

ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)

1. INTRODUCTION

The purpose of this Environmental Management Programme (EMPr) is to ensure ‘good environmental practice’ by taking a holistic approach to the management of environmental impacts during the construction and operation of the proposed eradication of 9 hectares of indigenous vegetation in order to establish a residential development consisting of 72 x 6 block residential units, 2 x 12 block residential units, 912 parking bays and streets as well as the construction of a facility for the storage of 115 cubic meters (5 x 23 000 litre tanks) of a dangerous good (Filling Station) situated on Erf 21244 (175/220), Aalwyndal, Mossel Bay. This EMPr therefore sets out the methods by which proper environmental controls are to be implemented by the applicant and his nominated contractor. However, where necessary, these methods have been expanded upon and additional issues addressed in order to ensure that all environmental aspects are appropriately considered and monitored.

It is important to note that this EMPr is focused primarily on the construction and operational phases of the project. Design specifications from an environmental point of view were taken into consideration, the Environmental Assessment Practitioner (EAP) have provided inputs with regard to possible mitigation measures for reducing environmental impacts.

This EMPr is also intended to ensure that the principles of sound Environmental Management and the general “Duty of Care” specified in the National Environmental Management Act are promoted on site during all phases of the development

This EMPr has been designed to suit the particular activities and needs of:

1. The **Construction Phase** of the proposed clearance of 0,57 ha of indigenous vegetation, located within a critical biodiversity area, and the installation of 5 x 23 000l fuel storage tanks;
2. The **Operational Phase** of Filling Station;

and incorporates specific project mitigation measures. This EMPr therefore identifies the following:

- Specifications with which the developer and contractors shall comply in order to protect the environment from the identified impacts;
- Specifications with which the operator of the Filling Station shall comply in order to protect the environment from the identified impacts; and
- Actions that shall be taken in the event of non-compliance.

It is important to note that the EMPr is a dynamic document subject to similar influences and changes as are brought by variations to the provisions of the project specification. Any substantial changes shall be submitted

to the contractor, resident engineer, Operator of the Filling Station and relevant environmental authorities in writing for approval.

A professional team consisting of the following experts have been assembled in order to ensure the success of the proposed development:

- Geotechnical Engineer
- Civil Engineer (For Civils and Flood lines)
- Traffic Engineer
- A Town and Regional Planner
- A SAHRA Specialist.
- An Ecological and Wetland specialist
- Visual Impact Specialist
- Economist
- Radar Specialist
- Registered Environmental Assessment Practitioner (EAP)

They were responsible for the following actions:

- A Geotechnical Engineer was appointed to determine whether the Geology and Soils of the site is suitable for the proposed development.
- A Civil Engineer was appointed to determine the availability of services and to design the internal services.
- An Engineer was appointed to determine the impact of flood lines on the proposed development.
- A Traffic Engineer was appointed to assess the road infrastructure and access.
- A Town and Regional Planner designed the proposed development in such a way that the layout of the proposed development satisfies the needs of future occupiers of the site.
- A SAHRA Specialist has been appointed to determine the possible impact of the development on Archaeological and Cultural features.
- An ecologist has been appointed to determine the impact of the proposed development on the Fauna and Flora of the area.
- A Wetland Specialist was appointed to determine the presence or not wetlands and other surface drainage features on and adjacent to the site.
- A Visual Impact Assessment has been done to determine the impact of the development on the sense of place
- An Economic impact assessment has been done in order to determine the impact of the proposed filling station on the area, including other filling stations in the area.
- An assessment of the impact of the proposed development on civil aviation installations were done and a report in this regard was received and incorporated into this document.
- An Environmental Screening Process was conducted by the EAP to ensure that all the relevant Environmental Legislation is taken into consideration.
- Desktop studies were conducted and alternatives assessed.

- The EAP must assess all possible environmental issues that may affect the proposed project and ensure that all interested and affected parties are notified in order to assist him in identifying possible impacts. He must also give mitigation measures where applicable.
- It will be essential to plan for the appointment of an Environmental Control Officer (ECO) who will be responsible to ensure that all aspects regarding the environmental issues are implemented and monitored. The ECO will also be responsible for maintaining a database of all records pertaining to the environment for the study area.
- The surveyor ensured that the cadastral information is accurate, up to date and properly mapped. The contours of the area are accurately plotted.

2. CONTENTS OF THE ENVIRONMENTAL MANAGEMENT PROGRAMME

The contents of an EMPr, shown below, are contained in Appendix 4 of the 2014 EIA Regulations as amended and published in Appendix 4 of Government Notice No. R 326 of 2017.

1. (1) An EMPr must comply with section 24N of the Act and include-

- (a) details of
 - (i) the EAP who prepared the EMPr; and
 - (ii) the expertise of that EAP to prepare an EMPr, including a curriculum vitae;
- (b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;
- (c) a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers;
- (d) a description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including-
 - (i) planning and design;
 - (ii) pre-construction activities;
 - (iii) construction activities;
 - (iv) rehabilitation of the environment after construction and where applicable post closure; and
 - (v) where relevant, operation activities;
- (f) a description of proposed impact management actions, identifying the manner in which the impact management outcomes and outcomes contemplated in paragraphs (d) will be achieved, and must, where applicable, include actions to –
 - (i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;
 - (ii) comply with any prescribed environmental management standards or practices;
 - (iii) comply with any applicable provisions of the Act regarding closure, where applicable; and
 - (iv) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;
- (g) the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);
- (h) the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);
- (i) an indication of the persons who will be responsible for the implementation of the impact management actions;

- (j) the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;
- (k) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);
- (l) a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;
- (m) an environmental awareness plan describing the manner in which-
- (i) the applicant intends 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; and
- (n) any specific information that may be required by the competent authority.

3. DETAILS OF ENVIRONMENTAL ASSESSMENT PRACTITIONER

Name of the EAP organisation:	AB Enviro Consult CC		
Person who compiled this Report:	Mr J. P. de Villiers		
EAP Reg. No.:	2019/808		
Contact Person (if not author):			
Postal address:	7 Louis Leipoldt Street, Potchefstroom, 2531		
Telephone:	018 294 5005	Postal Code:	2531
Cellular:	083 548 8105	Fax:	018 293 0671
E-mail:	jp@abenviro.co.za		
EAP Qualifications:	B.Sc. Honours (Environmental Management), M.Sc.		

4. EXPERTISE OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

4.1 Details of the lead EAP, including details on the expertise of the lead EAP responsible for the compilation of the Environmental Management Plan

Personal information

Date of Birth: 28/02/1970
 I.D. no: 700228 5035 084
 E-mail address: jp@abenviro.co.za
 Phone number: 083 548 8105

Employer: AB Enviro – Consult cc
 7 Louis Leipoldt Street
 Potchefstroom
 2531

Position at firm: Senior Environmental Assessment Practitioner (EAP)
Years at firm: 16 years
Nationality: South African
HDI Status: White Male

PREVIOUS WORK EXPERIENCE

1994 - 2004:	Manager: HJP Farms (Part-time manager HJP farms 1996 – 2003)
1999 - 2000:	Klerksdorp Technical High School Teacher – Geography and Mathematics
2001 - 2005:	Klerksdorp High School Teacher – Head of Subject: Geography Head of Department: Social Studies
2004 - 2006:	AB Enviro Consult Junior Consultant
2007 - 2010:	AB Enviro Consult Senior Consultant
2011 - 2014:	North West University Manager of NWU EIA Pro Bono Office
20011 - 2021:	AB Enviro Consult Executive Manager and Senior Consultant.

EDUCATION

BA (Geography, Economics)	PU FOR CHE	1993
HED (Geography, Economics)	PU FOR CHE	1994
B.Sc. (Honns) Cum Laude (Environmental Management)	North-West University	2006
M.Sc (Geography)	North-West University	2007

REGISTRATIONS

EAPASA Registration Number 2019/808

OTHER COURSES ATTENDED AND PROFESSIONAL REGISTRATION

- Environmental Assessment Practitioner - EAPASA
- Basic Principles of Ecological Rehabilitation and Mine Closure: (Centre for Environmental Management (North West University) -2008

Experience

JP de Villiers holds a M.Sc. in Geography from the North West University's Department of Geography and Environmental Management. He started as a junior EAP in 2004 with AB Enviro Consult and was promoted in 2007 to senior EAP. During 2011 he was appointed as the Manager of the North West University, EIA Pro-Bono Office. This office is an initiative of, and funded by, the DEA. (This was a three year contract between DEA and NWU that was extended by one year) As Manager of this office, Mr. de Villiers had the following responsibilities:

- Conduct Environmental Impact Assessments for municipalities on a pro-bono basis.
- Provide environmental management training to North West Municipalities.
- Provide environmental assistance to North West Municipalities.
- Undertake research related to Environmental Impact Management within the North West Municipal Context.
- Marketing for stakeholder 'pro-bono' expert donations.
- Marketing for corporate 'pro-bono' funding.

As EAP, Mr. de Villiers has been directly involved in obtaining 292 Environmental Authorizations and has performed the duties of Environmental Control Officer (ECO) for 33 developments. His responsibilities as Senior EAP includes the following:

Duties pertaining to Basic Assessments, EIA and Scoping and Section 24 G Applications:

- Marketing and communication with clients
- Communication with authorities, source and analyse relevant baseline information and undertake site inspections
- Compile Environmental Application Forms for projects and submit to the authorities
- Compile an *information requirements list* that is distributed to the project team. The Information required would assist with completion of the Report.
- Identify key interested and affected parties (I&APs)
- Compilation of terms of reference for specialist studies
- Commission specialist studies
- Compile and publish media notices in relevant newspapers
- Compile and place poster/s along the boundary of the site
- Hold public meetings / Open House / focus meetings with I&APs
- Receive and address comments from public
- Undertake assessment phase by assessing and evaluating potential impacts identified.
- Review and manage specialist studies.
- Compile and distribute Draft Reports (Including Environmental Management Programmes)
- Should the Reports require substantial changes, these changes are incorporated into the final reports and distributed
- Address comments received on the final Report, finalise Report and submit to authorities
- Once the decision is issued, all I&Ps are formally informed of the decision

Duties pertaining to Environmental Control Officer

- Preparation (Compilation) and submission of Environmental Control Document.
- Training of, and leasing with the Engineers Representative.
- Communicate with the Contractor.
- A monthly visit to the site during the construction period. Should any Environmental incident occur, an immediate site visit is undertaken.
- Monitoring and auditing according to the approved EMP and EA.
- Compilation of a written audit report for each site visits during the construction phase
- Liaising with the Compliance section of the Competent Authority

4.2 Experience of the consultancy

Over a period of 25 years (1996-2021) this consultancy has successfully applied for, and obtained positive ROD's and EA's for more than **394** projects. Environmental Control Officer's duties are also performed on various projects.

The company was involved (from 1992-1994) in evaluation of 114 applications for the subdivision of land, 23 applications for resort developments, and 54 applications for business rights for the Department of Agriculture, Conservation and the Environment - North West Province.

The consultancy is qualified to undertake professional studies in waste management and is still involved in the development of waste disposal- (solid and liquid effluent), and emission studies.

5. DESCRIPTION OF THE ACTIVITY

The land owner, **Hennie Bekker Familie Trust** has appointed AB Enviro Consult CC, an independent environmental consultancy, to undertake an Environmental Impact Assessment for the proposed eradication of 9 hectares of indigenous vegetation in order to establish a residential development consisting of 72 x 6 block residential units, 2 x 12 block residential units, 912 parking bays and streets as well as the construction of a facility for the storage of 115 cubic meters (5 x 23 000 litre tanks) of a dangerous good (Filling Station) situated on Erf 21244 (175/220), Aalwyndal, Mosselbaai. Please see Figure 1 for a Locality Map and Figure 2 for a copy of the proposed layout plan.



Figure 1: Locality Map.



Figure 2: Proposed layout plan.

The site is influenced by a number of design factors that were considered for the proposed layout plan to be acceptable. These factors include the slope of the site, environmental sensitivity, service provision, erf size, access, road layout and community facilities as well as the geotechnical features.

The site is located in an area that has been earmarked for development by the Mossel Bay Local Municipality in terms of Section 9(1) of the Municipal By-Law on land use planning and is known as the Aalwyndal Precinct Plan.

The vision for the Precinct Plan for Aalwyndal is listed below.

VISION

An integrated, mixed use and sustainable neighbourhood that builds on the spatial vision of the Mossel Bay Spatial Development Framework.

The vision is undergirded by the following design objectives:

- Contribute towards the goal of densification and compact development by designing the residential component accordingly
- Provide housing for a gradient mix of income groups
- Incorporating the natural environment in the design of land parcels
- Contain the footprint of the neighbourhood and land use mix at a density which will promote walkability
- Linking the commercial area with the airport activities to create a viable economic hub
- Design and build with renewable energy and green construction in mind

- Integrate Aalwyndal with the rest of the town by road linkages, bulk service networks and continuing natural systems.

The intention of this proposed development is to adhere to the principals as is set out in this Precinct Plan.

All the civil services and pertaining infrastructure have been designed in accordance with the "Guidelines for Human Settlements, Planning and Design" as compiled under patronage of the Department of Housing by CSIR Building & Construction Technology (also known as the "Red Book"). The relevant code of standards (i.e. SABS 1200, etc.) will be applicable to material and construction standards.

Bulk Water Supply for Domestic Usage

Potable water for human consumption and domestic use will be required and will be provided by Mossel Bay Municipality from their water treatment works in Klein Brakriver. Based on the Guidelines for the Provision of Municipal Infrastructure as well as the Water Master Plan for the Mossel Bay Area, it is estimated that the water demand that will be required for domestic usage is as follows:

i) Per annum: 105820 kℓ/y
Average per day: 290 kℓ/day

Allowance will be made for bulk supply to the proposed development to allow for peak and fire demand (Fire flow criteria of 15 ℓ/s is applicable).

Bulk water to the proposed development will be supplied from the existing Aalwyndal reservoir. An additional 7,0 ℓ/s pumping supply capacity will be required from the existing Langeberg to Aalwyndal reservoirs. There is however sufficient pumping capacity at the Aalwyndal pumping station and rising main to meet the increased required capacity.

Two reinforcing gravity supply pipelines, 2370 m x 250 mm ø and 680 m x 160 mm ø, between the Aalwyndal reservoir and the proposed development will be required to accommodate the development. The pipelines will supply water to the proposed development as well as the adjacent future development area. A proposed PRV will be required to reduce potential high static pressures in the lower laying areas of the zone. PRV pressure setting to be confirmed during final design.

The Mossel Bay Municipality confirmed that enough water is available to supply in this demand.

Bulk Sewage Removal

All the sewage from the proposed development will gravitate to a proposed new pumping station and rising main. From this pumping station the sewage from the proposed Development will be pumped to the existing Voorbaai pumping station.

From the Voorbaai pumpstation the sewage will be pumped through the existing sewage rising main to the connection point at the existing Municipal outfall sewer. From the connection point the sewage will gravitate through the existing 2 x 450 mm HDPE (Class 12) siphons from Hartenbos to the Inetworks at the Hartenbos Regional Sewage Treatment Works.

The Mossel Bay Municipality confirmed that the necessary capacity is available at their Hartenbos Regional Treatment Works to handle the additional sewage inflow from this development.

Stormwater drainage

As is standard practice, a stormwater management plan will be handed in to the controlling bodies for approval. For this development, the 1:50 year and 1:100 flood lines **are not applicable**.

The stormwater plan will be based on the following:

Up to 1:5 year flood to be handled in channels and/or underground pipes. Stormwater runoff from the roads will be channelled along concrete channels and/or road kerbs to catch pits from where it will be piped to low points. Bigger floods to run on surface as is the standard.

The stormwater network will consist of 450 mm concrete pipes. Pipe trench widths required by SANS 1200 is 900 mm. Trench depths will be determined by the topography but will be between 1,0 to 3,0 m deep.

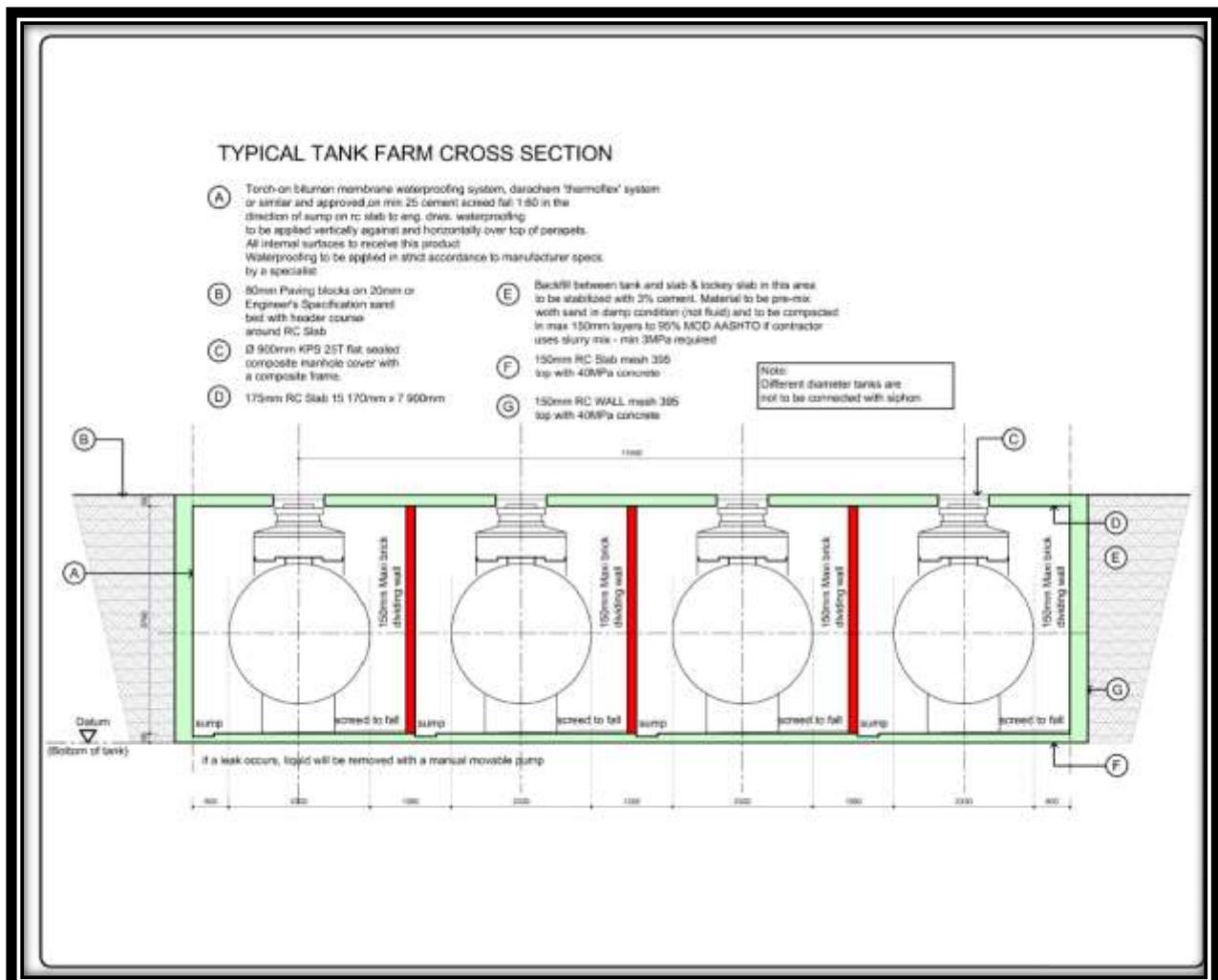
The applicant also intends to develop a Filling station, consisting of 5 x 23 000 ℓ tanks.

Design details:

- A “Master circuit breaker” controlling all petrol dispensing units, secured to the wall on the main driveway, in an easily accessible position, not less than 3m from any dispensing unit will be installed.
- A notice above the “Master circuit breaker” in 25mm letters which will read “EMERGENCY PUMP SWITCHES” in capital letters will be provided.
- Each petrol dispensing unit will be fitted with either an “O.P.W.” model 10 safety shut-off valve, or a similar device of an equal standard.
- The submersible pump motor will be flame and explosion proof.
- Piping will be in accordance with— S.A.N.S. 10062 and S.A.N.S. 1123
- Ventilation pipes will be taken to a height of 3,8m above ground level, and will be fitted with flame proof air vent caps with gauze.
- All piping will slope up from tanks to prevent airlocks.
- All fire fighting equipment on forecourt will be supplied by the operator to suit the Fire Department requirements. S.A.N.S. 10400
- All electrical switches, plugs & motors within 3m of any pump will be flame and explosion proof.
- 200mm reinforced concrete apron will be constructed over tanks to extend 1m beyond tanks.
- Electricians will connect up pump distribution boards.
- The installation will conform to S.A.N.S. 10089 part 3: 2010 for pumps and underground tanks, as well as S.A.N.S. 10131 part 2, 1186.
- The electrical installation will conform to S.A.N.S. code 10142, S.A.N.S. 1202, S.A.N.S. 10108, S.A.N.S. 10089—2 and S.A.N.S. 1109.
- Symbolic “NO SMOKING” and “NO OPEN FLAME” signs will be displayed on the canopy — S.A.N.S. 1186 — 1
- The Emergency Stop Switch will comply with S.A.N.S. 10089—3 SECTION 14.7

TANKS SHOULD BE POSITIONED 600mm APART FROM EACH OTHER.

In relation to the Service station and underground fuel storage tanks, the following detailed designs are proposed:



Typical Tank Farm Layout

Monitoring wells are proposed to either side of the tanks to ensure that leaks are detected in a timely manner. Containment elements are proposed concrete slab minimum 74mm concrete bedding/blinding concrete grade 15/19. Cement is proposed stabilised backfill in 150 mm layers, top slab 150mm thick to engineer's details.

RECOMMENDATIONS

Precautionary measures:

Even though the development poses a risk of contamination, sufficient mitigation and management measures exist and can be implemented to ensure the environmental sustainability and viability of the development, based on implementation of the following recommendations and precautionary measures:

The requirements stipulated in SANS 10089 must be complied with, including but not limited to:

- Steel tanks and coatings shall comply with the requirements of SANS 1535.
- Fibre-reinforced plastic tanks shall comply with the requirements of SANS 1668, and all materials used in contact with the tank shall be compatible with the fibre-reinforced resin.
- Installation of fuel leak observation wells adjacent to the tanks.
- A full system integrity test in accordance with an approved test method shall be carried out on the tank after installation

- An efficient stormwater management system must be designed implemented on site.
- Stormwater from the site must drain into a sealed oil sump constructed directly downstream of the site in order to intercept possibly contaminated surface run-off from the apron and parking areas.
- All surface areas where the handling of fuel will take place (apron area) must be sealed by means of concrete slabs underlain by bitumen at the intersections of the concrete slabs, to prevent the infiltration of liquids into the underlying soil. The soil material underlying this layer must be adequately compacted to prevent ingress of liquids through zones of weakness (i.e.: along joints) within the surface seal.
- The regular reconciliation of the volumes of petroleum products is recommended to ensure the early detection of leaks.
- Care should be taken that all fuel lines and fuel dispensers are leak-proof, especially in the light of the corrosion risk posed by the topsoil covering the area.
- A spillage contingency plan must be developed

6. DESCRIPTION OF THE PROPERTY

ACTIVITY LOCATION

Location of all proposed sites:	Erf 21244 (175/220), Aalwyndal, Mosselbaai
Farm / Erf name(s) and number(s) (including Portions thereof) for each proposed site:	Erf 21244 (175/220), Aalwyndal, Mosselbaai
Property size(s) in m ² for each proposed site:	12,5746 ha
Development footprint size(s) in m ² :	90 000m ²
Surveyor General (SG) 21 digit code for each proposed site:	C05100000000022000175

LANDOWNER

Applicant / Organisation / Organ of State:	Hennie Bekker Familie Trust		
Contact person:	Mr. Dean Nigrini		
Postal address:	PO Box 38, Grobbelaarskraal		
Telephone:	082 560 4419	Postal Code:	6450
Cellular:	082 560 4419	Fax:	018 293 0671
E-mail:	dnigrini@jabama.co.za		

The study area for this investigation is located on the outskirts of the town of Mossel bay, within the Mossel Bay Local Municipality forming part of the Eden District Mossel Bay within the south eastern portion of the Western cape Province of South Africa.

The site is roughly rectangular shaped and zoned "Residential 1". One Residential house has been constructed on site. The remainder of the site is mostly undeveloped. An overhead power line traverses the north eastern corner of the site. The northern and north western boundary of the site displays evidence of vegetation clearance for a firebreak. Scattered heaps of dumped material, which over time have been covered with vegetation is also scattered across the site. Tracks, fences and alien invasive plant species are found at the site. The site is located on Erf 21244 (175/220), Aalwyndal, Mosselbaai. Please see Figure 1 for a Locality Map and Figure 3 for a copy of the Biodiversity Sensitivity Map.

Location of the various proposed activities are depicted on the Layout Plan.



Figure 1: Locality Map.

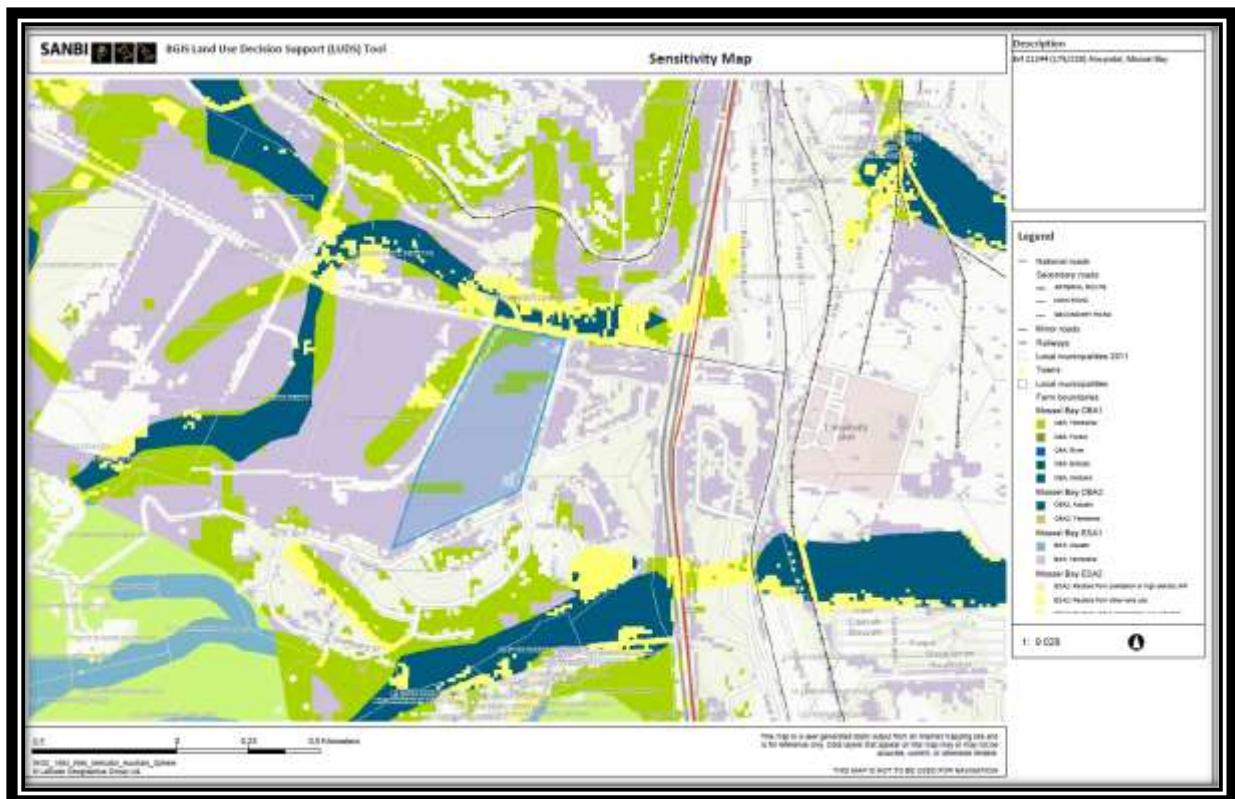


Figure 3: Sensitivity Map

The site is influenced by a number of design factors that were considered for the proposed layout plan to be acceptable. These factors include the slope of the site, environmental sensitivity, service provision, erf size, access, road layout and community facilities as well as the geotechnical features.

In 1988 the Aalwyndal area was earmarked for township development by the then Chief Directorate Local Government and the decision was Gazetted on 15 April 1988. In 1995-2004 the Aalwyndal area was established with comments and approvals from all relevant institutions, departments and Mossel Bay Municipal Council. The area was zoned residential although the property sizes were between 5 and 15 hectares. Therefore the current zoning allows owners to construct 2 dwelling units anywhere outside of the 10 m building lines on the properties by only submitting building plans.

The site is located in an area that has been earmarked for development by the Mossel Bay Local Municipality in terms of Section 9(1) of the Municipal By-Law on land use planning and is known as the Aalwyndal Precinct Plan. In terms of the Precinct Plan (2018), an Open Space Network has been suggested for the Precinct. See Figure 4. According to this Map, the Northern and Eastern borders of the Application site was identified as being included into the Open Space Network.

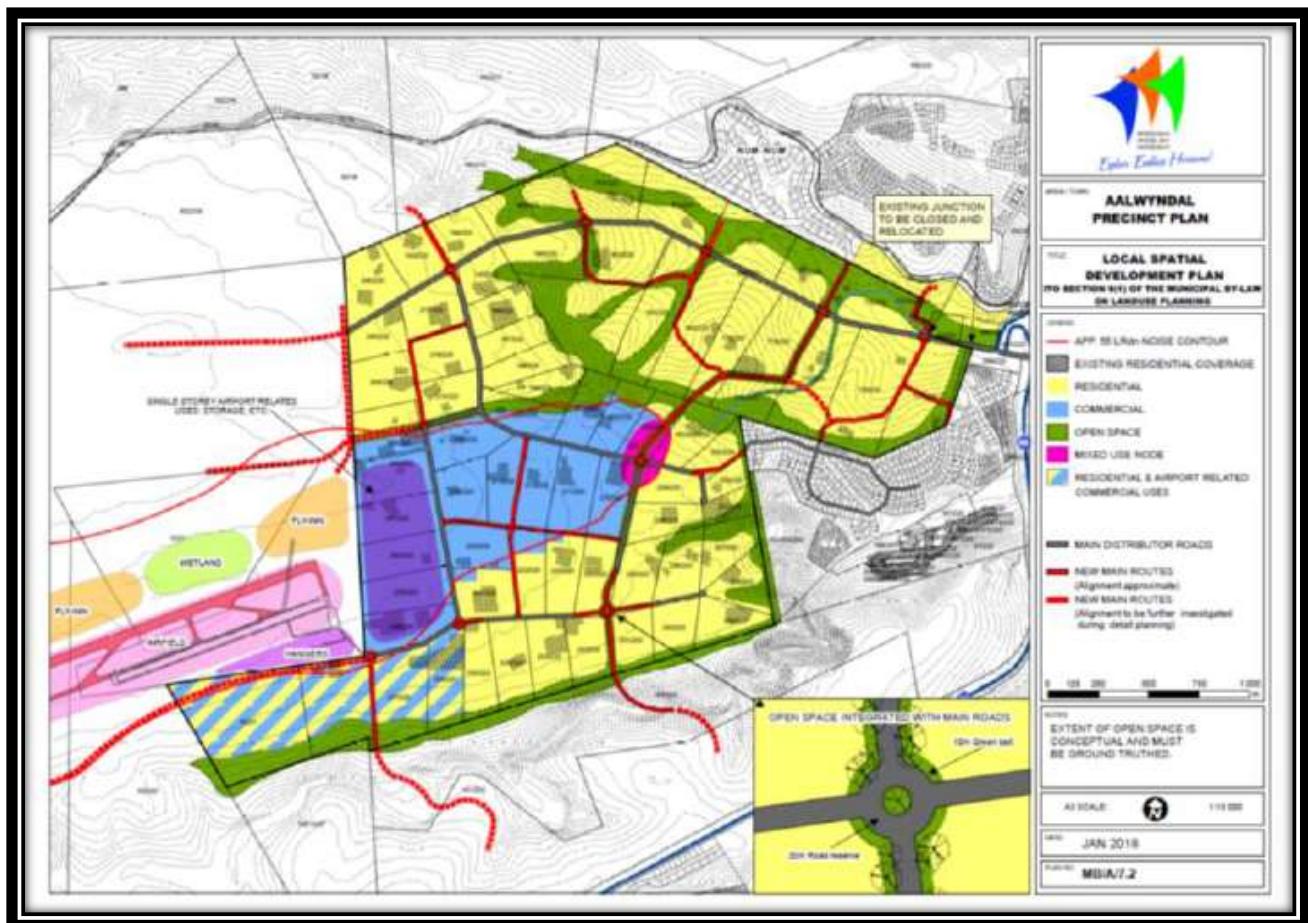


Figure 4: Open Space Network as suggested in the Aalwyndal Precinct Plan

"The Mossel Bay Municipality commissioned a Biodiversity Assessment for the area after it became evident that the high level Critical Biodiversity information from the Western Cape Department of Environment and Development Planning on which the Aalwyndal Precinct Plan was done, was inaccurate. The Biodiversity Assessment was done by combining a Vegetation Assessment, a Fresh Water Habitat Assessment and an Ecological viability Assessment. The outcome of the study is a Botanical Sensitivity Map with 4% Very High sensitivity areas, 55% High sensitivity areas and 40% Medium/Low sensitivity areas. The recommendation in this report is that only 40% of the area be developed in the Medium/Low sensitivity areas." (Sharples, J. 2019: 13-25). Please see Figure 5 below.

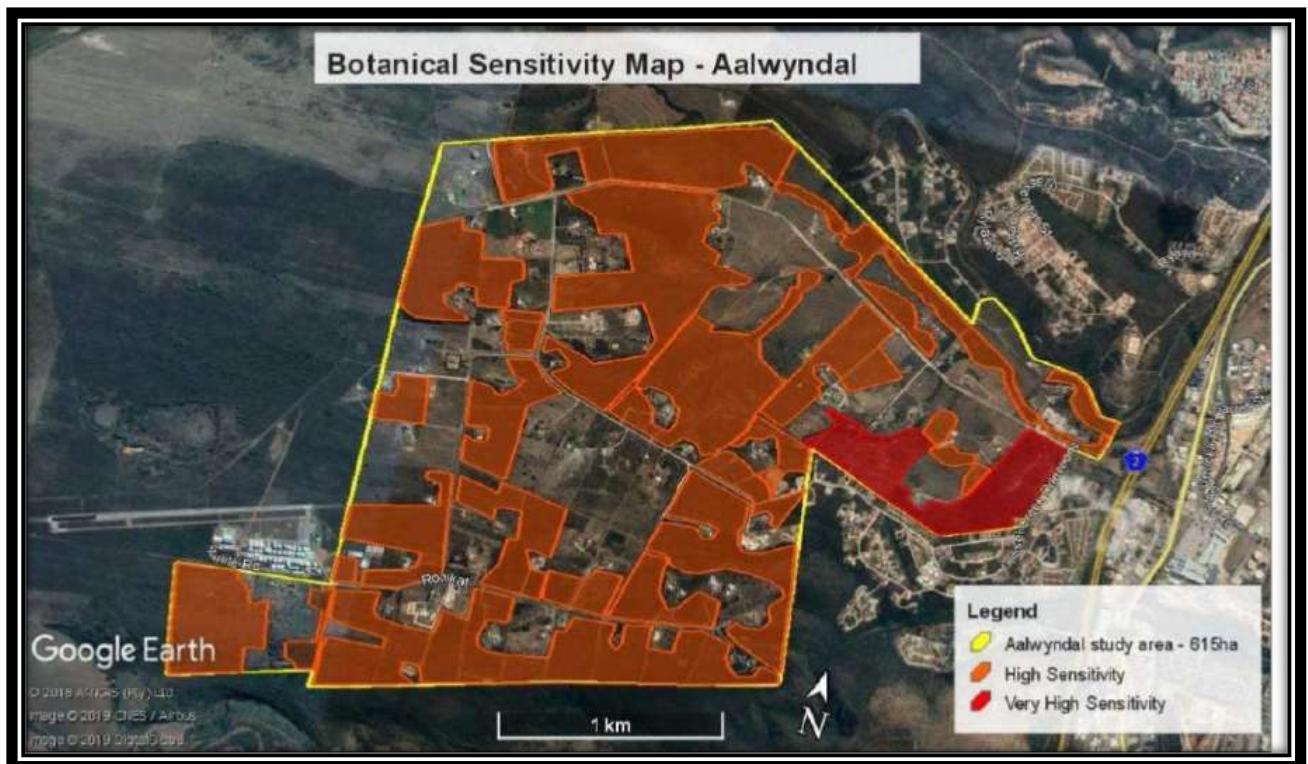


Figure 5: Botanical Sensitivity according to the Biodiversity Assessment for the area (Sharples, J. 2019: 13-25)

As is evident from the map above, the proposed development falls within an area that has been identified by the said study as being “Very High Sensitivity” and has led to the inclusion of this area (The Application site) into the Open Space Network proposed for the Precinct Plan. See Figure 6.

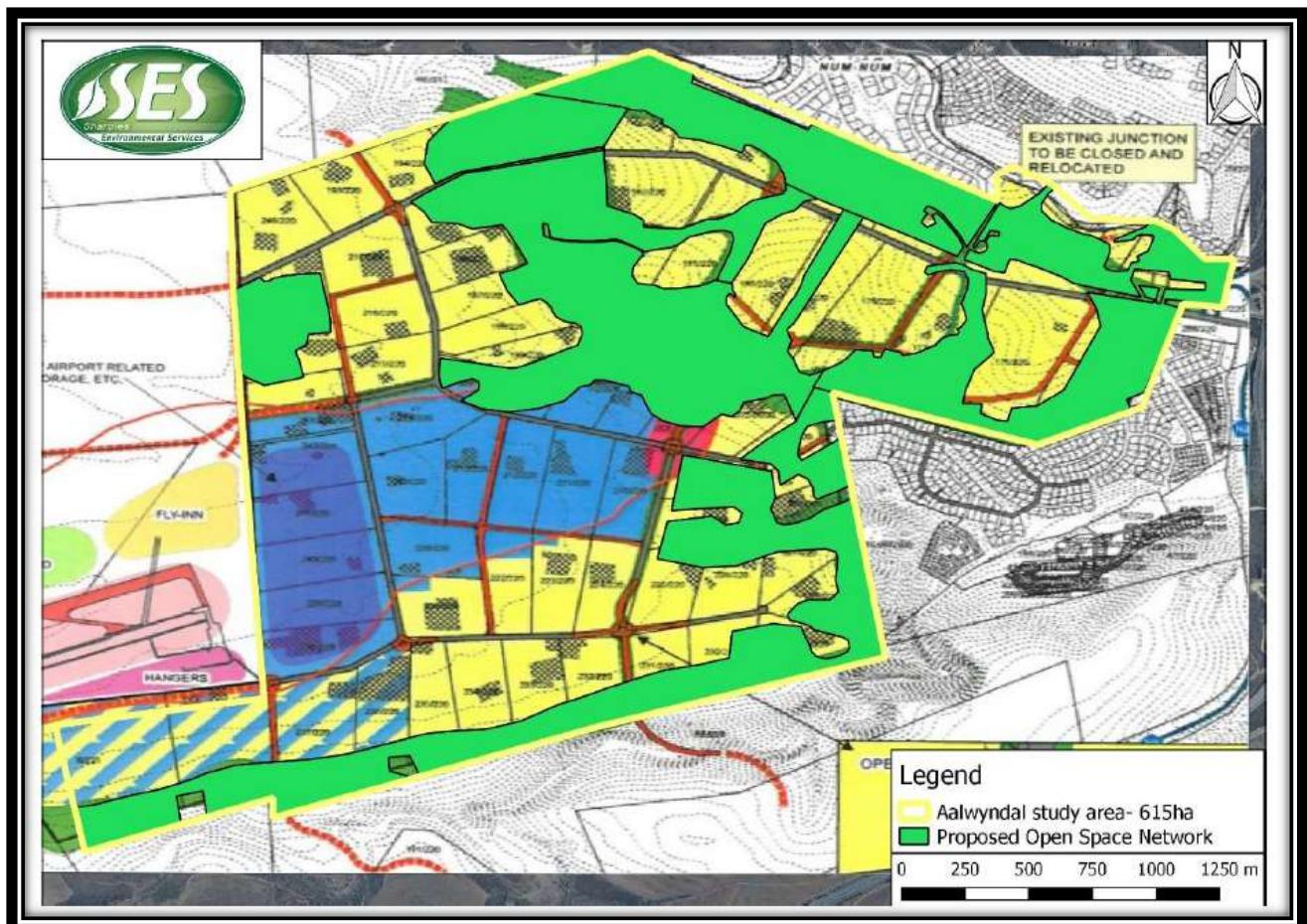


Figure 6: Proposed Open Space Network for Aalwyndal (Sharples, J. 2019: 13-25)

7. DESCRIPTION OF THE ENVIRONMENT THAT MAY BE AFFECTED BY THE PROJECT

7.1 Bio-physical aspects

7.1.1 Geology, Soil, Topography and Hydrology

Regional Geological Setting

According to the geology map of Oudtshoorn 3322, the study area is completely underlain by Conglomerate, Sandstone, Siltsone and Clay of the Enon Formation. This formation consists of reddish-brown, coarse-grained conglomerate containing pebbles, cobbles and boulders, typically of quartzite. It was deposited in the form of alluvial fans by rivers.

The regional geological setting of the study area (minus the surficial soil cover) is illustrated by Figure 7.

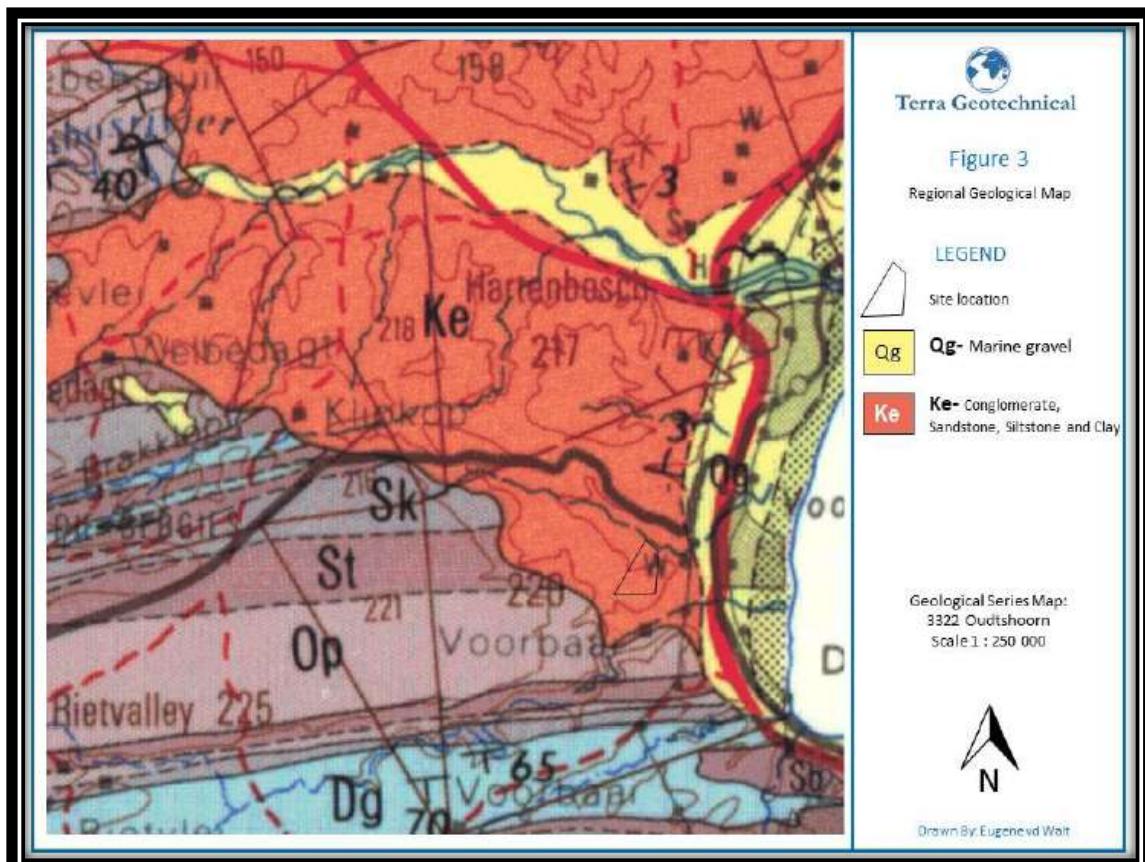


Figure 7: Regional geological setting (Source: Terra Geotechnical Report)

The study area does not reflect any risk for the formation of sinkholes or subsidence caused by the presence of water-soluble rocks (dolomite or limestone), and as such is **not deemed “dolomitic land”**.

Prominent Geological Structures

The available geological information does not indicate the presence of any linear structures, within the vicinity of the site.

Seismic Risk

According to Kijko et al. (2003) the regional seismic hazard in the project area can be defined as **LOW**, exhibiting a 10% probability of a seismic event with a peak ground acceleration of approximately 0.1 G within a period of 50 years.

The results of the Geotechnical study reveal that the site exhibits geotechnical characteristics that may require the implementation of specific design and precautionary measures to reduce the risk of structural damage due to adverse geotechnical conditions.

The following constraints needs to be considered

- The occurrence of a **non-perennial river** traversing the north western corner of the site; with expected elevated volumes of surface water runoff and associated erosion within, and adjacent to this channel. The exact extent of this channel and its 1:100 flood line needs to be determined. (Please see addendum to Geotechnical report in this regard.)
- The occurrence of **topsoil material** deemed to be **potentially highly expansive** and **potentially highly compressible**

- The occurrence of residuum material deemed to be **potentially slightly compressible**.
- The scattered occurrence of boulder size cobbles within the soil profile amplifying the predicted degree of **differential movement**.
- **Localized occurrence of difficult excavation** at shallow depth resulting in hard rock excavation of **less than 10%** of the total volume of material to a depth of 1.5 m below the ground surface.
- **Steep slopes** of between 6 and 12 degrees across the majority of the site.
- Across the site, the occurrence of **dense vegetation** and extensive large root systems.

However, these characteristics do not disqualify the site from being used for the proposed development, but rather require the implementation of site-specific precautionary measures.

Site Classification

In the light of the results of this study, the site can be subdivided into **FOUR** geotechnical entities/development potential zones (**Figure 6 of the Geotechnical report and illustrated below**).



Development Potential Zonation (Revision 1)

Please refer to **Table 5 of the Geotechnical report and illustrated below** overleaf which details the sites' zonation.

The table applies to **light foundation masonry residential structures**

Table 3: Site Zonation and Geotechnical Character

Development Potential Zone	NIDMC Site Classification	Pastorek, Wood and Brink (1993) Classification	Excavation Class	Slope Stability
Zone A	H1/S1	2C- Moderate soil Heave 2C- Moderate soil Compressibility 2F- Difficulty of excavation to a depth of 1.5 m with between 10 and 40% of the material deemed to be hard rock excavation	Soft Conditions to depth of approximately 1.0 m	Stable- and gentle slopes
Zone B	H1/S1	2C- Moderate soil Heave 2C- Moderate soil Compressibility 2I- Localized areas with slopes between 6 and 12 degrees	Soft Conditions to a depth of 1.5 m	Stable- with localized steep slopes
Zone C	H3/S2	3C- High soil Heave 2C- High soil Compressibility 2I- Large portion of the site with slopes between 6 and 12 degrees	Soft Conditions to a depth of 1.7 m	Stable- and steep slopes
Zone D	H3/S2	3C- High soil Heave 2C- High soil Compressibility 2I- Localized area of the site with slopes less than 2 degrees 3E - Areas adjacent to a known drainage channel (Exact extent of 1:100 year flood line needs to be determined)	Soft Conditions to a depth of 1.8 m	Stable- with very gentle to gentle slopes

Site Zonation and Geotechnical Character (Revision 1)

Groundwater Occurrence

Zone A, B, C

Groundwater was not encountered in any of the test pits excavated across the site.

There is the possibility that localized saturation of the soil material overlying less permeable material (e.g.: weathered bedrock) may occur throughout the site during and directly after the rainfall season, especially after heavy precipitation events (i.e.: perched water tables).

Zone D

A non-perennial drainage traversing this zone may increase the subsurface waterflow.

Soil Excavatability.

Zone A, C, D

No problems are foreseen during the excavation of **shallow foundation trenches** or **deep service trenches** to a depth of 1.7 m.

Material to a depth of 1.7 m deemed to be **Soft Excavation** (SANS 1200D).

Zone B

No problems are foreseen during the excavation of **shallow foundation trenches**, although **problems** are foreseen with the excavation of **deep service trenches**, due to the occurrence of shallow bedrock.

Between 10 and 40 % of the material to a depth of 1.0 m deemed to be **Intermediate Excavation** conditions (SANS 1200D).

All Zones

The following additional comments on excavation of service trenches apply:

- Trenches near the non-perennial streams may have to be dewatered, especially after heavy precipitation events.
- The side walls of deep excavations should be shored to prevent injury or death due to side wall failure

Slope Stability

Zone A & D

In the light of the **gentle slopes** and localized **very gentle slopes** across these zones, specialised methods for the stabilisation of cuts into the slopes **are not** deemed necessary.

Zone B & C

In the light of the **steep slopes** across these zones, specialised methods for the stabilisation of cuts into the slopes **are** deemed necessary

Foundation Recommendations and Solutions

In the light of the results of this investigation, the study is deemed suitable for development, provided due cognisance is given to the following:

- The soils covering the site may undergo a degree of **consolidation and heave** (i.e.: loss and gain of volume) under loading or when saturated, requiring that structures be adequately strengthened to prevent structural damage due to **differential movement** beneath foundations.
- Due to its variable nature, it is recommended that the **highly expansive organic rich topsoil** across the site be removed beyond the perimeter of the proposed developments. The decomposition of the organic material within the soil may induce structural damage due to differential movement beneath foundations.
- Due to its variable nature, it is recommended that all the **heaps of fill** material in the north of the site be removed beyond the perimeter of the proposed development.
- Due to the identified drainage feature traversing the north western portion of the site, it is recommended that detailed **1:100 flood line survey** be conducted to identify the extent of this feature
- In areas hosting shallow bedrock; it is recommended that foundations do not span from rock to natural soils or engineered fills, so as to limit differential settlement.
- The presented geotechnical model is based on point data, for this reason, inconsistencies identified during the construction phase of the project should be assessed on site by a qualified individual

It is recommended that EITHER of the following foundation designs be used in the development:

Zone A & B (NHBRC Site Class H1/S1)

1. Modified Normal:

- Reinforced strip footings.
- Articulated joints at some internal and all external doors.
- Light reinforcement in masonry.
- Site drainage and plumbing/service precautions.

2. Soil Raft:

- Remove all or part of expansive horizon to 1.0 m beyond the perimeter of the structure and replace with inert backfill, compacted to 93% MOD AASHTO density at -1% to +2% of optimum moisture content.
- Normal construction with lightly reinforced strip footings and light reinforcement in masonry.

It must be noted that differential settlement is assumed to equal 50 % of the total movement. The relaxation of some of these requirements, e.g. the reduction or omission of steel or articulation joints, may result in a Category 2 level of expected damage.

Zone C & D (NHBRC Site Class H2/S2)

1. Stiffened or cellular raft:

- Stiffened or cellular raft with articulated joints or lightly reinforced masonry.

- Site drainage and plumbing/service precautions.

2. Piled Construction:

- Piled foundations with suspended floor slabs with or without ground beams.
- Site drainage and plumbing/service precautions

3. Soil raft:

- Remove all or part of expansive horizon to 1.0 m beyond the perimeter of the structure and replace with inert backfill, compacted to 93% MOD AASHTO density at -1% to +2% of optimum moisture content.
- Normal construction with lightly reinforced strip footings and light reinforcement in masonry.
- Site drainage and plumbing/service precautions

Please note that if a soil raft is not selected, it is recommended that the problems soils (expansive and compressible material) immediately beneath the concrete surface beds be removed and replaced with a competent inert backfill, with depths and quality in accordance with design recommendations.

It must be noted that differential settlement is assumed to equal 50 % of the total movement. The relaxation of some of these requirements, e.g. the reduction or omission of steel or articulation joints, may result in a Category 2 level of expected damage

Please consult a qualified professional for additional options and final designs.

Due to the fact that this report is compiled using point data scattered over the site, provisions must be made to allow for changes in soil quality over short distances. It is recommended that a geotechnical investigation be undertaken by a suitably qualified geo-professional for each of the stands before construction to establish its own geotechnical nature.

Good Construction Practices

Drainage

An important factor in the promotion of a stable site is the control and removal of both surface and ground water from the site. It is important that the design of the storm water management system allow for the drainage of accumulated surface water. Disposal of storm water should in any case conform to the Department of Water Affairs and Forestry and local authority requirements. This includes the obtaining of water use licenses when necessary.

The report stated that there will be a significant increase in moisture content during periods of high rainfall and the high clay content will render the alluvial soils susceptible to volumetric change (swell) and alternatively shrink during dry periods. It is therefore important that effective drainage is achieved

Surface Drainage

It is recommended that an efficient surface drainage system be installed around all structures and along all roads throughout the study area in order to:

- prevent the ponding of water next to structures directly after heavy precipitation events, this may lead to differential settlement as the saturated material undergoes densification.
- prevent large-scale changes in soil moisture beneath the structures on a seasonal basis
- prevent the seasonal formation of perched water tables (i.e.: short-term groundwater seepage) within the soil material at shallow depth.
- prevent the possible lateral movement of liquids within the upper soil horizons

The precautionary measures should ideally include:

- the sealing of open ground surfaces by means of either of the following:
 - the cultivation of a natural soil cover (e.g.: grass)
 - compaction of the soil surface
 - bitumen or concrete paving
- the removal of surface water to a distance of at least 1 m beyond structures by means of watertight paving.
- the removal of surface run-off by means of an efficient surface drainage system.
- roads should preferably be constructed parallel to the natural surface elevation contours rather than perpendicular to it, in order to reduce run-off velocities

Sub Surface Drainage

Areas requiring subsoil drainage will have to be assessed on site during the construction phase of the development. No groundwater seepage was encountered during this investigation, however, if groundwater seepage is encountered during construction, these zones will need to be controlled with effective subsoil drains, particularly where water is likely to gain ingress into the structural layers of roads.

Earthworks

It is recommended that all earthworks be carried out in accordance with SABS 1200 (current version). The fill should be placed in layers not exceeding 200 mm loose thickness and compacted to a minimum of 90% Modified AASHTO maximum dry density.

Cut and fill slopes should be top soiled and planted with grass. This will limit erosion of these slopes and the problems associated with wash-aways of fill embankments.

ADDENDUM TO ENGINEERING GEOLOGICAL INVESTIGATION

Geotechnical Site Classification

These specialist studies have clearly defined the extent of the flood lines and marshy areas, proving that the inferred non-perennial stream indicated on Figure 6 of the Geotechnical report, does not intersect the site as previously indicated and as such the **investigated site does not pose any risk of being exposed to elevated volumes of surface water runoff, that could lead to localized flooding**. There is however a localized depression in the north western corner, that could lead to ponding of surface water.

Due to these specialist studies, changes to the zoning of the site (specifically Zone D) will occur. The following changes are deemed to more accurately define the on-site conditions and should be accepted as correct.

The major change that these findings bring to the geotechnical report is the shifting of the indicated non-perennial drainage feature. Through the evidence provided it can now be assumed that this drainage does not intersect or have any influence on the investigated area. The minor depression in the north western corner will lead to ponding of surface water during high rainfall. Surface drainage measures needs to be implemented as described in the original report.

Please refer to the updated table 5 and Figure 6 below, for the updated geotechnical zoning of the site.

The conclusions, recommendations, and opinions presented in this report addendum are based on evidence provided by the specialist studies. Terra Geotechnical carries no liability for the changes made due to the specialist input. Except as modified herein, the conclusions and recommendations presented in our previous report dated August 12, 2019 also apply to this report addendum.



Development Potential Zonation (Revision 2)

Table 5: Site Zonation and Geotechnical Character				
Development Potential Zone	NHBC Site Classification	Partridge, Wood and Beink (1993) Classification	Excavation Class	Slope Stability
Zone A	H1/S1	2C- Moderate soil Heterogeneity 2C- Moderate soil Compressibility 2F- Difficulty of excavation to a depth of 1.5 m with between 10 and 40% of the material deemed to be hard rock formation	Soft Conditions to depth of approximately 1.0 m.	Stable- and gentle slopes
Zone B	H1/S1	2C- Moderate soil Heterogeneity 2C- Moderate soil Compressibility 2F- Localized areas with slopes between 6 and 12 degrees	Soft Conditions to a depth of 1.5 m	Stable- with localized steep slopes
Zone C	H3/S2	3C- High soil Heterogeneity 2C- High soil Compressibility 2F- Large portions of the site with slopes between 6 and 12 degrees	Soft Conditions to a depth of 1.7 m	Stable- and steep slopes
Zone D	H3/S2	3C- High soil Heterogeneity 2C- High soil Compressibility 2F- Localized area of the site with slopes less than 2 degrees (leads to ponding of surface water)	Soft Conditions to a depth of 2.1 m.	Stable- with very gentle to gentle slopes

Site Zonation and Geotechnical Character (Revision 2) Regional Topography

Regionally, the study area is seen to display a highly undulating surface topography, prominent ridges separated by steeply dipping valleys. The colour coded image below clearly depicts the variable nature of the study area, with the **higher lying ridge structures depicted by the pink** and the **lower lying valley structures depicted by the green and blue colours**. Figure 8 graphically depicts the elevation and topography of the study area.



Figure 8: Elevation and topography of the study area (Source: Terra Geotechnical Report)

Site Topography

The site which is located on the northern slope of a localized hill, spans from the gentle sloping summit through the steeply sloping side slope to the gentle sloping foot slope of the hill. Overall, the site is seen to display a variable sloping nature, with the slope generally following a radial sloping nature around the hill summit. The major slope is however in a northerly direction, from the higher lying hill summit in the south (approximately 85 mamsl) towards the lower lying area in the north (approximately 30 mamsl). **Figure 9 graphically depicts the elevation and topography of the site.**



Figure 9: Elevation and topography of the site (Source: Terra Geotechnical Report)

Surface Drainage

Wetlands such as floodplain wetlands, channelled valley-bottom wetlands, unchannelled valley-bottom wetlands, wetland depressions (pans), seeps and wetland flats appear to be absent at the site. In conclusion no wetlands are found at the site.

A small depression, which is technically similar to a very small artificial waterbody (not a wetland depression/ pan) of approximately 0.03 ha, possibly excavated in the past and also cut off by tar road elevation, is present at the northwestern corner of the site. This small low-lying area appears to be hitherto excavated, though shallow. The northern edge of the small area where water may gather during substantial rainfall events is a slightly elevated tar road which in effect cuts off water flow under normal conditions. In the case when excessive water runs down from a shallow valley west of the site and from the surface of tar road and road verge north of the site, water could potentially gather at the shallow depression. Under what would likely be extraordinary circumstances this depression would overflow over the tar road in a northern direction to feed into the non-perennial river north of the site. Technically the depression could be described as a very small artificial waterbody which could be inundated sporadically. Historically this area where the depression occurs was part of a drainage line that ran through the extreme northwestern part of the site. This drainage line which starts at the head of the small shallow valley west of the site, has been conspicuously modified in the past by a ground wall (dam), buildings, fences, cleared areas and a tar road, the latter seemingly without culverts in the immediate area.

Excessive sheet flow from the shallow valley west of the site and also into the small excavated area could lead to water running over the tar road north of the site. If the development is approved a proper stormwater system could free and restore some water flow to the non-perennial river north of the site.

A non-perennial river is present north of the site and south of a substation. A small in-channel dam is present at this watercourse north of the site. Riparian vegetation at this non-perennial river consists of a mixture of indigenous and alien vegetation. This non-perennial river is converted into furrows/ canals downstream before reaching an estuary at the Indian Ocean. The non-perennial river outside the site remains an important conservation corridor in the larger area which emphasises the importance of a proper stormwater system at the site.

An artificial waterbody, a dam with a ground wall, exists west of the site and appears to be seasonal and dry for much of the time. This seasonal dam appears to limit water flow down the shallow valley beneath it. Over decades since the ground wall of this dam has been built and significant ecological disturbances below the ground wall took place the hydrology of the drainage line has probably been substantially modified in particular in an area with relatively low rainfall and limitations to water that reaches downhill.

Conspicuous ecological disturbances are present below the ground wall of the dam west of the site. The area where the ground wall is present is visibly poor in vegetation cover. Hitherto cleared areas, fences, buildings and implements are present below the dam wall to the extent that the drainage is difficult to recognise. Aggressive alien invasive *Acacia cyclops* is conspicuous at the fringes of the artificial dam west of the site. A spillway outlet is present at the northeaster limit of the dam.



Figure 10 Indications of watercourses at and near the site.

- Light blue outline and Non-perennial river north of site
- Blue outline and shading Artificial waterbodies/ areas where water could gather

7.1.2 Ecological aspects

The site is situated at the Fynbos Biome which is represented by Groot Brak Dune Strandveld (FS 9) vegetation type (Mucina & Rutherford, 2006). A brief overview of the vegetation type follows.

Groot Brak Dune Strandveld FS 9

Distribution: Groot Brak Dune Strandveld is present in the Western Cape Province of South Africa. It is found at coastal stretches between the mouth of the Gouritz River as far east as Victoria Bay near Wilderness, with by far the largest area covering the flats north of Mossel Bay (along the lower reaches of

the Groot Brak, Klein Brak and Hartenbos Rivers) and extending up to 17 km from the coast. Altitude 0 – 180 m (Mucina & Rutherford, 2006).

Vegetation & Landscape Features: Flats, undulating landscapes (stabilized dunes) and steep coastal slopes, covered by dense and tall (up to 3 m), spiny, sclerophyllous scrub with gaps supporting shrublands with ericoids or succulent-leaved shrubs. The graminoid layer is sparse and short (Mucina & Rutherford, 2006).

Geology & Soils: Mostly underlain by the clastic sedimentary rocks of the Kirkwood Formation (Mesozoic Uitenhage Group). In the east, quartzite, schist, and phyllite of the Kaaimans Group (Namibian Erathem) and Cape Granite (edges of high coastal cliffs) are also present. In parts along the coast, these rocks are covered by the unconsolidated dune sand of the Strandveld Formation (Bredasdorp Group). Most important land types Db and Dc (Mucina & Rutherford, 2006).

Climate: MAP varies between approximately 350 mm in the west to 750 mm in the east, with approximately 40% of the rain falling in the summer (October-March) and 60 % falling in the winter (April – September) (Mucina & Rutherford, 2006).

Important Taxa: Small Trees: *Chionanthus foveolatus*, *Clausena anisata*. Tall Shrubs: *Azima tetracantha*, *Cussonia thyrsiflora*, *Diospyros dichrophylla*, *Euclea racemosa* subsp. *racemosa*, *Grewia occidentalis*, *Gymnosporia buxifolia*, *Maytenus procumbens*, *Metalasia muricata*, *Morella cordifolia*, *Myrsine africana*, *Mystroxylon aethiopicum*, *Olea exasperata*, *Pterocelastrus tricuspidatus*, *Putterlickia pyracantha*, *Searsia crenata*, *Searsia glauca*, *Searsia longispina*, *Searsia lucida*, *Schotia afra* var. *afra*, *Sideroxylon inerme*, *Tarchonanthus littoralis*. Low Shrubs: *Asparagus suaveolens*, *Ballota africana*, *Carissa bispinosa* subsp. *bispinosa*, *Chironia baccifera*, *Clutia daphnoides*, *Eriocephalus africanus* var. *africanus*, *Helichrysum teretifolium*, *Lauridia tetragona*, *Phylica axillaris*, *Polygala myrtifolia*. Succulent Shrubs: *Aloe arborescens*, *Cotyledon orbiculata* var. *dactylopsis*, *Crassula perforata*, *Crassula pubescens* subsp. *pubescens*, *Euphorbia burmannii*, *Euphorbia mauritanica*, *Tetragonia fruticosa*, *Zygophyllum morgsana*. Woody Climbers: *Asparagus aethiopicus*, *Cissampelos capensis*, *Rhoicissus digitata*. Woody Succulent Climber: *Sarcostemma viminale*. Semiparasitic Shrubs: *Osyris compressa*, *Thesidium fragile*. Soft Shrub: *Hypoestes aristata*. Herb: *Commelina africana*. Geophytic Herbs: *Brunsvigia orientalis*, *Chasmanthe aethiopicus*, *Hesperantha falcata*. Succulent Herbs: *Carpobrotus edulis*, *Crassula expansa* subsp. *expansa*, *Senecio radicans*. Herbaceous Climbers: *Astephanus triflorus*, *Cynanchum obtusifolium*, *Kedrostis nana*. Herbaceous Succulent Climber: *Pelargonium peltatum*. Graminoids: *Cynodon dactylon*, *Ehrharta erecta*, *Ficinia indica*, *Panicum deustum*, *Stipa dregeana*.

Note: Not all of the above listed plant species for the vegetation type occur at the site in the study area.

Vegetation

For most of the site thorny sclerophyllous shrub is present as well as conspicuous infestation by the alien invasive *Acacia cyclops* (Redeye). A patch where *Elytropappus rhinocerotis* (Renosterbos) is more conspicuous occurs at the southwestern part of the site. Some areas have hitherto been cleared where pioneer species such as *Atriplex semibaccata* is noticeable.

Indigenous shrub species that form a dense shrub-stratum at some parts of the site include *Carissa bispinosa*, *Searsia glauca*, *Gymnosporia buxifolia*, *Schotia afra* and *Grewia occidentalis*. Three *Aloe* species have been found at the site – *Aloe arborescens*, *Aloe ferox* and *Aloe maculata*. Other succulents such as *Euphorbia heptagona*, *Carpobrotus edulis*, *Glottiphyllum depressum*, *Drosanthemum speciosum*, *Trichodiadema intosum* and *Gasteria carinata* are also found. Indigenous grass species include *Cynodon dactylon*, *Ehrharta villosa*, *Pentameris pallida*, *Sporbolus fimbriatus* and *Themeda triandra*. Exotic grass

species include *Pennisetum clandestinum*, *Briza maxima* and *Phalaris minor*. Other exotic plant species include *Lantana camara* and *Opuntia ficus-indica*.

Alien invasive weeds are conspicuous at the small low-lying area at the northwestern corner of the site, while the aggressive alien invasive tree *Acacia cyclops* is visible at some of the edges of this depression. Steep slopes with poor vegetation cover are found at the southern edges of the depression whereas the slopes at a fence north of the depression next to the tar road are covered by grasses such as the alien invasive *Pennisetum clandestinum* (Kikuyu) with some herbs and shrubs. The indigenous grass species *Cynodon dactylon* is also present at the depression. Extensive cover of pioneer plant species and alien invasive weeds such as *Atriplex semibaccata* (Australian Saltbush) and *Chenopodium* species at this possibly sporadically inundated area is noticeable. Other alien invasive weeds at the small low-lying area include *Sonchus oleraceus* and *Plantago lanceolata*. Typical wetland vegetation such as sedges, marsh-grasses and hydrophytic herbs, appears to be absent. Overall the small depression appears conspicuously degraded.

Presence of wetlands

No wetlands appear to be present at site. A small depression which is not a wetland and technically ascribes to a very small artificial waterbody where water could gather sporadically is found at a low-lying area at the northwestern corner of the site.

Signs of disturbances

Tracks, fences and alien invasive plant species are found at the site. Roads and urban areas are present at some of the boundaries of the site. A powerline and some hitherto cleared areas are also found. Small scale informal dumping occurs from adjacent residential areas.

Connectivity

Some corridor with indigenous vegetation should remain at the site. If the development is approved cultivation of indigenous plant species will be an asset for urban conservation corridors.

Habitat and vegetation characteristics

Plant Species

Extinct, threatened, near threatened and other plant species of high conservation priority of the Western Cape Province are listed in Tables 4.2 – 4.8 of the Fauna and Flora Habitat Report, (Appendix G3 of this report). Protected tree species are listed in Table 4.9 of the Fauna and Flora Habitat Report, (Appendix G3 of this report). The presence or not of all the species listed in the tables were investigated during the survey. Presence of Threatened and Near Threatened plant species at the site is unlikely.

Two plant species, which are not threatened but listed as Declining occur at the site: *Boophone disticha* and *Hypoxis hemerocallidea* (Star Flower).

Vertebrates

Mammals

Tables 4.10 – 4.13 of the Fauna and Flora Habitat Report, (Appendix G3 of this report) list the possible presence or absence of threatened mammal species, near threatened mammal species and mammal species of which the status is uncertain, respectively, at the site. Because the site falls outside reserves, large threatened species are absent. No smaller mammals of particular high conservation significance are likely to be found on the site as well.

Birds

Table 4.14 and Table 4.15 of the Fauna and Flora Habitat Report, (Appendix G3 of this report) list the possible presence or absence of threatened bird species and near threatened bird species at the site. With bird species which often have a large distributional range, their presence does not imply that they are particularly dependent on a site as breeding location. Therefore the emphasis in the right hand columns of Table 4.12 and Table 4.13 of the Fauna and Flora Habitat Report, (Appendix G3 of this report) are on the particular likely dependence or not of bird species on the site. No distinct habitat or population of any threatened bird species or any bird species of particular conservation importance have been found.

Reptiles

Tables 4.16 – 4.17 I of the Fauna and Flora Habitat Report, (Appendix G3 of this report) list the possible presence or absence of threatened and near threatened reptile species on the site. There appears to be no threat to any reptile species of particular high conservation importance if the site is developed.

Amphibians

Tables 4.18 – 4.21 of the Fauna and Flora Habitat Report, (Appendix G3 of this report) list the possible presence or absence of threatened and near threatened amphibian species at the site. There appears to be no threat to any amphibian species of particular conservation importance if the site is developed.

Invertebrates

Butterflies

Studies about the vegetation and habitat of threatened butterfly species in South Africa showed that ecosystems with a unique combination of features are selected by these often localised threatened butterfly species (Deutschländer and Bredenkamp 1999; Terblanche, Morgenthal & Cilliers 2003; Edge, Cilliers & Terblanche, 2008). Threatened butterfly species in South Africa can then be regarded as bio-indicators of rare ecosystems.

Tables 4.22 – 4.25 of the Fauna and Flora Habitat Report, (Appendix G3 of this report) list the likely presence or absence of threatened and near threatened butterfly species at the site. There appears to be no threat to any butterfly species of particular conservation importance if the site is developed.

Beetles

Tables 4.26 of the Fauna and Flora Habitat Report, (Appendix G3 of this report) lists the likely presence or absence of threatened and near threatened beetle species at the site. There appears to be no threat to any beetle species of particular conservation importance if the site is developed.

Dragonflies and damselflies

Tables 4.27 of the Fauna and Flora Habitat Report, (Appendix G3 of this report) lists the likely presence or absence of threatened and near threatened dragonfly or damselfly species at the site. There appears to be no threat to any dragonfly or damselfly species of particular conservation importance if the site is developed.

Invertebrates in general

The site provides a microhabitat diversity for a number of indigenous invertebrate species to co-exist. No distinct indications of a habitat or of invertebrate species of particular known conservation concern were found at the site.



Figure 11: Indications of ecological sensitivity at the site.

- | | | |
|---|----------------------------------|-------------------------|
| — | Red outline and shading | Boundaries of the site |
| — | Green outline and shading | Medium-high sensitivity |
| — | Orange-brown outline and shading | Medium sensitivity |
| — | Light yellow outline and shading | Low sensitivity |

Grid references and altitudes were taken at site with a GPS Garmin E-trex 20 © instrument.

Map information were analysed and depicted on Google images with the aid of Google Earth Pro (US Dept. of State Geographer, MapLink/Tele Atlas, Google, 2018).



Figure 12: Indications of ecological sensitivity and some ecological indicators at the site.

Red markers: *Gasteria carinata* (Not listed as threatened but regarded as ecological indicator)

Purple markers: A core distribution of the Declining *Boophone disticha* at the site

White markers: Rocks surface above ground

- | | |
|------------------------------------|-------------------------|
| — Red outline and shading | Boundaries of the site |
| — Green outline and shading | Medium-high sensitivity |
| — Orange-brown outline and shading | Medium sensitivity |
| — Light yellow outline and shading | Low sensitivity |



Figure 13: Indications of ecological sensitivity and proposed conservation corridor at the site.

- | | |
|--|---|
| — Red outline and shading
— Green outline and shading
— Orange-brown outline and shading
— Light yellow outline and shading
— Purple outline and shading | Boundaries of the site
Medium-high sensitivity
Medium sensitivity
Low sensitivity
Proposed route of conservation corridor |
|--|---|

Biodiversity targets and management objectives

If the development is approved cultivation of indigenous plant species will be an asset for urban conservation corridors.

Ecosystems and species in particular species that change over relatively fine scales such as often in the Fynbos are likely to become increasingly impacted by climate change. Two widespread plant species which are not Threatened but which are listed as Declining are found at the site: *Boophone disticha* and *Hypoxis hemerocallidea*. Where individuals of these two species are not within a proposed corridor those

individuals should be translocated by qualified specialist to the conservation corridor or a suitable site nearby.

Though threatened plant or animal species are unlikely to be present at the site, for considerations of the succulent plant diversity, ecological support areas and possible shifts in suitable habitat caused by climate change a continuous conservation corridor is imperative at the site if the development is approved. Such a continuous conservation corridor should only at appropriate restricted areas be interrupted by any roads. Such a conservation corridor if accompanied by the eradication of alien invasive *Acacia cyclops* could be beneficial to the quality of life if the development is approved, apart from conserving indigenous plants and associated smaller animals (such as sunbirds) in an increasingly urbanized area.

7.2 SOCIOLOGICAL AND ECONOMIC ISSUES

7.2.1 Social and Economic Characteristics

In 1988 the Aalwyndal area was earmarked for township development by the then Chief Directorate Local Government and the decision was Gazetted on 15 April 1988. In 1995-2004 the Aalwyndal area was established with comments and approvals from all relevant institutions, departments and Mossel Bay Municipal Council. The area was zoned residential although the property sizes were between 5 and 15 hectares. Therefore the current zoning allows owners to construct 2 dwelling units anywhere outside of the 10 m building lines on the properties by only submitting building plans. (In terms of Municipal Laws) Therefore, clearing for construction or gardening of any vegetation on the properties are permitted because of the existing residential zoning. (Mossel Bay Municipality, 2018a). The mentioned primary land use rights were established before 2006 and the area therefore falls within the Urban Area and Urban Edge from as early as 1988.

In 2015 the Western Cape Provincial Government embarked on a Growth Options Study for the Mossel Bay Municipal area. During the period 2000-2010 development areas were defined by developers, structure plans were amended and developments approved on an ad hoc basis, without evaluating the impact of Urban Sprawl on sustainability.

The study concluded that the Urban Sprawl in the Mossel Bay Municipal Area is not sustainable and that the residential densities in Mossel Bay are too low. Therefore Aalwyndal, amongst other areas must be densified to ensure a more sustainable urban environment. It was recommended that the area be earmarked to achieve a residential density of 25 units per ha. The study was public participated and approved by the Mossel Bay Municipal Council as a guide document. (PDG. 2015:12-18).

The Mossel Bay Municipal Spatial Development Framework included the Aalwyndal area into the Urban Edge and earmarked the area as an intensification area to achieve a denser residential urban environment. The Aalwyndal area was specifically identified because it is located next to the N2 Highway for accessibility; next to Voorbaai, one of the core job creation areas; close to existing municipal infrastructure and is next to Langeberg Mall which will serve the new community. It was recommended that a Precinct Plan be developed to optimize the available space to achieve the intensification required to make Mossel Bay more sustainable. The SDF was public participated and approved by the Mossel Bay Municipal Council as guide document. (CNDV Africa. 2017:398-422, 478-488)

The Mossel Bay Municipality commissioned a Precinct Plan for the Aalwyndal Area. A project team was appointed which consisted of Town Planners, Environmental Consultants, Civil Engineers and Traffic Engineers. The SDF and SPLUMA principles were applied to guide the urban form. The precinct plan study area is 629 ha and identified 126 ha (20%) Open Spaces, 44 ha (7%) Road Infrastructure, 109 ha (17%) Commercial and 50 ha (7%) Mixed (Residential or Airport Related) land use areas (see Figure 6). The

Precinct Plan envisaged a high density (at least 20 units per ha – 7000-8000 units) residential development, with amenities and a commercial/Airport node to create job opportunities in the immediate vicinity. The road and open space network will ensure that residents will be able to walk to work and enjoy a quality urban environment. The study proposed the location of main service infrastructure, roads and new bulk infrastructure to be installed. The Precinct Plan envisaged a sustainable urban environment. The study was public participated and approved by the Mossel Bay Municipal Council as a guide document. (De Kock, W.M. 2018:6-9)

The existing Mossel Bay Urban Edge shows future planning for the next 30-40 years, which is an indication that Mossel Bay will not change the Urban Edge for the next 30-40 years unless there is no developable land left to supply the land use demand. The Aalwyndal area was identified as the perfect area to densify the Mossel Bay Municipal Area by applying the SPLUMA principles and confirmed by several studies and investigations. The Mossel Bay Municipality has a financial sustainability model whereby future development must ensure a sustainable Mossel Bay. The provision of subsidised housing by government to people who mainly cannot pay for services has put lots of municipalities in a financial crisis.

The Mossel Bay model is based on an approach whereby BNG housing units must only form a small part of the housing market being developed. The housing market must also facilitate integration out of BNG developments into the larger Mossel Bay urban structure. This will be achieved by developing housing for all income brackets as efficiently as possible to ensure low capital and operational costs while ensuring a high taxable value per hectare for municipal fiscal sustainability. The housing market must also provide opportunities for every market segment. The segments will mainly be provided as follows via future development:

R 100 000 – R 600 000 Kwanonqaba, Tarka, De Almeida
R 300 000 – R 800 000 Louis Fourie Corridor/Infill development
R 600 000 – R 1 500 000 Aalwyndal/Infill development
R 1 000 000 – R 3 500 000 Hartenbos North Area/Existing Older areas

All the areas will have a mix of rental, sectional Title and Full Title ownership with social amenities. No BNG only developments will be developed in future.

7.2 2 Heritage and Cultural

A number of significant known cultural heritage sites (archaeological and/or historical) exist in the larger geographical area within which the study area falls. There are no known sites on the specific land parcel, but Stone Age archaeological material were identified in the study area during the assessment.

Although the assessment's visibility was hampered by the very dense vegetation covering the area, which also made accessing certain sections difficult, existing footpaths in sections of the area could be used, while small open sections with cleared or trampled vegetation also assisted. A fairly large number of Stone Age artifacts (flakes, cores, tools) were in the process identified located throughout the area. These were either as single objects or in denser scatters of objects in these locations. It is envisaged that many more of these locations are situated throughout the study area, but that due to the dense vegetation they are not visible as a result.

In light of the relatively high number of Stone Age artifacts identified in the area, and in relation to the significant Archaeological sites (such as Cape St. Blaize & Pinnacle Point) located in and around Mossel Bay, the finds made during the November 2018 assessment should be viewed as significant from an

Archaeological perspective. Although the site/s and material is situated in an open-air surface context, and not in a stratified cave or shelter context, the material located in the study area could provide valuable information related to the Stone Age archaeology of the area. The following is therefore recommended:

1. That a detailed Phase 2 archaeological assessment be conducted on the study area
2. This work needs to be undertaken by a qualified Stone Age archaeologist and needs to be done in conjunction and in sympathy with the ongoing Mossel Bay Archaeological Project (MAP) mentioned earlier
3. The work will include detailed mapping of the area and the Stone Age material located here, as well as the systematic collection of representative Stone Age material from the development area
4. It is also recommended that once development commences in the area that an Archaeological Watching Brief be implemented to ensure that if any possible stratified archaeological remains are exposed that these could be studied by specialists of the MAP.

Based on the assessment it is recommended that the development be allowed to continue, once the recommended mitigation measures have been implemented.



Stone tools found during the assessment.



A Stone Age core found in the area.



MSA & possible ESA stone tools found.



A broken MSA point.



A range of flakes and tools found during the assessment in one area.



Cores and flake-tools from another area.



A large core found during the assessment

7.2.3 Transport, Traffic and Access

Background traffic volumes were obtained from the 2017 Aalwyndal Precinct Plan and were escalated by 3% per annum, to the year 2024 (5 years from date of this report).

Trip Generation

- The worst-case trip generation scenario is expected to take place during the Weekday AM and PM Peak Hour Periods. It is expected that each portion will generate approximately 53 trip (IN) and 159 trip (OUT) during the AM Peak Hour Period and 159 trips (IN) and 53 trips (OUT) during the PM Peak Hour Period.

Operational Analyses

SIDRA intersection analysis indicates that a Stop Controlled layout, with priority along the Future Street 1 approaches, yields acceptable Levels Of Service, even after the full development trip volumes have been added.

Geometric Constraints

The large number of right turn movement expected during the PM Peak Hour period at the Access into Portion B, necessitates a dedicated Right Turn Lane.

Parking offering is sufficient.

7.2.4 Noise

It is a fact that a certain amount of noise will be generated during the construction phase of the project. Noise levels should however rarely exceed the allowable limits.

Apart from the anticipated noise level increase as a result of the increased traffic volumes, no other nuisance factor impacts are anticipated

7.2.5 Air Quality

"The extent and toxicity of emissions is not necessarily a concise indicator of contributions to ground-level air pollution concentrations or of risks to health and the environment. Such contributions are also a function of the height of emission, temporal variations in the release of pollutants, and the proximity of the source to the people or the environment affected by exposure to the pollutant (such as, for instance, children, or the elderly, or people who are ill, or others who may be particularly sensitive receptors to a specific pollutant above a certain concentration). If an industry is operating close to a school or hospital or centre for the elderly, the potential exposure (in combination with the other contributing factors) is high."

Three factors govern the significance of household fuel-burning emissions:

- (i) the low level of emissions (that is, their height above the ground is generally about 3 m, within people's breathing zone);
- (ii) the simultaneous occurrence of peak emissions (during the coldest months of winter and in the early mornings and throughout the evenings) and poor atmospheric dispersion (stable atmosphere with low wind speeds, with the possible development of temperature inversions); and
- (iii) the release of such emissions within high human exposure areas, given that such emissions generally occur in dense, low-income settlements where population density is high (in addition, the pollution is not only outdoors, but frequently indoors as well, due to poor ventilation, so it affects the whole family).

The significance of vehicle emissions as contributors to air-pollutant concentrations and health risks is similarly increased by the low level (close to the ground) of the emissions, and their proximity to highly populated areas – on highways, for example, with emissions being particularly high when traffic is congested. Vehicle emissions tend to peak early in the morning and in the evenings, when the potential for atmospheric dispersion is reduced (for example, wind speeds are generally low in the early mornings and evenings, reducing their potential for dispersing pollution).

Given the high volumes of pollutants emitted from fuel-burning within the industrial and power-generation sectors, their contribution to ambient concentrations and public health risks is often lower than might be expected. This is because these sources are generally characterized by constant releases, relatively high above ground level, and further away from residential settlements than are household fuel-burning and vehicle emissions.

Ranking the significance of different sources of pollution on the basis of the total emissions for which each source is responsible would, for example, place industrial emissions above household fuel-

burning. If the aim is to reduce impacts on human health, however, then household fuel-burning would need to be targeted as a top priority (Scorgie et al., 2004d).

Historically, air pollution control in South Africa has primarily emphasized the implementation of ‘command and control’ measures in the industrial sector. The shift from source-based control, to the management of the air that people breathe, emphasizes the importance of targeting a wider range of sources and using more flexible and varied approaches. It means paying greater attention to ambient air quality, as it is more important (and more cost-effective, in many cases) to make sure that the ambient air complies with air quality standards. This approach ensures that human and environmental health is protected and that the cumulative impact of pollution from a number of sources is addressed.

Approaches adopted or considered for future implementation have included: regulation (for example, the use of Atmospheric Emission Licences for Listed Activities); market instruments (such as atmospheric user-charges and pollution taxes); the potential for voluntary agreements, education and awareness raising; and emissions trading. International experience shows that adopting a mix of instruments and interventions is more effective than using a single instrument to improve air quality across various types of source. Although direct regulation remains important in controlling industrial sources, there is evidence that specifying emission limits is more effective than specifying the use of particular technologies, so as to give companies flexibility in selecting the method of achieving success that suits them best. This approach is advocated as being more cost-effective and more likely to stimulate technological advances in pollution control methods and production processes.

For large point sources (that is, sources of pollution that are concentrated on one site, but that have large, constant volumes of many types of pollution) that are few in number, instruments such as emissions trading have been advocated as an effective way to manage pollutant emissions and reduce the costs of compliance.

Implementing an efficient social protection system to alleviate poverty is central to maintaining conditions that facilitate not only economic growth but also environmental sustainability. Many South African households – including those with access to electricity – use coal, wood, and paraffin, due to the relative cost-effectiveness of such fuels for heating (that is, space heating) and cooking purposes.

Many low-cost housing developments and informal settlements are located close to industrial and mining operations, as such land is both available and inexpensive. Poorer communities are more likely to suffer from poor service delivery, including inadequate waste removal that sometimes results in refuse being set alight illegally. These examples show that poverty alleviation could help to improve air quality by enabling people to choose practices that are friendlier to the environment.”

https://www.environment.gov.za/sites/default/files/docs/stateofair_airqualityand_sustainable_development.pdf Date visited: 17/03/2020.

The proposed development is planned and will eventually be developed with the above mentioned in mind. The alleviation of poverty (Jobs that will be created) and the provision of proper accommodation facilities (Which has been designed to be as energy efficient as possible) will contribute towards lessening air pollution in the area.

In addition to the above, it should be noted that the project will however create a certain amount of dust during the construction phase. If proper dust suppression measures are implemented this variable will have very little impact (low in intensity and significance during the construction phase).

7.2.5 Visual Impact

Development proposals are likely to change the environment within which it will be situated, be it natural or man-made, as well as people's perceptions of that changed environment. The visual, scenic and cultural components of the environment are valuable resources and development proposals have the potential to cause significant impacts.

Visual Impact Assessment aims to accurately determine, with information available at the time, to illustrate the expected visual impact associated with the proposed development; and to formulate measures to mitigate any detrimental impacts of the proposal to the extent that the development will be meet acceptable visual criteria. As all development proposals have the potential to change the visual character of the environment within which they are located, and to affect people's perception of such places, significant visual impacts may be expected. Therefore, Visual Impact Assessment can serve as a proactive tool to inform planning and design processes.

Thus this VIA will consider :

- The areas surrounding the older existing urban edge which is not well developed
- The impact of the proposed development on the side-slope of the hill
- The impact of the lighting on the landscape at night
- Architectural Guidelines

GENERAL MITIGATION MEASURES

Mitigation measures will assist in mitigating the visual impact, namely:

- The physical reforming of the landscape for development, such terracing and cut- to fill for roads and buildings, must be designed in such a way to minimise the visual impact, to this end a **Landscape Architect must be employed at the earliest stages** to work with the Engineers developing this plan.
- Extensive landscaping along internal and external streets and between buildings with an emphasis on the treatment of the sidewalks to help with the Visual Absorption Capacity by careful and selective use of indigenous landscaping to softening the visual impact of the new development. Establish extensive landscaping including large indigenous trees that will screen the development and will increase the Visual Absorption Capacity and partly help conceal the development on the exposed areas on the site
- Mitigation should be implemented during the operational phase: landscape, cut/fill, slopes, terraces, retaining walls and use natural finishes and/or colours on retaining walls
- Retaining as much of the existing, indigenous natural landscape as possible to be encouraged.
- External lighting restrictions and guidelines by lighting engineer/ expert. Refer to Lighting mitigation
- No solid boundary walls but the use of a translucent boundary e.g. 'Clearview Fencing'
- A solid boundary walls may only be used between the existing residential built on the most southern boundary.
- Urban Heat Island: The absorbance value of flat hard surfaces of roads and parking areas should be considered. The use of materials with a solar reflectance value of less than 0.6 is encouraged
- Provision must be made for rainwater harvesting and should be linked to landscape irrigation systems or other water consumption areas

Conclusion

Any new buildings and/or developments will have an impact on its environment in many ways, but especially on the existing visual and scenic environment. These mitigating measures aims to find a

balance to integrate the new development in its environment and further enhance the existing landscape to a acceptable visual level

These mitigation measures will need to be implemented and monitored throughout the planning, design development, construction, maintenance and operation of development if the mitigation of the visual impact of this development is to be significantly and successfully achieved.

7.2.7 Climate Change

According to: WIREs Climate Change 2014, 5605-620. Doi:10.1002/wcc.295: "Climate change is a key concern within South Africa. Mean annual temperatures have increased by at least 1.5 times the observed global average of 0.65°C over the past five decades and extreme rainfall events have increased in frequency. These changes are likely to continue. Climate change poses a significant threat to South Africa's water resources, food security, health, infrastructure, as well as its ecosystem services and biodiversity. Considering South Africa's high levels of poverty and inequality, these impacts pose critical challenges for national development. In relation to water, impact studies for the water resources sector have begun to look beyond changes in streamflow to changes in the timing of flows and the partitioning of streamflow into base flows and stormflows, reservoir yields, and extreme hydrological events. Spatially the eastern seaboard and central interior of the country are likely to experience increases in water runoff. Higher frequencies of flooding and drought events are projected for the future. Complexities of the hydrological cycle, influences of land use and management and the linkages to society, health, and the economy indicate far higher levels of complexity in the water resources sector than in other sectors. What has emerged is that land uses that currently have significant impacts on catchment water resources will place proportionally greater demands on the catchment's water resources if the climate were to become drier. The influence of climate change on water quality is an emerging research field in South Africa, with assessments limited to water temperature and non-point source nitrogen and phosphorus movement. A critical interaction that has not been explored is between changes in water quality and quantity and the combined impacts, such changes might have impact on various types of water use, e.g., irrigation, domestic consumption, or aquatic ecosystems support".

In Mossel Bay, sprawling coastal and housing estate development has increased significantly in recent years. Urban areas consume the majority of energy production worldwide and account for the largest share of global CO₂ emissions (Satterthwaite et al. 2007, OECD 2010). Greenhouse gas (GHG) emissions in cities and towns are increasingly driven by transport and energy services, rather than industrial processes.

Coordinated compact growth development and efficient human settlement in urban areas forms an important part of climate change mitigation and adaptation strategies and in Mossel Bay has started to form part of local spatial development plans and future growth policies. This includes outlining the implications of climate change in terms of disaster management and improved infrastructure provision. The potential influx of people into Mossel Bay as it becomes a more popular destination results in a need for controlled and careful planning listed as a measure to adapt to a growing urban population. Set-back lines along the coast and in estuaries already form part of the national legislation as an adaptation to possible sea level rise, coastal erosion and increased storm events (PDG. 2015).

The Aalwyndal area was identified in the Mossel Bay Spatial Development framework as a compact growth node to ensure an efficient human settlement and urban form which will result in less Urban Sprawl over time. The Aim of the Aalwyndal development is to break the historical sprawling pattern.

7.2.8 Impact on Civil Aviation Installations

The Aalwyndal Mosselbay Development has been rated as a “High” sensitivity site for the civil aviation theme. This is mainly due to its close proximity to the Mossel Bay Aerodrome (FAMO) at location Ref. Point: S340925 E0220341. In accordance with the Government Gazette No. 43110 a specialist assessment was performed in order to ensure the level of impact on civil aviation installations. After an assessment performed by a radio frequency and radar specialist the site was rated as a “Low” sensitivity site for the civil aviation theme. Therefore according to the Government Gazette No. 43110 no further assessment requirements are identified.

Initial Screening tool result: “High” Sensitivity site related to the impact on civil aviation installations.

Assessed result: “Low” Sensitivity site related to the impact on civil aviation installations.

After the assessment the Aalwyndal Mosselbay Development has been rated as a “Low” sensitivity site for the civil aviation theme because of the following main reasons.

1. The development site is located beyond line of sight of the Mossel Bay Aerodrome (FAMO). The Mossel Bay Aerodrome (FAMO) is located on a plateau that is more than 70meter higher than the highest point on the development site. Therefore the site cannot cause any visual interference as well as any radio signal reflections.
2. The site also will cause zero radar interference. Radar is a detection system that uses radio waves to determine the range, angle, or velocity of objects. A radar system consists of a transmitter producing electromagnetic radio waves. These electromagnetic radio waves reflect off the object and return to the receiver, giving information about the object's location and speed. Because the Aalwyndal Mosselbay Development is beyond line of sight the radar will never get any reflections back from this site and can thus not cause any interference.
3. The site will also not interfere with any ground to air communication, any airport radio direction finding equipment as well as any radio transmitting beacons.

8. ENVIRONMENTAL MANAGEMENT OBJECTIVES AND TARGETS

The following table is a summary of the impact management objectives, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process.

ENVIRONMENTAL ASPECTS	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS
DOCUMENTATION AND TRAINING		
The necessary documentation must be available in the site office	Ensure that all concerned is aware of the EMPr and related environmental aspects	Availability of documents Trained and informed workforce.
SITE ACCESS & TRAFFIC MANAGEMENT		
Access roads may increase the construction footprints	Construction vehicles, machinery and workers must be restricted to the designated access roads, and may not drive through undeveloped vegetation outside of the existing access route except where that vegetation falls within the authorised working area (development footprint) at the site.	Minimizing eradication of vegetation.
VEGETATION CLEARING		

ENVIRONMENTAL ASPECTS	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS
Vegetation will be cleared from within the footprint of the working area, before earthmoving and construction activities commence.	Vegetation clearing may only commence once the working area has been clearly demarcated to the ECO's satisfaction.	Land clearing must be restricted to the demarcated working area, and no vegetation may be cleared outside of the demarcated working area.
TOPSOIL & SUBSOIL MANAGEMENT		
Topsoil (where present) will be removed from any area where physical disturbance of the surface will occur.	Removed topsoil and subsoil should be stockpiled for the duration of the active construction period, and utilized for the final landscaping and rehabilitation of disturbed areas on site	The topsoil must be adequately protected from being blown away or eroded by storm water. Removed subsoil should be stockpiled separately from topsoil. Topsoil should be the final layer applied during rehabilitation, after subsoil/ spoil material has been placed and shaped on the site
EXCAVATIONS & EARTHWORKS		
It will be necessary to employ heavy machinery (excavators, back-actors, bulldozers, dump trucks etc.) for the earthmoving required	Use of heavy machinery can substantially increase the likelihood, intensity and significance of potential negative environmental impacts, and it is thus essential that earthworks be performed under constant supervision, and that operators must be made aware of all the environmental obligations, as there is always the potential to inflict damage to sensitive areas.	Use of machinery should be restricted to only that which is strictly required, and the unnecessary or excessive movement/ use of such machinery must be kept to a minimum. Machinery must enter and exit the site via the indicated access roads, and may not enter/ exit the open space area at any other location. Excavations and earth-moving may only take place within the demarcated working area
DANGEROUS AND TOXIC MATERIALS (CHEMICALS)		
Safe storage of chemicals See also below for further aspects on this subject	Clean environment	No spills of chemicals
Availability of safety kits to prevent oils/toxic materials spreading in the environment	Safe storage of materials	Proper storage provided
Proper storage must be provided for chemicals , paint and construction materials needed		
STORAGE OF OIL AND FUEL		
Safe handling of fuel and oil and prevention of spills.	Clean environment	No spills of oil or fuel No leakages of oil
USE OF OIL AND CHEMICALS		
Drip trays must be provided for vehicles in storage yard	No spills of oil	No oil spills from vehicles
Wash bay and oil trap to be provided	Cleaning area for vehicles	No oil or fuel into environment due to cleaning of vehicles or equipment
STORAGE OF CEMENT		
Safe handling of cement	Clean environment	No spills of cement
STORAGE OF EQUIPMENT AND MATERIALS		

ENVIRONMENTAL ASPECTS	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS
Safe and proper storage of equipment and material	Safe and proper storage of equipment and material	Neat, clean and ordered storage of material
CONCRETE The contractors must provide information on proposed handling of concrete.	Minimise the possibility of concrete residue entering into the surrounding environment	No evidence of contaminated soil on the construction site
TOILETS AND ABLUTION FACILITIES Clean sanitary environment	Clean and sanitary environment	Toilets for workers in accordance with the instructions in the EMP
WASTE MANAGEMENT A clean and waste free environment	Clean environment with waste handled in accordance with the EMP	No waste in the environment
WORKSHOP EQUIPMENT, MAINTENANCE AND STORAGE OF MATERIAL Clean and safe work area	Clean and safe work area	Safe and clean work and storage area
FIREs No burning of waste and or fires originating from the construction area	No burning of waste and or fires originating from the construction area	No fire incidents
OTHER ENVIRONMENTAL ASPECTS		
Stockpiles All stockpiled material must be easily accessible without any environmental damage to adjacent grasslands/farmlands. All temporarily stockpiled material must be stockpiled in such a way that the spread of materials are minimised. The stockpiles may only be placed within the demarcated areas - the location of which must be approved by the ER or ECO. Stockpiled material at batching plant must be contained to prevent the spread of gravel in the area.	Properly constructed and well maintained stockpiles	No erosion or spread of material from stockpiles Gravel stockpiles must be properly managed
Erosion, sedimentation and storm water No erosion and or sedimentation	• Minimise scarring of the soil surface and land features • Minimise disturbance and loss of soil • Minimise construction footprint	No erosion or sedimentation.
Vegetation The contractor must avoid vegetated areas that will not be cleared.	Minimise impacts on vegetation	Limit impact on vegetation
Waste management Any illegal dumping of waste must not be tolerated. This aspect must be closely monitored and reported on; proof of legal dumping must be able to be produced on request. Bins must be clearly marked for ease of management. Sufficient closed containers must be strategically located around the construction site to handle the amount of litter, wastes, rubbish, debris, and builder's wastes generated on the site.	• Sustainable management of waste; to keep the site neat and tidy. This will control potential influx of vermin and flies thereby minimising the potential of diseases on site and the surrounding environment. It will also minimise the potential to pollute soils, water resources and natural habitats	• Disposal of rubble and refuse in an appropriate manner with no rubble and refuse lying on site • Sufficient containers available on site

ENVIRONMENTAL ASPECTS	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS
Dust Dust production must be controlled by regular watering of roads and works area, should the need arise.	Reduce dust fall out	No visible signs of dust
SAFETY	Children's access to construction site controlled, Access to construction camp controlled Safety aspects considered	No children on construction site Safety fence and controlled access available Safety signs with necessary information displayed

9. ENVIRONMENTAL IMPACT MANAGEMENT OUTCOMES

9.1 Assessment Criteria

Impacts were rated and are discussed in detail – see BAR for detailed impact assessment.

9.2 Environmental Impact Management Outcomes

9.2.1 The following Environmental Impact Management Outcomes has been identified for the “Non-Operational” (pre-construction and construction phase) phase of the proposed development:

1. A full copy of the signed EA in terms of NEMA, granting approval for the development must be available on site
2. A copy of the EMPr as well as any amendments thereof must be available on site
3. A suitably qualified ECO must be appointed.
4. Impacts on the environment must be minimised during site establishment and the development footprint must be kept to the approved development area.
5. Vegetation clearing may not commence until such time as the development footprint has been clearly defined.
6. No clearance of vegetation outside of the development footprint may occur.
7. At the end of the construction phase the site and its surrounding area must be free from any pollution that originated as a result of the construction activities.
8. No disturbance of topsoil & subsoil may commence until such time as the development footprint has been clearly defined.
9. No disturbance of topsoil & subsoil outside of the development footprint may occur.
10. At the end of the construction phase the site and its surrounding area must be free from any chemical, fuel, oil and cement spills that originated as a result of the construction activities.
11. At the end of the construction phase the site and its surrounding area must be free from any sewage that originated as a result of the construction activities.
12. At the end of the construction phase the site and its surrounding area must be free from any hazardous or general waste pollution that originated as a result of the construction activities.
13. Dust prevention measures must be applied to minimise the generation of dust.
14. Noise prevention measures must be applied to minimise the generation of unnecessary noise pollution as a result of construction activities on site.
15. Absolutely no burning of waste is permitted.
16. Fires will only be allowed in facilities especially constructed for this purpose.
17. No hunting of animals will be allowed.
18. No intentional destruction of any sites, features or material of cultural heritage (archaeological and/or historical) origin or significance may occur.
19. All Contractors and sub-contractors must abide to the rules and regulations of the Occupational Health and Safety Act, 85 of 1993.

9.2.2 The following Environmental Impact Management Outcomes has been identified for the “Operational” phase of the proposed development:

1. A full copy of the signed EA in terms of NEMA, granting approval for the development must be available on site
2. A copy of the EMPr as well as any amendments thereof must be available on site
3. Records of Environmental Monitoring must be available on site.
4. The site and its surrounding area must be kept free from any pollution that originated as a result of the operational activities.
5. The site and its surrounding area must be free from any chemical, fuel, and oil spills that originated as a result of the operational activities.
6. The site and its surrounding area must be free from any hazardous or general waste pollution that originated as a result of the operational activities.
7. The operator of the site must abide to the rules and regulations of the Occupational Health and Safety Act, 85 of 1993.

10. MITIGATION MEASURES

10.1 Mitigation Measures for the Non-Operational Activities

NON-OPERATIONAL ENVIRONMENTAL MANAGEMENT PROGRAMME					
ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
ENVIRONMENTAL DOCUMENTATION REPORTING AND COMPLIANCE	A full copy of the signed EA in terms of NEMA, granting approval for the development must be available on site	Obtain the Environmental Authorization and plan to have a copy of the signed EA on site.	Ensure that a signed copy of the EA is available in the site office	No action required	The Applicant, assisted by the EAP to be monitored by the ECO
	A copy of the EMPr as well as any amendments thereof must be available on site	Ensure that a site specific EMPr is compiled and approved and plan to have a copy of the approved document on site	Ensure that a copy of the approved EMPr is available in the site office	No action required	The Applicant, assisted by the EAP to be monitored by the ECO
	A suitably qualified ECO must be appointed.	Prior to the start of construction activities, an ECO must be appointed to ensure that an Environmental Control document is compiled. This	Ensure that the ECO document is available on site and that everyone on site is informed and trained regarding their Environmental obligations in terms of the EA and EMPr. Records of training sessions must be kept on site.	No action required	The Applicant and the ECO

NON-OPERATIONAL ENVIRONMENTAL MANAGEMENT PROGRAMME					
ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
		document must explain the roles and responsibilities of everyone involved and must also contain an Environmental awareness training manual.			
			ECO's report must be an item on monthly site meeting agenda	No action required	The project manager.
		The ECO must ensure that the contractor provides method statements for the various environmental aspects.	The method statements must be available in the site office	No action required	The Applicant and the contractor must ensure that the method statements are developed and approved by the ECO
SITE ESTABLISHMENT	Impacts on the environment must be minimised during site establishment and the development footprint	A Land surveyor must peg the parameters of the development footprint.	Construction vehicles, machinery and workers must be restricted to only operate within the approved development footprint. The development footprint must be clearly demarcated and the extent of this area must be	No action required	The developer must ensure that a Land surveyor pegs the parameters of the

NON-OPERATIONAL ENVIRONMENTAL MANAGEMENT PROGRAMME					
ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
	must be kept to the approved development area.		<p>communicated to all contractors and sub-contractors.</p> <p>Existing access roads must be utilised to access the site camp(s) and working/construction areas</p> <p>Appropriate traffic management strategies must be implemented to ensure the safety of construction vehicles and other road-users. If needed, signage to warn other road users of the presence of construction vehicles should be erected at appropriate locations, where the signage will be clearly visible to potentially affected road users.</p>		development footprint and that all concerned are trained in this regard. The ECO will monitor compliance.
VEGETATION CLEARING <u>Nature of impact</u> Loss of Vegetation Communities Loss of Biodiversity Habitat Fragmentation	Vegetation clearing may not commence until such time as the development footprint has been clearly defined.	A Land surveyor must peg the parameters of the development footprint.	Clearly define the construction area before construction activities commence. No clearance of vegetation will be allowed outside of this demarcated area.	The open space network must be maintained as planned.	The developer must ensure that a Land surveyor pegs the parameters of the development footprint and that all concerned are trained in this regard. The ECO will monitor compliance.

NON-OPERATIONAL ENVIRONMENTAL MANAGEMENT PROGRAMME					
ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
Invasion of Invasive Alien Plant Species	No clearance of vegetation outside of the development footprint may occur.		<p>Demarcate the open space area as a no-go zone during the construction phase of the development.</p> <p>Two widespread plant species which are not Threatened but which are listed as Declining are found at the site: <i>Boophone disticha</i> and <i>Hypoxis hemerocallidea</i>. Where individuals of these two species are not within a proposed corridor those individuals should be translocated by qualified specialist to the conservation corridor or a suitable site nearby.</p> <p>Parts of the site, mainly owing to the threatened ecosystem listed above represent an Ecological Support Area. Ecological Support Areas ensure the long-term ecological functioning of the landscape as a whole. From an environmental management perspective these Ecological Support Areas must retain ecological processes, which often requires at least semi-natural ecological conditions (SANBI, 2017). This means if developments are approved the site should retain ecological functioning. In the case of this site a corridor is proposed if the development is approved.</p>	Eradication of alien invasive species must be a continuous process.	The Developer must plan for and implement a plan to ensure that eradication of alien invasive species continuous.

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		Pre-construction phase	Construction phase	Operational phase	
			<p>Of concern is the obvious high frequency of the alien invasive declared weed <i>Acacia cyclops</i> (Redeye) at most parts of the site. Eradication of alien invasive <i>Acacia cyclops</i> at the site is key also when possible dispersal to more sensitive ecosystems in the larger area is considered.</p> <p>With the Open Space network that is proposed, most of the sensitive areas will remain intact and will be preserved.</p> <p>Start with the rehabilitation of vegetation to minimize the negative effects of the removal of plants.</p> <p>The rule must be to minimize the disturbance of animal life by keeping the footprint as small as possible.</p> <p>Land clearing must be restricted to the demarcated working area, and no vegetation may be cleared outside of the demarcated working area.</p>		
GEOLOGY, SOIL AND TOPOGRAPHY	Infrastructure must be able to withstand forces of nature.	Plan to conduct a Geo-technical investigation, Phase 1 (for the preliminary planning phase) and	The soils covering the site may undergo a degree of consolidation and heave (i.e.: loss and gain of volume) under loading or when saturated, requiring that structures be adequately strengthened to prevent structural	No action required	The Developer must plan to appoint a suitably qualified Geo-Technical

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		Pre-construction phase	Construction phase	Operational phase	
		a Phase 2 for detailed designs)	damage due to differential movement beneath foundations. Due to its variable nature, it is recommended that the highly expansive organic rich topsoil across the site be removed beyond the perimeter of the proposed developments. The decomposition of the organic material within the soil may induce structural damage due to differential movement beneath foundations. Due to its variable nature, it is recommended that all the heaps of fill material in the north of the site be removed beyond the perimeter of the proposed development. In areas hosting shallow bedrock; it is recommended that foundations do not span from rock to natural soils or engineered fills, so as to limit differential settlement. It is recommended that all earthworks be carried out in accordance with SABS 1200 (current version). The fill should be placed in layers not exceeding 200 mm loose thickness and compacted to a minimum of 90% Modified AASHTO maximum dry density.		Engineer that will have to design the foundations according to the findings of his investigations. The Civil Engineer will have to ensure that the Contractor abides to these designs.

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ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			Cut and fill slopes should be top soiled and planted with grass. This will limit erosion of these slopes and the problems associated with wash-away of fill embankments		
STORM AND WASTE WATER MANAGEMENT	At the end of the construction phase the site and its surrounding area) must be free from any pollution that originated as a result of the construction activities.	The developer must compile a storm water management plan.	Runoff from the cement/ concrete batching areas must be strictly controlled, and contaminated water must be collected, stored and either treated or disposed of off-site, at a location approved by the project manager All spillage of oil onto concrete surfaces must be controlled by the use of an approved absorbent material and the used absorbent material disposed of at an appropriate waste disposal facility. No wastewater may run freely into any naturally vegetated areas. Run-off containing high sediment loads must not be released into drainage channels Approval must be obtained from DW&S for any activities that require authorisation in terms of Section 39 of the National Water Act, 1998 (Act No. 36 of 1998. Surface water or storm water must not be allowed to concentrate, or to flow down cut or	No action required	The developer must ensure that a storm water management plan is developed. The ECO must monitor compliance.

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		Pre-construction phase	Construction phase	Operational phase	
			<p>fill sloped routes without erosion protection measures being in place</p> <p>Storm water from the site must drain into a sealed oil sump in order to intercept possibly contaminated surface run-off from the apron and parking areas.</p> <p>All surface areas where the handling of fuel will take place (apron area) must be sealed by means of concrete slabs underlain by bitumen at the intersections of the concrete slabs, to prevent the infiltration of liquids into the underlying soil. The soil material underlying this layer must be adequately compacted to prevent ingress of liquids through zones of weakness (i.e.: along joints) within the surface seal.</p> <p>The buried fuel tanks should be installed according to the SANS 10089-3:2010 standards with a minimum of four fuel leak observation wells around the tanks. This is recommended to detect any leakage or ingress of liquid pollutants in the area surrounding the tanks. The observation boreholes adjacent to the tanks must be constructed to allow easy accessibility for monitoring purposes.</p>		

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		Pre-construction phase	Construction phase	Operational phase	
			<p>Ensure that storm water channels do not discharge straight down contours. These must be aligned at such an angle to the contours that they have the least possible gradient</p> <p>To reduce the loss of material by erosion, the contractor must ensure that disturbance on site is kept to a minimum. The contractor is responsible for rehabilitating all eroded areas in such a way that the erosion potential is minimised after construction has been completed.</p>		
TOPSOIL & SUBSOIL	No disturbance of topsoil & subsoil may commence until such time as the development footprint has been clearly defined.	A Land surveyor must peg the parameters of the development footprint.	<p>Land clearing must be restricted to the demarcated working area, and no disturbance of topsoil & subsoil outside of the demarcated working area will be allowed.</p> <p>Removed topsoil and subsoil should be stockpiled for the duration of the active construction period, and utilized for the final landscaping and rehabilitation of disturbed areas.</p> <p>The topsoil must be adequately protected from being blown away or eroded by storm water. The topsoil storage area must be located on a level area outside of any surface drainage/</p>	No action required	<p>The developer must ensure that a Land surveyor pegs the parameters of the development footprint and that all concerned are trained in this regard.</p> <p>The Contractor will be responsible for</p>

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		Pre-construction phase	Construction phase	Operational phase	
	No disturbance of topsoil & subsoil outside of the development footprint may occur.		storm-water channels, and at a location where it can be protected from disturbance during construction and where it will not interfere with construction activities.		the removal and correct stockpiling of the topsoil and subsoil. The ECO will monitor compliance.
			Removed subsoil should be stockpiled separately from topsoil. Handling of topsoil should be minimized as much as possible, and the location of the topsoil berm should be chosen carefully to avoid needing to relocate the topsoil berm at a later date. Ideally, topsoil is to be handled twice only, once to strip and stockpile, and once to replace, level, shape and scarify. The topsoil berm may be a few meters wide but should ideally not be more than 0.5m high to allow sufficient light and air penetration.		
			Topsoil should be the final layer applied during rehabilitation, after subsoil/ spoil material has been placed and shaped.		
		CHEMICALS			

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ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
DANGEROUS AND TOXIC MATERIALS	At the end of the construction phase the site and its surrounding area must be free from any chemical, fuel, oil and cement spills that originated as a result of the construction activities.	The Contractor must provide method statements for the storage and handling of chemicals on site.	All hazardous substances must be stored in suitable containers as defined in the Method Statement; Containers must be clearly marked to indicate contents, quantities and safety requirements All storage areas must be bunded. The bunded area must be of sufficient capacity to contain a spill / leak from the stored containers Bunded areas to be suitably lined with a SABS approved liner An Alphabetical Hazardous Chemical Substance (HCS) control sheet must be drawn up and kept up to date on a continuous basis All hazardous chemicals that will be used on site must have Material Safety Data Sheets (MSDS); All employees working with HCS must be trained in the safe use of the substance and according to the safety data sheet Employees handling hazardous substances / materials must be aware of the potential impacts and follow appropriate safety measures. Appropriate personal protective equipment must be made available	No Action required	The Contractor will be responsible for providing method statements. He will also be responsible for training of staff in this regard. The ECO will monitor compliance.
		FUEL AND OIL			

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		Pre-construction phase	Construction phase	Operational phase	
		The Contractor must provide method statements for the storage and handling of fuel and oil on site.	<p>The Contractor must ensure that diesel and other liquid fuel, oil and hydraulic fluid is stored in appropriate storage tanks or in bowsers</p> <p>Fuel storage tanks must be located in a portion of the construction camp where they do not pose a high risk in terms of water pollution (i.e. they must be located away from storm water structures)</p> <p>The tanks/ bowsers must be situated on a smooth impermeable surface (concrete) with a permanent bund. The impermeable lining must extend to the crest of the bund and the volume inside the bund must be 110% of the total capacity of all the storage tanks/ bowsers</p> <p>The floor of the bund must be sloped, draining to an oil separator</p> <p>Provision must be made for refuelling at the storage area by protecting the soil with an impermeable groundcover. Where dispensing equipment is used, a drip tray must be used to ensure small spills are contained</p> <p>All empty externally dirty drums must be stored on a drip tray or within a bunded area</p> <p>Spill kits must be available on site and in all vehicles that transport hydrocarbons for</p>	No Action required	<p>The Contractor will be responsible for providing method statements. He will also be responsible for training of staff in this regard.</p> <p>The ECO will monitor compliance.</p>

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ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			<p>dispensing to other vehicles on the construction site. Spill kits must be made up of material/product that is in line with environmental best practice (SUNSORB is a recommended product that is environmentally friendly)</p> <p>Where refuelling away from the dedicated refuelling station is required, a mobile refuelling unit must be used. Appropriate ground protection such as drip trays must be used</p> <p>The responsible operator must have the required training to make use of the spill kit in emergency situations</p> <p>In the event of a spill, contaminated soil must be collected in containers and stored in a central location and disposed of according to the National Environmental Management: Waste Act 59 of 2008.</p> <p>During servicing of vehicles or equipment, a suitable drip tray must be used to prevent spills onto the soil.</p> <p>Leaking equipment must be repaired immediately or be removed from site to facilitate repair</p>		

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		Pre-construction phase	Construction phase	Operational phase		
			Construction area must be monitored for oil and fuel spills			
			Drip trays (minimum of 10cm deep) must be placed under all vehicles that stand for more than 24 hours. Vehicles suspected of leaking must not be left unattended, drip trays must be utilised. The surface area of the drip trays will be dependent on the vehicle and must be large enough to catch any hydrocarbons that may leak from the vehicle while standing.			
		CONCRETE AND CEMENT				
		The contractors must provide and maintain a method statement for "cement and concrete batching". The method statement must provide information on proposed storage, washing & disposal of cement, packaging, tools and plants	The mixing of concrete must only be done at specifically selected sites on mortar boards or similar structures to contain run-off into soils rocky outcrops, streams and natural vegetation	No Action required	The Contractor will be responsible for providing method statements. He will also be responsible for training of staff in this regard. The ECO will monitor compliance.	
			Cleaning of cement mixing and handling equipment must be done using proper cleaning trays			
			All empty containers must be stored in a dedicated area and later removed from the site for appropriate disposal at a licensed facility			
			Any spillage that may occur must be investigated and immediate remedial action must be taken			

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		Pre-construction phase	Construction phase	Operational phase	
			The visible remains either of concrete, solid, or from washings, must be physically removed immediately or disposed of as waste to a registered landfill site Cement batching areas must be located in an area where residues are contained and that the location does not fall within storm water channels		
TOILETS AND ABLUTION FACILITIES	At the end of the construction phase the site and its surrounding area must be free from any sewage that originated as a result of the construction activities.	The contractor must provide method statement for the operation and maintenance of toilets and ablution facilities.	The contractor is responsible for providing all sanitary arrangements for his and the sub-contractors team. A minimum of one chemical toilet must be provided per 30 persons and should include male and female toilets. Sanitary arrangements must be to the satisfaction of the ECO. The contractor must keep the toilets in a clean, neat and hygienic condition. The contractor must supply toilet paper to all toilets at all times. Toilet paper dispensers must be provided in all toilets The contractor must be responsible for the cleaning, maintenance and servicing of the toilets. The contractor must ensure that no spillage occurs when the toilets are cleaned or emptied.	No Action required	The Contractor will be responsible for providing method statements. He will also be responsible for training of staff in this regard. The ECO will monitor compliance.

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ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			<p>The use of ablution facilities and or mobile toilets must be used at all times and no indiscriminate use of the veld for the purposes of ablutions must be permitted under any circumstances</p> <p>Toilets out on site must be secured to the ground and have a sufficient locking mechanism operational at all times</p>		
WASTE MANAGEMENT	At the end of the construction phase the site and its surrounding area must be free from any hazardous or general waste pollution that originated as a result of the construction activities.	The contractors must provide and maintain a method statement for "solid waste management". The method statement must provide information on the proposed licensed facility to be utilised and details must be kept of record keeping for auditing purposes	<p>Waste must be separated into recyclable and non-recyclable waste, and must be separated as follows:</p> <ul style="list-style-type: none"> • Hazardous waste: including (but not limited to) old oil, paint, etc. • General waste: including (but not limited to) paper, plastic, glass and construction rubble <p>Any illegal dumping of waste must not be tolerated, this action will result in a fine and if required further legal action will be taken. This aspect must be closely monitored and reported on; proof of legal dumping must be able to be produced on request.</p> <p>Bins must be clearly marked for ease of management</p>	No Action required	<p>The Contractor will be responsible for providing method statements. He will also be responsible for training of staff in this regard.</p> <p>The ECO will monitor compliance.</p>

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ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			<p>All refuse bins must have a lid secured so that animals cannot gain access</p> <p>Sufficient closed containers must be strategically located around the construction site to handle the amount of litter, wastes, rubbish, debris, and builder's waste generated on the site</p> <p>Subcontractor(s) contracts must contain a clause to the effect that the disposal of all construction-generated refuse / waste to an officially approved dumping site is the responsibility of the subcontractor in question and that the subcontractors are bound to the management activities stipulated in this EMP. Proof of this undertaking must be issued to the ECO</p> <p>All solid and chemical wastes that are generated must be removed and disposed of at a licensed waste disposal site. The contractor is to provide proof of such to the ECO</p> <p>Chemical containers and packaging brought onto the site must be removed for disposal at a suitable site</p> <p>A suitably positioned and clearly demarcated waste collection site must be identified and</p>		

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		Pre-construction phase	Construction phase	Operational phase	
			provided The waste collection site must be maintained in a clean and orderly manner. A covered container (Like a skip, with a cover), must be used to contain refuse from campsite bins, rubble and other construction material		
DUST	Dust prevention measures must be applied to minimise the generation of dust.	The contractors must provide and maintain a method statement for "dust control". The method statement must provide information on the proposed source of water to be utilised.	<p>All forms of dust pollution must be managed in terms of the National Environmental Management: Air quality Act, 2004 (Act No 39 of 2004)).</p> <p>Acceptable dust fall rates for residential areas are:</p> <p>Dust fall rate (D) (mg/m²/day, 30 days average): D<600</p> <p>Permitted frequency of exceeding dust fall rate: Two within a year, not sequential months</p> <p>A standard test method to be used for measuring dust fall rate and the guideline for locating sampling points shall be ASTM D1739. The latest version of this method shall be used.</p>	No Action required	<p>The Contractor will be responsible for providing method statements. He will also be responsible for training of staff in this regard.</p> <p>The ECO will monitor compliance.</p>

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		Pre-construction phase	Construction phase	Operational phase	
			similarly exposed surfaces must be revegetated or stabilised as soon as is practically possible.		
			Excavation, handling and transport of erodible materials must be avoided under high wind conditions or when a visible dust plume is present		
			The construction camp must be watered during dry and windy conditions to control dust fallout.		
			Dust pollution must be controlled by regular watering of roads and work area, should the need arise		
			During high wind conditions, the ECO must evaluate the situation and make recommendations as to whether dust damping measures are adequate, or whether working will cease altogether until the wind speed drops to an acceptable level		
			Where possible, soil stockpiles must be located in sheltered areas where they are not exposed to the erosive effects of the wind		
			Where erosion of stockpiles becomes a problem, erosion control measures must be implemented at the discretion of the ECO		

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		Pre-construction phase	Construction phase	Operational phase	
			Vehicle speeds must not exceed 40 km/h along dust roads or 20 km/h when traversing unconsolidated and non-vegetated areas		
NOISE	Noise prevention measures must be applied to minimise the generation of unnecessary noise pollution as a result of construction activities on site.	The contractors must provide and maintain a method statement for noise.	All vehicles and machinery must be fitted with appropriate silencing technology and must be properly maintained. Develop a Code of Conduct for the construction phase in terms of behaviour of construction staff. Operating hours as determined by the environmental authorisation are adhered to during the development phase. Where not defined, it must be ensured that development activities must still meet the impact management outcome related to noise Management. It is proposed that normal working hours are between 08h00 and 17h00 (Mondays to Saturdays). No work will be allowed on Sundays or outside of the abovementioned hours.	No Action required	The Contractor will be responsible for providing method statements. He will also be responsible for training of staff in this regard. The ECO will monitor compliance.

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		Pre-construction phase	Construction phase	Operational phase	
			provide transport to and from the site on a daily basis for construction workers.		
FIREs	Absolutely no burning of waste is permitted. Fires will only be allowed in facilities especially constructed for this purpose.	The contractors must provide and maintain a method statement for "fires", clearly indicating where and for what, fires will be utilised plus details on the fuel to be utilised	Absolutely no burning of waste is permitted. Fires will only be allowed in facilities especially constructed for this purpose within fenced Contractor's camps. Wood, charcoal or anthracite are the only fuels permitted to be used for fires. The contractor must provide sufficient wood (fuel) for this purpose. Fires within the designated areas must be small in scale so as to prevent excessive smoke being released into the air. The contractor must designate a smoking area for the labour force so as to prevent unanticipated incidents of veldt fires. No wood is to be collected, chopped or felled for fires from private or public property as well as from no-go or sensitive areas within the site and any surrounding natural vegetation	No Action required	The Contractor will be responsible for providing method statements. He will also be responsible for training of staff in this regard. The ECO will monitor compliance.
FAUNA	No hunting of animals will be allowed.	Plan to ensure that all activities on site must comply with the regulations of the Animal Protection	All construction workers must be informed that the intentional killing of any animal is not permitted as faunal species are a benefit to society. Poaching is illegal and it must be a condition of employment that any employee	No Action required	The Contractor will be responsible for providing method statements. He will also be

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		Pre-construction phase	Construction phase	Operational phase	
		Act, 1962 (Act No. 71 of 1962)	caught poaching will be dismissed. Employees must be trained on how to deal with fauna species as intentional killing will not be tolerated. In the case of a problem animal e.g. a large snake, a specialist must be called in to safely relocate the animal.		responsible for training of staff in this regard. The ECO will monitor compliance.
			Environmental induction training and awareness must include aspects dealing in safety with wild animals into and on site. Focus on animals such as snakes and other reptiles that often generate fear by telling workers how to move safely away and to whom to report the sighting. Workers should also be informed where snakes most often hide so that they can be vigilant when lifting stones, etc.		
HERITAGE	No intentional destruction of any sites, features or material of cultural heritage (archaeological and/or historical) origin or significance may occur.	Conduct a Phase 1 HIA for the development to identify any sites, features or material of cultural heritage (archaeological	In terms of the National Heritage Act, 1999 (Act No. 25 of 1999), construction personnel must be alert and must inform the local heritage agency within 48 hours should they come across any signs of heritage resources.	No action required	The developer and applicant. Study to be conducted by a suitable qualified specialist.
			No work may commence until all comments/permits from SAHRA has been obtained.		

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		Pre-construction phase	Construction phase	Operational phase		
	and/or historical) origin or significance.	Carry out general monitoring of excavations for potential fossils, artefacts and material of heritage importance.	Should any archaeological artefacts be exposed during site activities, work on the area where the artefacts were found must cease immediately and the ECO must be notified immediately.	All work must cease immediately, if any human remains are uncovered. Such material, if exposed, must be reported to the South African Police Services, so that a systematic and professional investigation can be undertaken. Sufficient time must be allowed to remove/collect such material before development recommences	Findings to be monitored by the ECO.	
CRIME, SAFETY AND SECURITY	All Contractors and sub-contractors must abide to the rules and regulations of the Occupational Health and Safety Act, 85 of 1993.	Plan to appoint a health and safety officer for the construction site.	The site and crew are to be managed in strict accordance with the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) and the National Building Regulations	Compile an Emergency Response Action Plan (ERAP) prior to	No actions required	Health and safety officer.

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		Pre-construction phase	Construction phase	Operational phase	
		the commencement of the project	<p>the ground, accidents to employees, use of hazardous substances and materials, etc.</p> <p>The contractor must ensure that lists of all emergency telephone numbers / contact persons are kept up to date and that all numbers and names are posted at relevant locations throughout the construction site.</p> <p>Identify fire hazards, demarcate and restrict public access to these areas as well as notify the local authority of any potential threats e.g. large brush stockpiles, fuels etc</p> <p>All unattended open excavations must be adequately fenced or demarcated.</p> <p>Maintain an incidents and complaints register in which all incidents or complaints involving the public are logged.</p> <p>Ensure that the workforce is sensitised to the effects of sexually transmitted diseases, especially HIV AIDS. The Contractor must ensure that information posters on AIDS are displayed in the Contractor Camp area</p> <p>Workers must be instructed not to trespass onto adjacent land. Trespassers will be prosecuted.</p>		

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		Pre-construction phase	Construction phase	Operational phase	
VISUAL	As all development proposals have the potential to change the visual character of the environment within which they are located, and to affect people's perception of such places, significant visual impacts may be expected.	The physical reforming of the landscape for development , such terracing and cut- to fill for roads and buildings, must be designed in such a way to minimise the visual impact, to this end a Landscape Architect must be employed at the earliest stages to work with the Engineers developing this plan.	Extensive landscaping along internal and external streets and between buildings with an emphasis on the treatment of the sidewalks to help with the Visual Absorption Capacity by careful and selective use of indigenous landscaping to softening the visual impact of the new development. Establish extensive landscaping including large indigenous trees that will screen the development and will increase the Visual Absorption Capacity and partly help conceal the development on the exposed areas on the site.	Landscape, cut/fill, slopes, terraces, retaining walls and use natural finishes and/or colours on retaining walls	The developer and applicant. Study to be conducted by a suitable qualified specialist.
		Develop external lighting restrictions and guidelines by lighting engineer/ expert	Retain as much of the existing, indigenous natural landscape as possible No solid boundary walls but the use of a translucent boundary e.g. 'Clearview Fencing'. (A solid boundary walls may only be used between the existing residential built on the most southern boundary)	Provision must be made for rainwater harvesting and should be linked to landscape irrigation systems or other	

NON-OPERATIONAL ENVIRONMENTAL MANAGEMENT PROGRAMME					
ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			Urban Heat Island: The absorbance value of flat hard surfaces of roads and parking areas should be considered. The use of materials with a solar reflectance value of less than 0.6 is encouraged	water consumption areas	

10.2 Mitigation Measures for the Operational Activities

OPERATIONAL ENVIRONMENTAL MANAGEMENT PROGRAMME			
ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS	RESPONSIBLE PERSON
		Operational phase	
ENVIRONMENTAL DOCUMENTATION REPORTING AND COMPLIANCE	A full copy of the signed EA in terms of NEMA, granting approval for the development must be available on site	Ensure that a signed copy of the EA is available on site.	The Applicant/Operator of the facility.
	A copy of the EMPr as well as any amendments thereof must be available on site	Ensure that a copy of the approved EMPr is available on site.	
	Records of Environmental Monitoring must be available on site.	Ensure that copies of all monitoring outcomes/reports are kept on site.	
STORM AND WASTE WATER MANAGEMENT	The site and its surrounding area must be kept free from any pollution that originated as a result of the operational activities.	Storm water from the site must drain into a sealed oil sump constructed directly downstream of the site in order to intercept possibly contaminated surface run-off from the apron and parking areas.	The Applicant/Operator of the facility.
		Runoff from the surfaced areas at the filling station must be strictly controlled, and contaminated water must be collected, stored and disposed of off-site (by a recognized service provider).	
		All spillage of oil onto concrete surfaces must be controlled by the use of an approved absorbent material and the used absorbent material disposed of at an appropriate waste disposal facility.	

OPERATIONAL ENVIRONMENTAL MANAGEMENT PROGRAMME			
ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS	RESPONSIBLE PERSON
		Operational phase	
		<p>Natural storm water runoff not contaminated by construction activities can be discharged directly into the drainage system.</p> <p>No wastewater may run freely into any naturally vegetated areas. Run-off containing high sediment loads must not be released into drainage channels</p> <p>Approval must be obtained from DW&S for any activities that require authorisation in terms of Section 39 of the National Water Act, 1998 (Act No. 36 of 1998).</p> <p>Ensure that storm water channels do not discharge straight down contours. These must be aligned at such an angle to the contours that they have the least possible gradient</p>	
DANGEROUS AND TOXIC MATERIALS	The site and its surrounding area must be free from any chemical, fuel, and oil spills that originated as a result of the operational activities.	<p>CHEMICALS</p> <p>All hazardous substances must be stored in suitable containers as defined in the Method Statement;</p> <p>Containers must be clearly marked to indicate contents, quantities and safety requirements</p> <p>All storage areas must be bunded. The bunded area must be of sufficient capacity to contain a spill / leak from the stored containers</p> <p>Bunded areas to be suitably lined with a SABS approved liner</p> <p>An Alphabetical Hazardous Chemical Substance (HCS) control sheet must be drawn up and kept up to date on a continuous basis</p> <p>All hazardous chemicals that will be used on site must have Material Safety Data Sheets (MSDS);</p>	The Applicant/Operator of the facility.

OPERATIONAL ENVIRONMENTAL MANAGEMENT PROGRAMME			
ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS	RESPONSIBLE PERSON
		Operational phase	
		All employees working with HCS must be trained in the safe use of the substance and according to the safety data sheet	
		FUEL AND OIL The regular reconciliation of the volumes of petroleum products must be done to ensure the early detection of leaks. Physical visual inspection of the fuel tanks (contained within the underground bunker), must be done regularly by accessing the bunker via the manhole to ensure leaks are detected at the earliest.	
		The onsite borehole must be used as a groundwater monitoring point .	
		Groundwater quality samples must be taken at the monitoring borehole. Samples must be taken quarterly for the first year, to determine the monitoring trends, after which monitoring on a bi-annual basis must be continued. All major physical constituents as per SANS 241 must be analysed. Hydrocarbon contamination must be conducted additionally. Once trends have been established, the sampling must be focused on the major determinants, including hydrocarbon contamination.	
		A combined sample must be taken, by means of bailing, from the fuel leak observation wells on a biannual basis to and submitted to an accredited laboratory to ensure the detection of any pollution taking place at the immediate vicinity of the storage tanks.	

OPERATIONAL ENVIRONMENTAL MANAGEMENT PROGRAMME			
ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS	RESPONSIBLE PERSON
		Operational phase	
		All empty oil cans must be stored in suitable leak proof containers that is situated within a bunded area.	
		Spill kits must be available on site. Spill kits must be made up of material/product that is in line with environmental best practice (SUNSORB is a recommended product that is environmentally friendly)	
		No petrol and diesel to be supplied/used until petrol and diesel is registered under the emergency services by-laws. This is an annual registration.	
		The responsible operator must have the required training to make use of the spill kit in emergency situations	
		In the event of a spill, contaminated soil must be collected in containers and stored in a central location and disposed of according to the National Environmental Management: Waste Act 59 of 2008.	
		Tanker Trucks delivering fuel must be in good working order.	
		Before connecting any pipes to the delivery tanker trucks, make sure all valves, lines, and connections are secure in order to reduce the chance of either leaks or being doused during transfer.	
		Never leave equipment unattended during transfer operation.	
		Ensure all valves are closed properly before disconnecting pipes from delivery tanker trucks.	

OPERATIONAL ENVIRONMENTAL MANAGEMENT PROGRAMME			
ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS	RESPONSIBLE PERSON
		Operational phase	
		After the pipes have been disconnected, inspect the truck for any leaks. No trucks will be allowed to leave the area if they are leaking.	
WASTE MANAGEMENT	The site and its surrounding area must be free from any hazardous or general waste pollution that originated as a result of the operational activities.	<p>Waste must be separated into recyclable and non-recyclable waste, and must be separated as follows:</p> <ul style="list-style-type: none"> • Hazardous waste: including (but not limited to) old oil, paint, etc. • General waste: including (but not limited to) paper, plastic, glass and construction rubble <p>Bins must be clearly marked for ease of management.</p> <p>All refuse bins must have a lid secured so that the wind and animals cannot gain access.</p> <p>All solid and chemical wastes that are generated must be removed and disposed of at a licensed waste disposal site.</p> <p>Absolutely no burning of waste is permitted</p>	The Applicant/Operator of the facility
CRIME, SAFETY AND SECURITY	The operator of the site must abide to the rules and regulations of the Occupational Health and Safety Act, 85 of 1993.	<p>The site and crew are to be managed in strict accordance with the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993).</p> <p>The operator of the site must ensure that all emergency procedures are in place. Emergency procedures must include (but not be limited to) fire, spills, contamination of the ground, accidents to employees, use of hazardous substances and materials, etc.</p>	The Applicant/Operator of the facility.

OPERATIONAL ENVIRONMENTAL MANAGEMENT PROGRAMME			
ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS	RESPONSIBLE PERSON
		Operational phase	
		<p>The operator of the site must ensure that lists of all emergency telephone numbers / contact persons are kept up to date and that all numbers and names are posted at relevant locations.</p> <p>Identify fire hazards, demarcate and restrict public access to these areas as well as notify the local authority of any potential threats.</p> <p>Ensure that the workforce is sensitised to the effects of sexually transmitted diseases, especially HIV AIDS. The operator of the must ensure that information posters on AIDS are displayed.</p>	

11. ENVIRONMENTAL AWARENESS PLAN

11.1 Introduction

Training is essential for ensuring that the EMP provisions are implemented efficiently and effectively. It is vital that all personnel are adequately trained to perform their designated tasks to an acceptable standard.

The Construction Contractor and the Operator of the facility must make allowance for all construction workers (including all subcontractors) and operators of the site during the operational phase that will be working at the site, to attend environmental awareness training sessions (undertaken by the ECO) before commencing work on site. During this training, the ECO will explain the EMP and the conditions contained therein. Attention will be given to the construction and operational processes and how the EMP fits into these processes.

In addition to training, general environmental awareness must be fostered among the project's workforce to encourage the implementation of environmentally sound practices throughout its duration. This ensures that environmental accidents are minimized and environmental compliance maximized.

Environmental awareness training and education should be ongoing throughout the construction phase, and should be undertaken regularly if deemed necessary (especially if it becomes apparent that there are repeat contraventions of the conditions of the EMP), or as new workers come to site. Translators should be utilized where needed.

Environmental awareness could be fostered in the following manner:

- Induction course for all workers on site, before commencing work on site.
- Refresher courses as and when required.
- Daily toolbox talks at the start of each day with all workers coming on site, where workers might be alerted to particular environmental concerns associated with their tasks for that day or the area/habitat in which they are working.

Courses must be given by suitably qualified personnel and in a language and medium understood by workers/employees.

11.2 Organisational structure

This section describes the roles and responsibilities of the key stakeholders involved in the development, implementation and review of the EMP.

11.2.1 Project proponent

The Project Proponent will be the **Hennie Bekker Familie Trust**. Ultimately, they will be responsible for the development and implementation of the EMP and for ensuring that the conditions in the eventual Environmental Authorization (EA) are satisfied. Although construction activities will be contracted out, the liability associated with non-compliance still rests with the Project Proponent. The Project Proponent (and not the Contractor or operator of the facility) is therefore responsible for liaising directly with the

relevant authorities with respect to the preparation and implementation of the EMP and meeting EA conditions.

The Project Proponent must inform the Contractor and Operator of the facility of the EA and EMP obligations, as well as **Method Statements** to be prepared and environmental training to be undertaken by the Contractor in terms of these obligations.

The Project Proponent must identify a **Project Manager (PM)** who has overall responsibility for managing the Project, Contractors, Operators and for ensuring that the environmental management requirements are met. During the construction phase, the Project Manager will be the Proponent's construction manager; during the operations phase this role will be fulfilled by the operations manager.

All decisions regarding environmental procedures and protocol must be approved by the Project Manager, who also has the authority to stop any construction activity in contravention of the EMP or EA.

An **Environmental Control Officer (ECO)** must be employed by the Project Proponent for the duration of the project. The ECO should have appropriate training and experience in the implementation of environmental management specifications. The ECO provides feedback to the Project Manager regarding all environmental matters. Contractors are answerable to the ECO (or Project Manager, depending on contractual arrangements) for non-compliance with the requirements stated in the EMP or EA.

11.2.2 Environmental Control Officer (ECO)

The appointed Environmental Control Officer (ECO) is responsible for monitoring the site at regular intervals (including pre-construction set-up and final rehabilitation), in order to ensure that the provisions of this EMP is adhered to and that sound environmental management is ensuing on site.

The ECO must inspect all areas of the site that may be affected by construction-related activities, including the working area, site camp, stockpile areas and access roads. After each ECO inspection the ECO must compile an ECO report detailing the ECO's observations on site, any instances of non-compliance and any issues or aspects that require attention, follow-up or remedial action. The ECO reports must be submitted to the Applicant, the ER, Construction Contractor(s) and the Competent Authority. The ECO inspection reports should include both photographic and written records.

The ECO will have the following responsibilities:

- Maintenance, update and review of the EMP.
- Liaison between the Project Proponent, Contractors, authorities and other lead stakeholders on all environmental concerns.
- Compilation and administration of an environmental monitoring plan to ensure that the environmental management measures are implemented and are effective.
- Monitoring the performance of the Contractor (and Sub-contractors) and ensuring compliance with the EMP and associated Method Statements.

- Validating the regular site inspection reports, which are to be prepared by the Contractor's Environmental Officer (EO).
- Checking the EO's *record of environmental incidents* (spills, impacts, legal transgressions etc) as well as corrective and preventive actions taken.
- Checking the EO's *public complaints register* in which all complaints are recorded, as well as action taken.
- Issuing of site instructions to the Contractor for corrective actions required.
- Assisting in the resolution of conflicts.
- Communication of all modifications to the EMP to the relevant stakeholders.
- Conducting regular audits (Monthly for the Non-Operational Phase and quarterly for the Operational Phase) to ensure that the system for implementing the EMP is operating effectively.

11.2.3 Contractor

The Contractor should appoint a **Contractor's Representative**, who is responsible for the on-site implementation of the EMP and EA. The Contractor's representative can be the site agent; site engineer; a dedicated environmental officer; or an independent consultant. The Contractor must ensure that the Contractor's Representative is suitably qualified to perform the necessary tasks and is appointed at a level such that she/he can interact effectively with other site Contractors, labourers, the Environmental Control Officer and the public. The Contractor's Representative ensures that all Sub-contractors working under the Contractor abide by the requirements of the EMP.

The Contractor is answerable to the Project Manager (PM) for all environmental issues associated with the project. Contractor performance will, amongst others, be assessed on health, safety and environmental management criteria.

The Contractor will be required to provide the following **Method Statements**, setting out in detail how the management actions contained in an EMP and EA will be implemented in order to ensure that the environmental management objectives are achieved. The Method Statements must be reviewed and approved by the Project Proponent.

- > Stockpiles
- > Excavation stabilisation
- > Oil and chemicals
- > Cement
- > Storage of fuel and oils
- > Use of dangerous and toxic materials
- > Toilets and ablution facilities

- > Waste Management
- > Dust
- > Workshop equipment, maintenance and storage
- > Noise
- > Fires
- > Erosion and sedimentation
- > Flora and Fauna (Including no-go areas)
- > Crime, safety and security
- > Hydrology

The Contractor may appoint an **Environmental Officer (EO)**, or officers, if more than one is required. Their primary role is to coordinate the environmental management activities of the Contractor on site. The EO may be required to perform the following roles:

- Support the ECO in the monitoring and execution of the Contractors or Sub-contractors' Method Statements by maintaining a permanent presence on site.
- Inspect the site as required to ensure adherence to the management actions of the EMP, EA and the Method Statements.
- Complete Site Inspection Forms on a regular basis (eg. daily or weekly).
- Provide inputs to the regular (eg. monthly) environment report to be prepared by the ECO.
- Liaise with the construction team on issues related to implementation of, and compliance with, the EMP and EA.
- Maintain a *record of environmental incidents* (spills, impacts, legal transgressions etc) as well as corrective and preventive actions taken, for submission to the Project Proponent.
- Maintain a *public complaints register* in which all complaints are recorded, as well as action taken, for submission to the Project Proponent.

11.2.4 Operator of the Filling Station

The Operator of the Filling Station will be responsible for implementation of the EMPr. He will have to familiarize himself and his staff with the contents of this document. He will also be responsible to ensure that quarterly Environmental Audits are performed and that all monitoring be done as prescribed.

11.3 Checklists

The table below provide the main mitigation measures and/or management interventions to minimise or reduce the negative impacts and enhance positive impacts identified by the specialists associated with the proposed development.

The intent is for the document to be a live, dynamic document that should be maintained and updated throughout the project lifecycle, *inter alia*, by including the necessary Environmental Authorisation from the approving Authority as an attachment.

The table below provide the main mitigation measures and/or management interventions appropriate to the Planning and Construction Phases of the proposed project. The tables present the objectives to be achieved and the management actions that need to be implemented in order to reduce the negative impacts and enhance the positive impacts per management activity. The associated monitoring and implementation frequencies and the responsible person(s) are indicated.

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
1. Construction and operational activities planning	The construction/operational activities must conform to the conditions of authorisation contained in the Environmental Authorisation and mitigation measures contained within this EMPr	Proponent	Continuous
2. Appointment of the ECO	<p>The Proponent must appoint an independent Environmental Control Officer (ECO) who must monitor the Contractor's compliance with the EMPr and who must complete ECO checklist reports (audits) on a regular basis (at least once a month).</p> <p>The Proponent must provide the ECO with a copy of the EMPr.</p> <p>The ECO must form part of the project management team and should attend the monthly project progress meetings.</p> <p>The Contractor must ensure that the construction crew attend an environmental briefing and training session presented by the ECO prior to commencing activities on site.</p>	Proponent ECO ECO ECO, Contractor	Once-off Once-off Continuous Once-off
3. EMPr	This EMPr must be made binding to the main Contractor and to individual Contractors, and must be included in the tender documentation for the construction contract.	Proponent	Once-off
4. Licences/ permits and permissions	<p>The Proponent must ensure that all pertinent licences/permits, certificates and permissions required for the project have been obtained prior to any activities commencing on site and ensure that they are strictly enforced/adhered to. These documents must be made available on site at all times, and the Contractor must be made aware of their content.</p> <p>The Contractor must maintain a database of all pertinent permits and permissions required for the contract.</p>	Contractor, Proponent, ECO Contractor, Proponent, ECO	Prior to commencement of work Continuous
5. Method Statements	<p>The Contractor must submit written Method Statements to the PM and ECO for the activities identified during consultation.</p> <p>Method Statements must be submitted at least five working days prior to the proposed commencement of work on an activity to allow the PM (and/or ECO) time to study and approve the method statement.</p> <p>The Contractor may not commence work on that activity until such time as the Method Statement has been approved in writing.</p> <p>The Contractor must carry out the activities in accordance with the approved Method Statement.</p>	Contractor, PM, ECO Contractor, PM, ECO Contractor, PM, ECO	As required As required Continuous Continuous

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
	Under certain circumstances, the PM may require changes to an approved Method Statement. In such cases the proposed changes must be agreed upon in writing between the Contractor and the PM, and appropriate records retained.	Contractor, PM, ECO	Continuous
	Approved Method Statements must be readily available on the site and must be communicated to all relevant personnel. Approval of the Method Statement shall not absolve the Contractor from any of his/her obligations or responsibilities in terms of the EMPr specifications.	Contractor, Proponent	Continuous
6. Existing services and infrastructure	<p>The Contractor must ensure that existing services (e.g. roads, pipelines, power lines and telephone services) are not damaged or disrupted unless required by the contract and with the permission of the PM, ensuring the necessary way-leaves; permissions and permits are in place.</p> <p>The Contractor must be responsible for the repair and reinstatement of any existing infrastructure that is damaged, or services which are interrupted, at his/her own cost.</p> <p>The Contractor must adhere to any time limits for the repairs that may be stipulated by the PM in consultation with the Contractor.</p>	Contractor, PM, ECO	Continuous
7. Environmental incidents	The Contractor must take timeous corrective action to mitigate an incident appropriate to the nature and scale of the incident and must also rehabilitate any residual environmental damage caused by the incident or by the mitigation measures themselves. The Contractor must adhere to any time limits for such corrective actions that may be stipulated by the ECO in consultation with the PM.	ECO, Contractor	Continuous
8. Labour	<p>Local labour must be used wherever possible to stimulate the local economy.</p> <p>The Contractor should use labour intensive construction measures where appropriate, practical and financially feasible.</p> <p>The workforce should be trained to benefit individuals beyond the completion of the project.</p> <p>The Contractor should use local suppliers where possible.</p> <p>The PM must ensure that all staff working on the project must be in possession of a South African Identity Document or a relevant work permit. A register must be kept on site of all staff working on site.</p> <p>Equal opportunities for employment should be created to ensure that all sectors of society (especially women) have equal access to such opportunities.</p>	Contractor PM	Once-off Continuous
9. Training of staff	<p>The Contractor must ensure that all construction staff receive environmental awareness training concerning, amongst others, the prevention of accidental spillage of hazardous chemicals and oil; pollution of water resources (both surface and groundwater), air pollution and litter control and identification of archaeological artefacts, protection of any animals encountered on site, no-go areas, the use of toilets and basic sanitation, and basic health and safety on site.</p> <p>It is the Contractor's responsibility to provide the site foreman with environmental training (including explaining the content of the EMPr and any Conditions of Approval) and is to ensure that the foreman has sufficient understanding to pass this information onto the construction staff.</p> <p>Training must be provided to the staff members in the use of the appropriate fire-fighting equipment.</p> <p>The Contractor must ensure that all staff operating machinery/construction vehicles are adequately trained to carry out the designated tasks.</p>	Contractor, ECO Contractor, ECO Contractor, Health and Safety Officer Contractor, Health and Safety Officer	Once-off Once-off Once-off Once-off

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
10. Worker health and safety	A Health and Safety Plan must be developed and implemented by the Contractor for the construction period to ensure worker safety. Should any injury be obtained as a result of work the Contractor must ensure the necessary medical attention is received. The necessary Health and Safety file and incident register must be kept on site at all times.	Contractor, Health and Safety Officer	Continuous
11. Site access & traffic management	Construction vehicles, machinery and workers must be restricted to the designated access roads, and may not drive through undeveloped vegetation outside of the existing access route except where that vegetation falls within the authorised working area (development footprint) at the site.	Contractor ECO	Continuous
12. Vegetation clearing	Vegetation clearing may only commence once the working area has been clearly demarcated to the ECO's satisfaction.	Proponent Contractor ECO	Once-off
13. EMPr	This EMPr must be made binding to the main Contractor and to individual Contractors, and must be included in the tender documentation for the construction contract.	Proponent	Once-off
14. Topsoil & subsoil management	Removed topsoil and subsoil should be stockpiled for the duration of the active construction period, and utilized for the final landscaping and rehabilitation of disturbed areas on site. The topsoil must be adequately protected from being blown away or eroded by storm water. Removed subsoil should be stockpiled separately from topsoil. Topsoil should be the final layer applied during rehabilitation, after subsoil/ spoil material has been placed and shaped on the site	Contractor ECO	Continuous
15. Excavations earthworks	& Use of heavy machinery can substantially increase the likelihood, intensity and significance of potential negative environmental impacts, and it is thus essential that earthworks be performed under constant supervision, and that operators must be made aware of all the environmental obligations, as there is always the potential to inflict damage to sensitive areas. Use of machinery should be restricted to only that which is strictly required, and the unnecessary or excessive movement/ use of such machinery must be kept to a minimum. Machinery must enter and exit the site via the indicated access roads, and may not enter/ exit the river channel at any other location. Excavations and earth-moving may only take place within the demarcated working area	Contractor ECO	Continuous
16. Groundwater contamination	Ensure vehicles are serviced and refuelled in bunded areas Ensure vehicles are checked weekly for faults and serviced timely if faulty Should any leaks occur ensure contaminated soil is dug up to 1 cm below the level of visible contamination and disposed of as hazardous waste	Contractor Contractor Contractor	Continuous As required As required
	Drip trays should be placed under all vehicles remaining stationary for more than 24 hours	Contractor	Continuous
17. Noise	Limit construction activities to normal working hours	Contractor	Continuous

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
	Coincide any excessively noisy activities to minimise duration of inconvenience	Contractor	As required
	Ensure noise standards are complied with and that construction staff are provided with personal protective equipment when undertaking noisy operations	Contractor	Continuous
18. Safety	No children on construction site. Safety fence and controlled access should be enforced Safety signs with necessary information displayed	Proponent Contractor ECO	Continuous
19. No go areas	Any sensitive areas identified as such by the ECO need to be considered no-go areas. The Contractor must, as advised by the ECO, erect temporary fencing along the perimeter of designated sensitive no-go areas. Temporary fencing must, as a minimum, consist of wooden or metal posts at 3 m intervals, with two plain wire/plastic strands tensioned horizontally at heights of 300 mm and 900 mm above the ground – it is essential that the strands are visible. The Contractor must maintain in good order all demarcation fencing and barriers for the duration of construction activities, or as otherwise instructed. Commercial type danger tape should not be used, as this perishes rapidly, and pollute the environment when torn and blown away by strong winds.	Contractor, ECO	Monthly Once-off, as required
20. Stockpiles	Soil stockpiles must not be situated within 50m of any water course. If stockpiles are exposed to windy conditions or heavy rain, they should be covered either by vegetation or cloth, depending on the duration of the project. Stockpiles may further be protected by the construction of berms or low brick walls around their bases. Stockpiles must be kept clear of weeds and alien vegetation growth by regular weeding. Where contamination of soil is expected, analysis must be done prior to disposal of excess soil to determine the appropriate disposal method. Proof from an applicable waste disposal site where contaminated soils are dumped if and when a spillage / leakage occur must be provided to the ECO upon request. Stockpiles must not exceed 2m in height unless otherwise permitted by the PM and / or ECO.	Contractor, ECO	Monthly Monthly Monthly Monthly Monthly
21. Erosion control	Wind screening and stormwater control must be undertaken where required by the ECO to prevent soil loss from the site. The use of silt fences and sand bags must be implemented in areas that are susceptible to erosion, if required by the ECO. Other erosion control measures that can be implemented are as follows: <ul style="list-style-type: none">• Brush packing with cleared vegetation;• Mulch or chip packing;• Planting of vegetation; and• Hydro-seeding / hand sowing. Sensitive areas need to be identified prior to construction so that the necessary precautions can be implemented. All erosion control mechanisms need to be regularly maintained. Re-vegetation of disturbed surfaces must occur as soon as possible after construction activities are completed. No impediment to the natural water flow o site other than approved erosion control or rehabilitation works is permitted.	Contractor, ECO	Twice monthly Twice monthly Contractor, ECO Contractor, ECO Contractor, ECO Contractor, ECO Contractor, ECO Contractor, ECO Contractor, ECO

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency	
	Stockpiles not used in three (3) months after stripping should be seeded to prevent dust and erosion, as advised by the ECO	Contractor, ECO	Twice monthly	
22. Hazardous materials	Use and or storage of materials, fuels and chemicals which could potentially leak into the ground must be controlled.	Contractor, ECO	Monthly	
	Any hazardous substances must be stored at least 50m from any of the watercourse on site in a bunded area.	Contractor, ECO	Monthly	
	The Contractor must ensure that potentially harmful materials are properly stored in a dry, secure, ventilated environment, with concrete or sealed flooring and a means of preventing unauthorised entry. Such materials may also be temporarily stored on drip-trays.	Contractor, ECO	Monthly	
	Contaminated wastewater must be managed by the Contractor to ensure existing water resources on the site are not contaminated. All wastewater from general activities in the camp must be collected and removed from the site for appropriate disposal at a licenced waste disposal facility or sewage works.	Contractor, ECO	Monthly	
	All storage tanks containing hazardous materials must be placed in bunded containment areas with sealed surfaces. The bund wall must be high enough to contain 110% of the total volume of the stored hazardous material. Such bunded areas must be regularly emptied of accumulated rainwater. Wastewater from such emptying, if contaminated, must be disposed at an appropriately licenced waste disposal facility or sewage works.	Contractor, ECO	Monthly	
	In the event of a spill, the Contractor must take prompt action to clear polluted areas and prevent spreading of the pollutants. The Contractor will be liable to arrange for professional service providers to clear affected areas, if required.	Contractor, ECO	As required	
	Proper facilities for the storage of oils, paints, grease, fuels, chemicals and any hazardous materials to be used must be provided to prevent the migration of spillage into the ground and groundwater. These pollution prevention measures for storage must include a bunded containment area with a wall high enough to contain at least 110% of any stored volume. This containment area must be sited at least 50m away from any drainage line, in a site approved by the ECO.	Contractor, ECO	Monthly	
	Cement storage and batching must only take place in a bunded area, and any runoff			
	Any spillage, which may occur, must be investigated and immediate action must be taken. This must be reported to the ECO and to the relevant authorities if so required by the ECO.	Contractor, ECO	As required	
23. Cement and concrete batching	Concrete must not be mixed on the ground, but in a bunded area with any runoff captured for disposal as hazardous wastewater.	Contractor, ECO	Continuous	
	The batching area is to be located in an area of low environmental sensitivity, as approved by the ECO.	Contractor, ECO	Once-off	
	Cement bags must only be stored in a covered, bunded area and not directly on the ground. Used cement bags must be disposed of as hazardous waste.	Contractor, ECO	Weekly	
24. Hydrology stormwater	and	Silt fences must be used where required by the ECO to remove any suspended silt from stormwater before it enters the stormwater system.	Contractor, ECO	Monthly
		Temporary cut-off drains and berms must be used where necessary to capture stormwater and promote infiltration.	Contractor, ECO	Monthly
		Stormwater and surface water must be diverted away from excavation trenches, and care must be taken to avoid surface stormwater from the site running into the non-perennial stream adjacent to the site.	Contractor, ECO	Monthly

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
	No rubble, litter or sand may be deposited into any freshwater systems or water courses.	Contractor, ECO	Monthly
25. General materials handling, use and storage	<p>Choice of location for storage areas must take into account prevailing winds, distances to the seasonal watercourses (50m minimum), general onsite topography and water erosion potential of the soil. Impervious surfaces must be provided where necessary.</p> <p>Storage areas must be designated, demarcated and fenced. Storage areas must be secure so as to minimize the risk of crime. They must also be safe from access by unauthorised persons. Fire prevention facilities must be present at all storage facilities.</p>	Contractor, ECO, Health and Safety Officer	Once-off
	Material Safety Data Sheets (MSDSs) must be readily available on site for all chemicals and hazardous substances to be used on site. Where possible, the available MSDSs should include information on ecological impacts and measures to minimise negative environmental impacts during accidental spills.	Contractor, ECO, Health and Safety Officer	Once-off, as required
	Clear signage must be placed at all storage areas containing hazardous substances / materials.	Contractor, ECO, Health and Safety Officer	Once-off
	The Contractor must be responsible for the training and education of all personnel on site who will be handling the hazardous material about its proper use, handling and disposal. The Contractor must ensure that information on the management of spill and accidental ingestion is kept on site. Staff dealing with these materials / substances must be aware of their potential impacts and follow the appropriate safety measures.	Contractor, Health and Safety Officer	Once-off
	The provisions of the Hazardous Chemical Substances Regulations promulgated in terms of the Occupational Health and Safety Act 85 of 1993 and the SABS Code of Practice must be adhered to. This applies to solvents and other chemicals possibly used in the construction time.	Contractor, Health and Safety Officer	Continuous
	The Contractor must ensure that its staff is made aware of the health risks associated with any hazardous substances used and has been provided with the appropriate protective clothing/equipment in case of spillages or accidents and have received the necessary training.	Contractor, Health and Safety Officer	Continuous
	All excess cement and concrete mixes must be contained on the construction site prior to disposal off site.	Contractor, ECO	Monthly
	Hazardous substances must be stored at least 50m away from any water bodies on site to avoid pollution.	Contractor, ECO	Monthly
26. Fuel storage	Topsoil and subsoil to be protected from contamination.	Contractor, ECO	Monthly
	Fuel and material storage must be away from stockpiles on site in appropriate containers in a bunded area.	Contractor, ECO	Twice monthly
	Chemicals must be mixed on an impermeable surface and provisions must be made to contain spillages or overflows into the soil.	Contractor, ECO	Monthly
	Any storage tanks containing hazardous materials must be placed in bunded containment areas with sealed surfaces. The bund walls must be high enough to contain 110% of the total volume of the stored hazardous material. Drip trays may be used for temporary storage of such materials.	Contractor, ECO	Monthly
	Contaminated soil must be contained and disposed of off-site at an approved hazardous waste disposal site.	Contractor, ECO	Monthly
27. Transportation	Material must be appropriately secured to ensure safe passage between destinations during transportation. Loads must have appropriate cover to prevent them spilling from the vehicle during transit. The Contractor must be responsible for any	Contractor, ECO, Health and Safety Officer	Monthly

Activity/Impact		Action Required	Responsible Party	Monitoring Frequency
		clean-up resulting from the failure by his employees or suppliers to properly secure transported materials.		
28. General management	waste	<p>Litter generated by the construction crew must be separated on site into general waste and recyclables and collected in covered rubbish bins. General waste is to be removed to a licenced landfill site on a weekly basis and recyclables must be taken to a recycling centre monthly.</p> <p>Ensure that no refuse wastes are burnt on the premises or on surrounding premises. No fires shall be allowed on site, unless in designated areas approved by the PM and by the ECO or by the Health and Safety Officer.</p> <p>The Contractor must supply waste bins/skips throughout the site at locations where construction personnel are working. The bins must be provided with lids and an external closing mechanism to prevent their contents blowing out and must be scavenger-proof to deter animals that may be attracted to the waste. The Contractor must ensure that all personnel immediately deposit all waste in the waste bins for removal by the Contractor. Bins must be emptied on a weekly basis and the waste removed to the construction camp where it must be properly contained in scavenger, water and windproof containers until disposed of. The bins must not be used for any purposes other than waste collection.</p> <p>Ensure that no litter, refuse, wastes, rubbish, rubble, debris and builders waste generated on the premises be placed, dumped or deposited on adjacent/surrounding properties during or after the construction period of the project.</p> <p>If possible and feasible, all waste generated on site must be separated into glass, plastic, paper, metal and wood and recycled.</p>	Contractor, ECO Contractor, ECO, PM, Health and Safety Officer Contractor, ECO	Weekly/ Monthly Monthly Monthly
29. Hazardous management	waste	<p>The waste, resulting from the use of hazardous materials, must be disposed of at a registered hazardous waste disposal site by a certified waste disposal Contractor as approved by the ECO. A disposal certificate must be obtained from the disposal Contractor.</p> <p>Staff must be trained in the identification of hazardous waste.</p> <p>Temporary storage and disposal of hazardous waste is regulated by legislation which must be complied with, i.e. the Occupational Health and Safety Act.</p>	Contractor, ECO Contractor, ECO	As required As required Monthly
30. Noise		<p>The Contractor must aim to adhere to the relevant noise regulations and limit noise to within standard working hours.</p> <p>Construction site camp and other noisy facilities must be located well away from noise sensitive neighbours.</p> <p>Truck traffic must be routed away from noise sensitive areas, where possible.</p> <p>All noise and sounds generated must adhere to SABS 0103 specifications for maximum allowable noise levels for residential areas. No pure tone sirens or hooters may be utilised except where required in terms of SABS standards or in emergencies.</p> <p>Noisy operations must be combined so that they occur where possible at the same time.</p> <p>Construction activities must be contained to reasonable working hours. Night-time activities near noise sensitive receptors must not be allowed.</p> <p>With regard to unavoidable noisy construction activities, the Contractor must liaise with local residents to inform them of such events.</p> <p>As construction workers operate in a noisy environment, it must be ensured that their working conditions comply with the</p>	Contractor, ECO Contractor, ECO Contractor, ECO Contractor, ECO Contractor, ECO Contractor, ECO	Monthly Once-off As required Monthly Monthly Monthly Monthly As required Monthly

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
	requirements of the Occupational Health and Safety Act (Act No 85 of 1993). Where necessary, ear protection gear must be worn.	and Safety Officer	
	Noise suppression measures must be applied to all construction equipment where required. Construction equipment must be kept in good working order and where appropriate fitted with silencers which are kept in good working order. Should the vehicles or equipment not be in good working order, the Contractor may be instructed to remove the offending vehicle or machinery from site.	Contractor, ECO, Health and Safety Officer	Monthly
31. Worker health and safety	Safety measures, work procedures and first aid must be implemented on site.	Contractor, , Health and Safety Officer	Monthly
	A Health and Safety Plan in terms of the Occupational Health and Safety Act (Act No. 85 of 1993) must be drawn up to ensure worker safety.	Contractor, Health and Safety Officer	Once-off
	Workers must be thoroughly trained in using potentially dangerous equipment.	Contractor, Health and Safety Officer	As required
	Contractors must ensure that all equipment is maintained in a safe operating condition.	Contractor	Monthly
	A safety officer must be appointed.	Contractor	Once-off
	A record of health and safety incidents must be kept on site.	Contractor, , Health and Safety Officer	Monthly
	Any health and safety incidents must be reported to the project manager immediately.	Contractor, , Health and Safety Officer	As required
	First aid facilities must be available on site at all times. All incidents requiring first aid occurring on site must be recorded in the incidents book on site.	Contractor, , Health and Safety Officer	Monthly
	A record must be kept of medication administered or precautions taken and the time and dates when this was done. This can then be used as evidence in court should any claims be instituted against the Contractor.	Contractor, , Health and Safety Officer	Monthly
	Material stockpiles or stacks must be stable and well secured to avoid collapse and possible injury to site workers / local residents.	Contractor, ECO, Health and Safety Officer	Monthly
32. Personal Protective Equipment	Personal Protective Equipment (PPE) must be made available to all construction staff and must be compulsory. Hard hats and safety shoes must be worn at all times and other PPE worn were necessary i.e. dust masks, ear plugs etc.	Contractor, ECO, Health and Safety Officer	Monthly
	No person is to enter the portion of the site where construction activities are being undertaken without the necessary PPE.	Contractor, ECO, Health and Safety Officer	Monthly
	SABS Standards and specifications governing dangerous processes such as welding must be strictly applied, with a view to proper protection of the public and workers.	Contractor, ECO, Health and Safety Officer	As required
33. Fauna and Flora	Implement the eradication programme for invasive species in terms of the Conservation of Agricultural Resources Act (Act No. 43 of 1983).	Contractor, ECO	Monthly
	Institute the rehabilitation of areas as soon as construction activity allows it.	Contractor, ECO	As required
	No disturbance, capture or injury of any fauna will be permitted. Should any fauna be found on site it must be removed from site by the ECO or a suitably qualified person.	Contractor, ECO	Continuous

12. MONITORING, AUDITING AND REPORTING

The Applicant **Hennie Bekker Familie Trust** is responsible for ensuring that all environmental management measures prescribed in this EMPr, as well as any other conditions specified by the relevant authorities, are implemented and adhered to during all phases of the proposed development. The Applicant may delegate the responsibilities for implementing the requirements to other persons/entities, however the Applicant remains responsible for ensuring that the delegated responsibilities are carried out.

It is the responsibility of the project team or their delegate to ensure that regular monitoring of environmental issues addressed in this management plan is undertaken. The applicant is responsible for the monitoring of the infrastructure.

Site inspections to determine maintenance needs during the operational phase are imperative for good housekeeping.

Internal environmental audits must be undertaken at regular monthly intervals throughout the construction phase to ensure compliance.

The applicant will be responsible for maintaining a database of all records pertaining to the environment for the study area.

All incidents such as spills of toxic or any other substance that may negatively affect the environment must be reported to the relevant authorities.

FINES

The ECO can impose fines on the Contractor for any contraventions of this EMPr. The imposition of fines will enable the ECO to ensure that the requirements of the EMPr are taken seriously by the Contractor.

For an alternative method of ensuring Environmental Compliance, it should be considered that the ECO must issue a "Compliance Certificate" once a month. This certificate must be attached to the Contractor's "Payment Certificate" and no Contractor will be paid without such a certificate. (Experience with this method of enforcement has proven very successful in the past.)

The Contractor shall be advised in writing of the nature of the infringement. The Contractor shall also take the necessary steps (e.g. training) to prevent a recurrence of the infringement.

The Contractor is also advised that the imposition of spot fines does not replace any legal proceedings the authorities, landowners and/or members of the public may institute against the Contractor.

In addition to the fine/non-payment, the Contractor shall be required to make good any damage caused as a result of the infringement at his own expense.

NB: The above mentioned tools and the contents of the EMPR (and eventual conditions as contained in the Environmental Authorization) must form part of the Contractor's appointment.