance with environmental specifications and management measures. The implementation of this EMP for key cycle phases (i.e. construction and operation) of the proposed project is considered to be fundamental in achieving the appropriate environmental management standards as detailed for this project.

It is recommended that the process of open communication and consultation with the community is maintained throughout the life cycle of this project.

The way forward with regards to the Environmental Impact Assessment process is detailed below:

1. **Draft Environmental Impact Report (EIR)**. The results of the specialist studies have been synthesized by the project team to provide this draft EIR.

2. **Draft EIR published**. The draft EIR will be made available to registered interested and affected parties for comment for a period of 30 calendar days.

3. **Comments Report**. Comments on the Draft EIR will be synthesised by the project team into a comments report, which will be appended to the final EIR.

4. **Revise draft EIR**. The draft report will be updated by addressing and responding to the issues raised in the Comments Report. Responses from the proponent to key aspects will also be included.

5. **Final EIR**. The revised final report will be published with the various specialist reports appended. This will be submitted to the DEADP for a final review opportunity in order to make a decision with respect to the proposed development.

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12 APPENDIX A: PUBLIC PARTICIPATION

12.1 Appendix A 1: Background Information Document

12.2 Appendix A 2.1: Notification Letters

12.3 Appendix A 2.2: Proof of Delivery – Notification Letters

12.4 Appendix A 2.3: Correspondence to and from I&AP's

12.5 Appendix A 3.1: Site Notices

12.6 Appendix A 3.2: Proof of Site Notices

12.7 Appendix A 4.1: Newspaper Advert

12.8 Appendix A 4.2: Proof of Newspaper Advert

12.9 Appendix A 5.1: Focus Group Meeting Minutes

12.10 Appendix A5.2: Open Day Documents

12.11 Appendix A 6: Comments and Response Report

13 APPENDIX B: CORRESPONDENCE FROM DEPARTMENTS

13.1 Appendix B 1: Correspondence from DEADP

13.2 Appendix B 2: Submission of AEL to WCDM

13.3 Appendix B 3: Submission of WULA to DWA

The proof of submission of the WULA will be submitted to DEADP with the final EIR.

13.4 Appendix B 2: Submission of WMLA to DEA

14 APPENDIX C: TECHNICAL DOCUMENTATION

14.1 Appendix C1: Proposed layout of the plant

14.2 Appendix C2: Process Flow Diagram

14.3 Appendix C3: Waste Settling Pond Design

15 APPENDIX D: OTHER LEGISLATIVE REQUIREMENTS

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18 APPENDIX G: STORMWATER MANAGEMENT PLAN

19 APPENDIX H: HYDROGEOLOGICAL STUDY

19.1 Appendix H 1 Water balance memorandum

20 APPENDIX I: ECOLOGICAL IMPACT ASSESSMENT

21 APPENDIX J: AIR QUALITY IMPACT ASSESSMENT

22 APPENDIX K: HEALTH IMPACT ASSESSMENT

23 APPENDIX L: VISUAL IMPACT ASSESSMENT

24 APPENDIX M: ECONOMIC IMPACT STUDY

25 APPENDIX N: SOCIAL IMPACT ASSESSMENT

26 APPENDIX O: HERITAGE STUDIES

26.1 Appendix O 1: Heritage Impact Assessment

26.2 Appendix O 2: Archaeological Impact Assessment

26.3 Appendix O 3: Palaeontological Impact Assessment

27 APPENDIX P: TRAFFIC IMPACT ASSESSMENT

28 APPENDIX Q: NOISE IMPACT ASSESSMENT

29 APPENDIX R: SERVICE AGREEMENT DOCUMENTATION (WATER SUPPLY, WASTE, SEWAGE)

30 APPENDIX S: LETTER FROM CITY OF CAPE TOWN REGARDING SALT DISPOSAL

31 APPENDIX T: IDZ NEWS ARTICLE