

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 for the proposed clearance of 17.37 hectares of indigenous vegetation in order to establish 16 "Agricultural Small Holdings" and "Recreational" erf located within a Critical Biodiversity Area and on the Remainder of the Remaining Extent of Portion 337 and 338 of the Farm Elandsheuvel, 402 IP, City of Matlosana Local Municipality, North West Province.

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. Due to the projected lifespan, a detailed Site Closure and Decommissioning has not been included in this document as it is not intended for a project of this nature. Design specifications from an environmental point of view were taken into consideration, the Environmental Assessment Practitioner (EAP) have provided input 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 the for the proposed clearance of 17.37 hectares of indigenous vegetation in order to establish 16 "Agricultural Small Holdings" and "Recreational" erf located within a Critical Biodiversity Area and on the Remainder of the Remaining Extent of Portion 337 and 338 of the Farm Elandsheuvel, 402 IP, City of Matlosana Local Municipality, North West Province and incorporates specific project mitigation measures. This EMPr therefore identifies the following:

- Construction and operation activities that will impact on the environment;
- Specifications with which the contractor 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 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:

- A Geotechnical Engineer
- A Civil Engineer
- A Town and Regional Planner
- A SAHRA Specialist.

- Ecological Specialist (Fauna and Flora habitat 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 in the area and to design the services for the proposed development.
- 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.
- A Ecological specialist has been appointed to determine the impact of the proposed development on the Fauna and Flora of the area.
- An Environmental Screening Process was conducted by the EAP to ensure that all the relevant Environmental Legislation is taken into consideration.
- Desk top studies were conducted and alternatives assessed.
- Site inspections were carried out to verify the outcomes of the desktop studies, and the preferred alternative defined.
- A full Public Participation Process is being followed to obtain inputs from interested and affected parties.
- All the information obtained from the above mentioned processes is being used to assess the Environmental Impact that the proposed development may have on the Environment and vice versa.

2. Contents of the Environmental Management Programme

The contents of an EMPr, shown below, are contained in Appendix 4 of the NEMA EIA Regulations 982 of 2014 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

Environmental Assessment Practitioner (EAP): ¹	Mr. JP de Villiers of AB Enviro Consult CC		
Contact person:	Mr JP de Villiers		
Postal address:	7 Louis Leipoldt Street		
Postal code:	2531	Cell:	083 5488 105
Telephone:	018 294 5005	Fax:	018 293 0671

E-mail:

jp@abenviro.co.za

4. Expertise of the Environmental Assessment Practitioner

AB Enviro Consult (CC) is a registered consultancy, owned and operated as an independent unit by the registered owner and consultant: **Prof. A.B. de Villiers. Mr J.P. De Villiers** joined the consultancy during 2004 and **Mrs J.E. du Plooy** is a consultant since 2001.

Over a period of 27 years (1996-2023) this consultancy has successfully applied for, and obtained positive ROD's and EA's for more than 380 projects. Environmental Control Officer's duties are also performed on various projects.

ACADEMIC AND PROFESSIONAL QUALIFICATIONS OF PROF DE VILLIERS

Post-Matric Qualifications

YEAR	Qualification	Institution	Field of Study
1968	B.Sc.	PU FOR CHE	Geography, Geology
1970	HONNS. B.Sc.	PU FOR CHE	Soil Science
1974	M.Sc.	PU FOR CHE	Geography
1981	Ph.D.	UOFS	Geography

ACADEMIC AND PROFESSIONAL QUALIFICATIONS MR J.P. DE VILLIERS

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

PROFESSIONAL QUALIFICATIONS AND REGISTRATIONS

YEAR	Qualification/ Registration	Institution	Field of Study
2008	Basic Principles of Ecological Rehabilitation and Mine Closure	Centre for Environmental Management (North West University)	Ecological Rehabilitation
2019	Registered Environmental Assessment Practitioner 2019/808	Environmental Assessment Practitioners of South Africa	

CV: Mr JP de Villiers

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 **309 Environmental Authorizations** and has performed the duties of **Environmental Control Officer (ECO) for 42 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 Form for the project 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 a public meeting / Open House / focus meeting 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

ACADEMIC AND PROFESSIONAL QUALIFICATIONS MRS J.E. DU PLOOY

<u>YEAR</u>	<u>Qualification</u>	<u>Institution</u>	<u>Field of Study</u>
1999	BA	PU FOR CHE	Geography, Tourism
2000	BA (Honns) Cum Laude	PU FOR CHE	Geography
2003	Masters degree in Environmental Management	PU FOR CHE	Environmental Management
2001	Aquabase Intro	AQUABASE	Hydrology
2001	Geomedia Professional	INTERTECH	GIS
2001	Map Info	SPATIAL TECHNOLOGY	GIS

PROFESSIONAL QUALIFICATIONS AND REGISTRATIONS

<u>YEAR</u>	<u>Qualification/ Registration</u>	<u>Institution</u>
2020	Registered Environmental Assessment Practitioner 2019/1573	Environmental Assessment Practitioners of South Africa

5. DESCRIPTION OF THE ACTIVITY

The proposed development will involve the clearance of 17.37 hectares of indigenous vegetation within a Critical Biodiversity Area. Please see Figure 1 for a map indicating the extent of the area to be cleared. Note that no clearance of indigenous vegetation will take place on Portion 21 within the area identified as the watercourse. 2.51 Ha of the development is located within 100 meters of the Schoonspruit. Please see Figure 2 for a map indicating the extent of vegetation clearance within 100 meters from the Schoonspruit. The Proposed development will be for the provision of 16 “Agricultural Small Holdings” and 1 “Recreational” erf. In order to provide access to the Small Holdings, 1 207 meters of streets will be developed. The streets will be located within a 12 meter road reserve. Activities planned for the Recreational erf includes a Golf Driving Range, Put-Put and a Bicycle track. Please see Figure 3 for a copy of the proposed development.

Please note that this application only deals with erven 5 to 21 as erven 1 to 4 has already been legally developed. Portion 1 and Portion 2, with a combined area of 7458m² is currently zoned as “Business 2”. The northern part of portions 1 is already used for business (See Photograph 1), while the southern part of portion 1 is currently being used as residential (flats) (See Photograph 2). Portion 3 with an area of 10 028m², is currently used for residential purposes and consist of a main house and 5 flats. See Photographs 3 and 4. Please see Figure 4 for an enhanced view of the area already developed. The current zoning for Portions 5 to 21 is "Agricultural".



Photograph 1: The northern part of portions 1 is already used for business



Photograph 2: The southern part of portion 1 is currently being used as residential (flats)



Photograph 3: Portion 3 is currently used for residential purposes. Illustration of the main house.



Photograph 4: Portion 3 is currently used for residential purposes. Illustration of the 5 flats

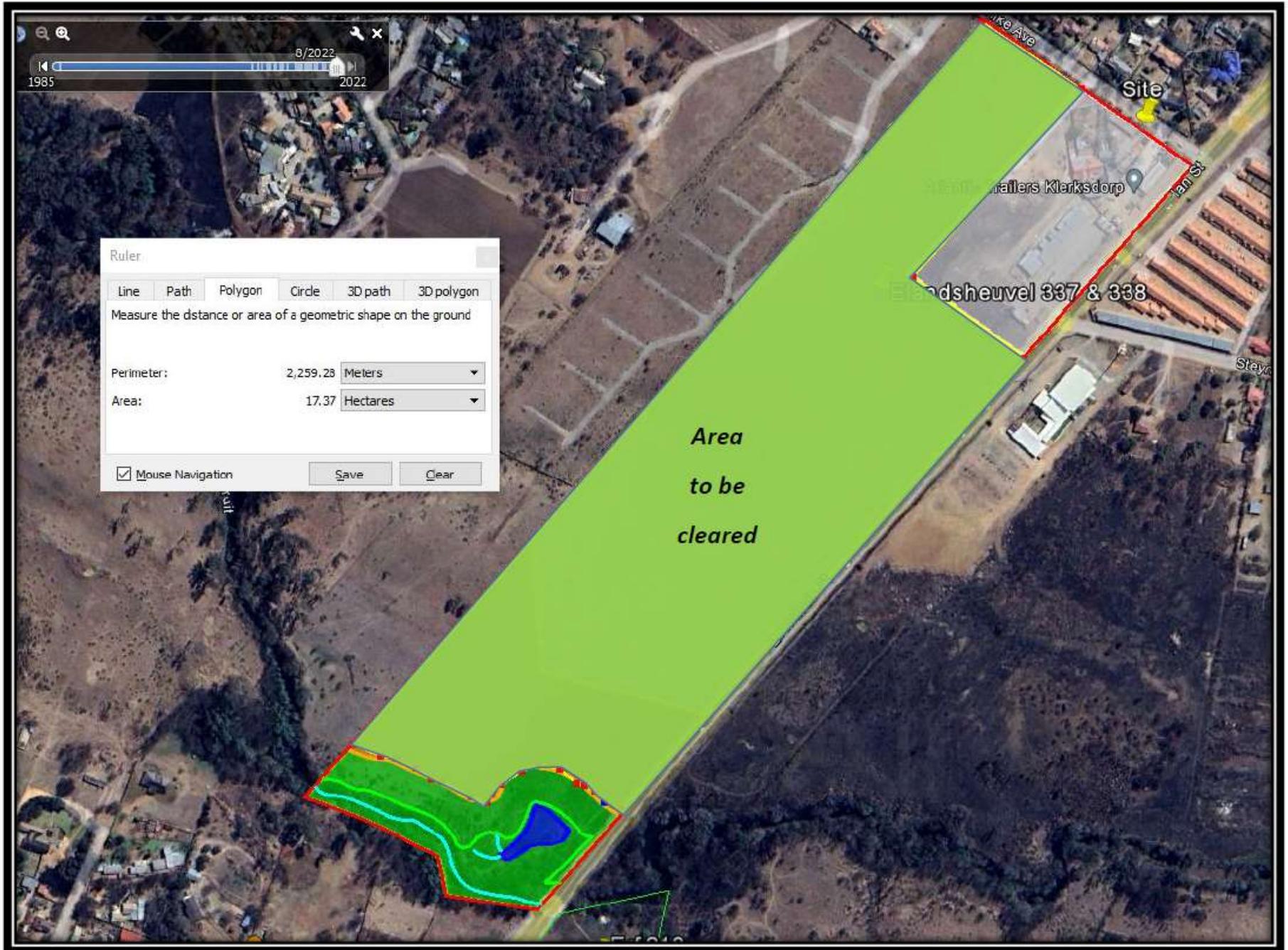
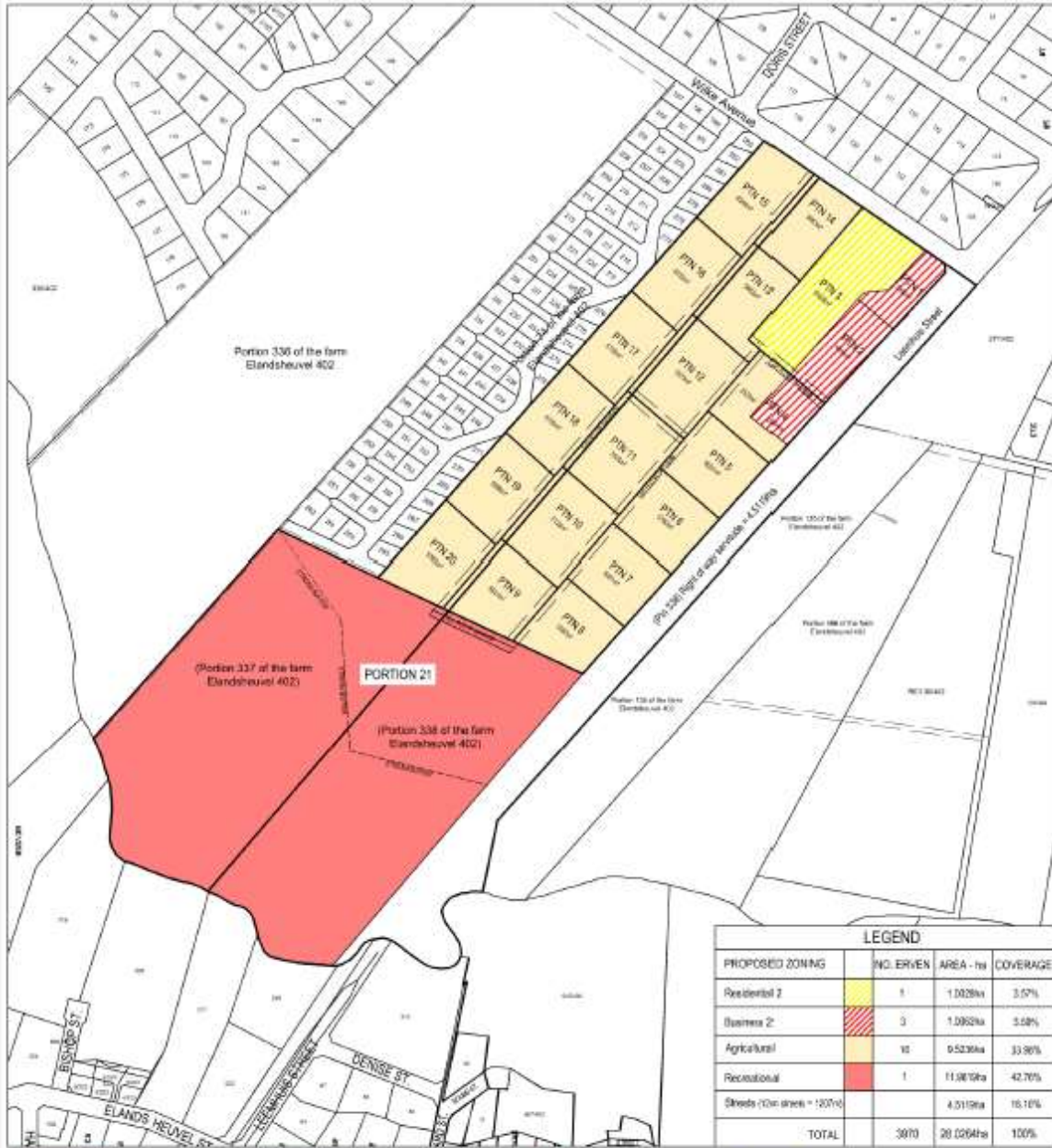


FIGURE 1: MAP INDICATING THE EXTENT OF THE AREA TO BE CLEARED



FIGURE 2: MAP INDICATING THE EXTENT OF VEGETATION CLEARANCE WITHIN 100 METERS FROM THE SCHOONSPRUIT

PROPOSED ZONING MAP OF PORTIONS 337 AND 338 OF THE FARM ELANDSHEUVEL No. 402-IP



Recreational
 Agricultural
 Business 2
 Residential 2

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City of
Matlosana



MAP 2
SCALE 1 : 6 000

Drawing Compiled by : C. Cloete

Drawings Nr. : 2/1952

Date : 2022/12/15

Revision :

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FIGURE 3: PROPOSED LAYOUT PLAN

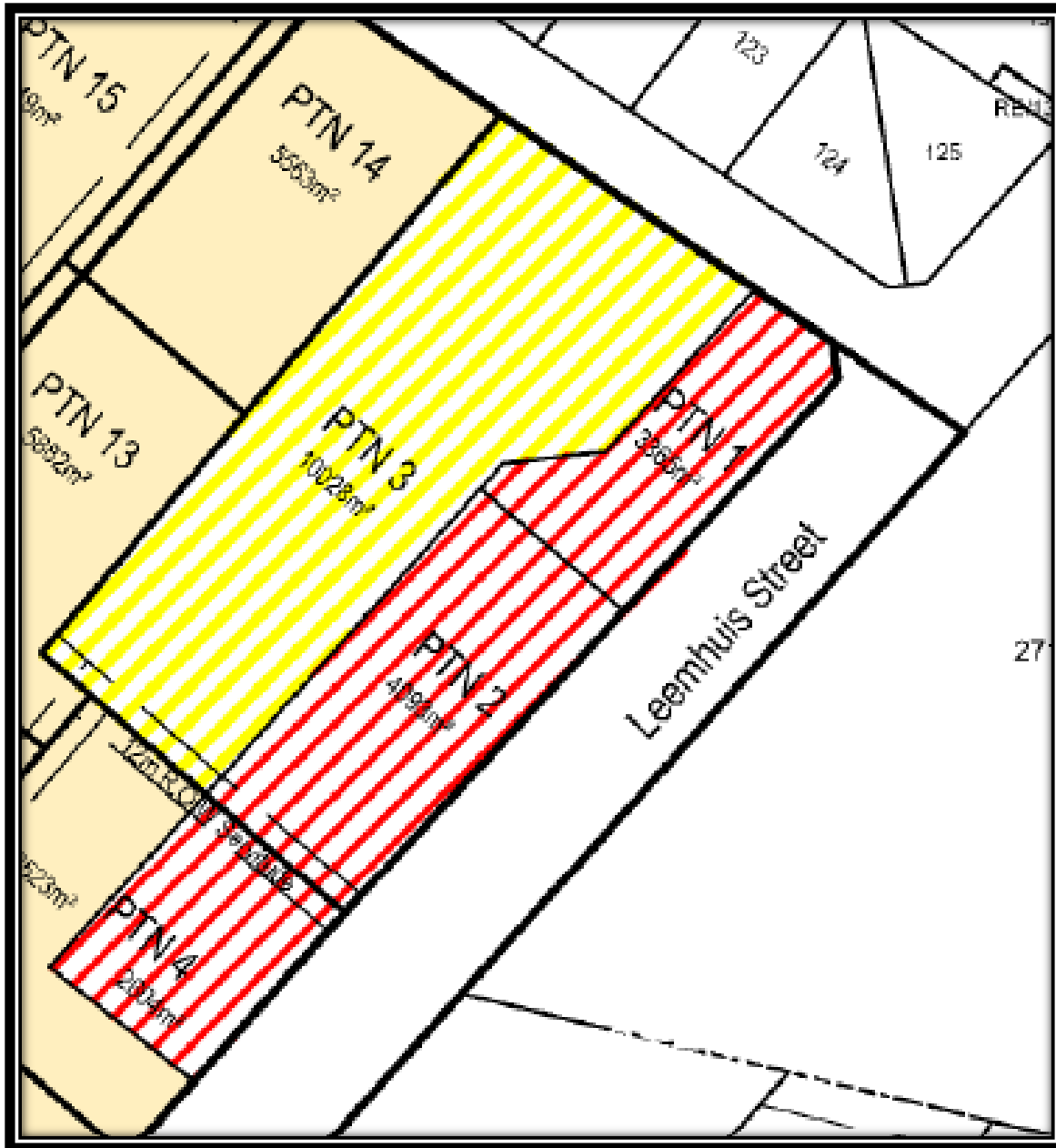


FIGURE 4: ENHANCED VIEW OF THE AREA ALREADY DEVELOPED

Bulk and Link Services

Water

The Local Authority will be responsible for sufficient bulk water supply and water pressure to the boundary of the development. The developer will be responsible for the design and construction of the internal water supply network to the requirements of the Local Authority.

Based on the information received from the Municipality, there is a 100 mm Ø water pipe in Wilke Street from where the development will be able to connect.

Sewerage

The Local Authority will be responsible for the supply of bulk sewerage services. The developer will be responsible for the design and construction of the internal sewer network. All indications are that available capacity in the reticulation and treatment works are available to support this development. Existing sewer infrastructure are available to the east and south of the property. The Proposed development will connect to the existing infrastructure on the south-eastern boundary, on the existing 450mm diameter sewer line.

Storm Water

The site is relatively flat, with natural drainage in a southern direction. The Schoonspruit natural stream approximately 500m south of the planned development. Drainage within the development will be surface drainage towards Leemhuis Street. There is an earth channel, on the western side of Leemhuis street that will be utilized to carry any surface runoff from the development towards the Schoonspruit stream.

Refuse

The Municipality renders a refuse service in the area. All refuse is dumped and managed at the formal dumping site of the Matlosana City Council. Considering current volumes of refuse generated in the Klerksdorp area, the additional contribution of refuse from this development will be minor.

6. DESCRIPTION OF THE PROPERTY

The site is located on the Remainder of the Remaining Extent of Portion 337 and 338 of the Farm Elandsheuvel, 402 IP, City of Matlosana Local Municipality, North West Province. The City of Matlosana is situated approximately 164 South West of Johannesburg, on the N12 highway and covers about 3 625km². The City of Matlosana is part of the Dr Kenneth Kaunda District Municipality in the North West province. It was called Klerksdorp Municipality and the name was officially changed to the City of Matlosana on the 1st of July 2005. The name Matlosana is said to mean "People helping each other to move from one area to the other". The City of Matlosana includes Klerksdorp, Jouberton, Alabama, Orkney, Kanana, Stilfontein, Khuma, Tigane and Hartbeesfontein and is the largest of all towns in the North West province. The area has strong physical and socioeconomic linkages and economic interactions with Gauteng, as well as other main towns like Potchefstroom, Rustenburg, Welkom, Ventersdorp, Wolmaransstad and Ottosdal.

The site is situated on the south-western corner of Ian Street and Wilke Avenues in Klerksdorp. Ian Street (Leemhuis Street) is a north/south connecting street linking the N12, approximately 2km southwest of the development and the R30 (Ventersdorp Road), approximately 450m north-east of the planned development. See Figure 5a and b for a Locality Map.

Site Co-ordinates

Alternative S1 (preferred or only site alternative)	Latitude (S):			Longitude (E):		
	26°	50'	55,09"	26°	38'	59.12"



FIGURE 5a: LOCALITY MAP

LOCALITY MAP OF
 PORTIONS 337 AND 338 OF THE
 FARM ELANDSHEUVEL No. 402-IP



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City of
 Matlosana



MAP 1
 SCALE 1 : 6 000

Drawing Compiled by : C. Cloete
 Drawings Nr. : 2/1952
 Date : 28/09/2022
 Revision : 
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 337 & 338 Elandsheuvel\Maps\CAD

FIGURE 5b: LOCALITY MAP

The site is relatively flat, with natural drainage in a southern direction towards the Schoonspruit that borders the site towards the south. See Photograph 5 and 6. The site is located in a CBA 2. See Figure 6.



Photograph 5: View of the Schoonspruit that borders the site towards the south



Photograph 6: Riparian zone of the Schoonspruit.

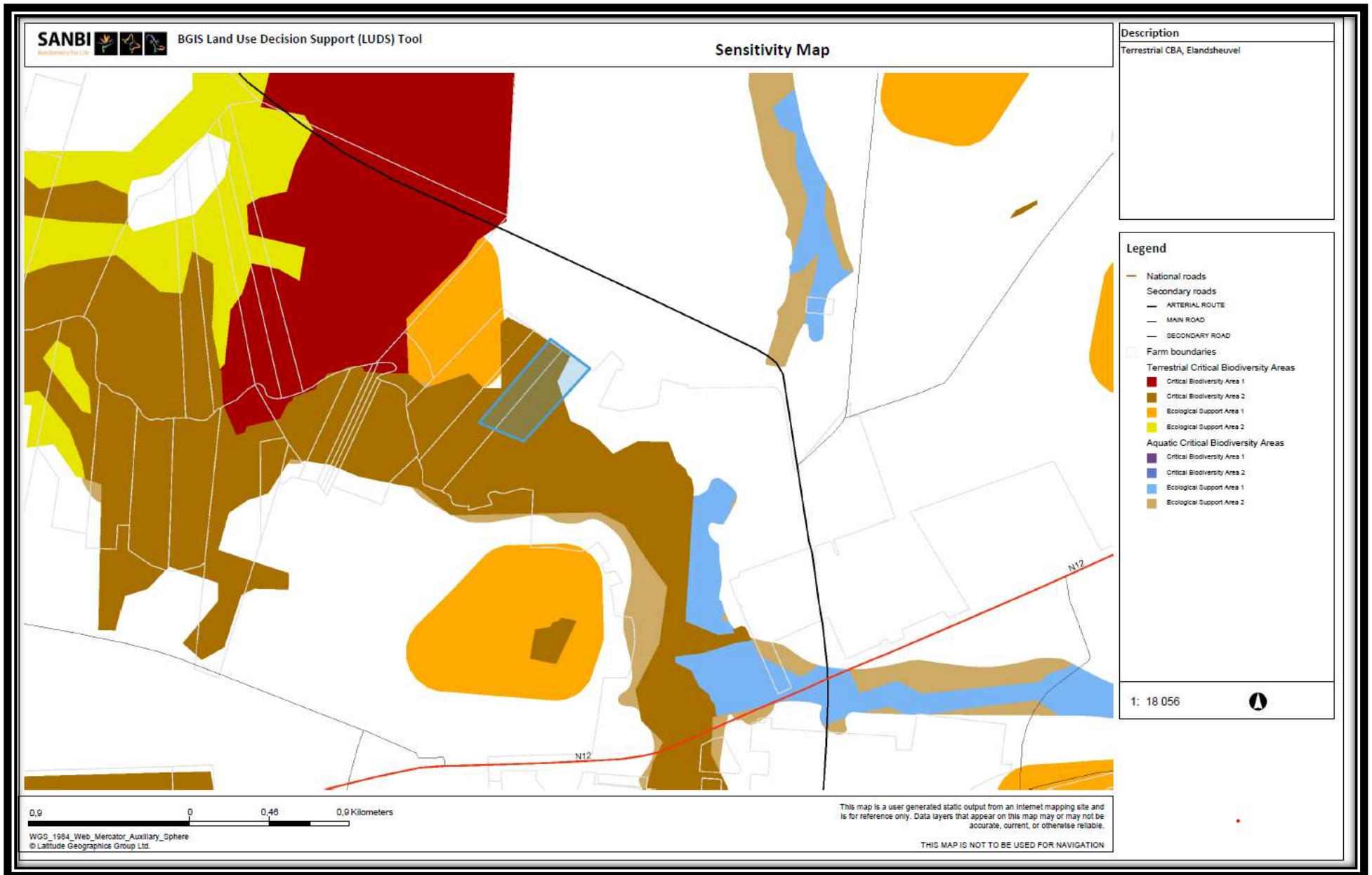


FIGURE 6: SENSITIVITY MAP

Vegetation at the terrestrial zone of the site is a disturbed grassland of which a large part has been ploughed or cultivated in the past. Terrestrial vegetation consists of a grass layer that contains some forbs, a few trees and areas where the cover of the shrub *Asparagus larycinus* approaches bush encroachment. Conspicuous clumps of the indigenous dwarf-shrub *Ziziphus zeyheriana*, is also indicative of disturbance at the site. Indigenous grass species include *Cynodon dactylon*, *Aristida congesta*, *Eragrostis lehmanniana*, *Eragrostis curvula*, *Eragrostis superba*, *Melinis repens*, *Setaria sphacelata*, *Sporobolus africanus* and *Chloris virgata*. Indigenous forb species include *Hilliardiella oligocephala*, *Gazania krebsiana*, *Senecio consanguineus*, *Bulbine narcissifolia*, *Conyza podocephala* and *Monsonia angustifolia*. Alien invasive herbaceous weed species are conspicuous at the site and include include *Physalis viscosa*, *Argemone ochroleuca*, *Plantago lanceolata*, *Tagetes minuta*, *Bidens bipinnata*, *Bidens pilosa*, *Gomphrena celosioides*, *Schkuhria pinnata*, *Conyza bonariensis*, *Guileminea densa*, *Verbena bonariensis*, *Alternanthera pungens*, *Verbena aristigera* and *Chenopodium album*.

Vegetation at the riparian zone consists of a visibly dense tree layer that abruptly ends at the intersection with the terrestrial zone. Exotic tree species are conspicuously frequent at the riparian zone and include *Melia azedarach*, *Salix babylonica*, *Gleditsia triacanthos*, *Eucalyptus camaldulensis* and *Morus alba*. Indigenous tree species such as *Vachellia karroo*, *Searsia pyroides*, *Combretum erythrophyllum*, *Ziziphus mucronata* and *Gymnosporia buxifolia* are found at the riparian zone at the site. Please see Figure 7 for a Sensitivity Map generated by the Fauna and Flora Habitat Specialist.



Photograph 7: View of part of the site. The shrubs visible in the picture are *Asparagus larycinus* which approaches bush encroachment in some areas

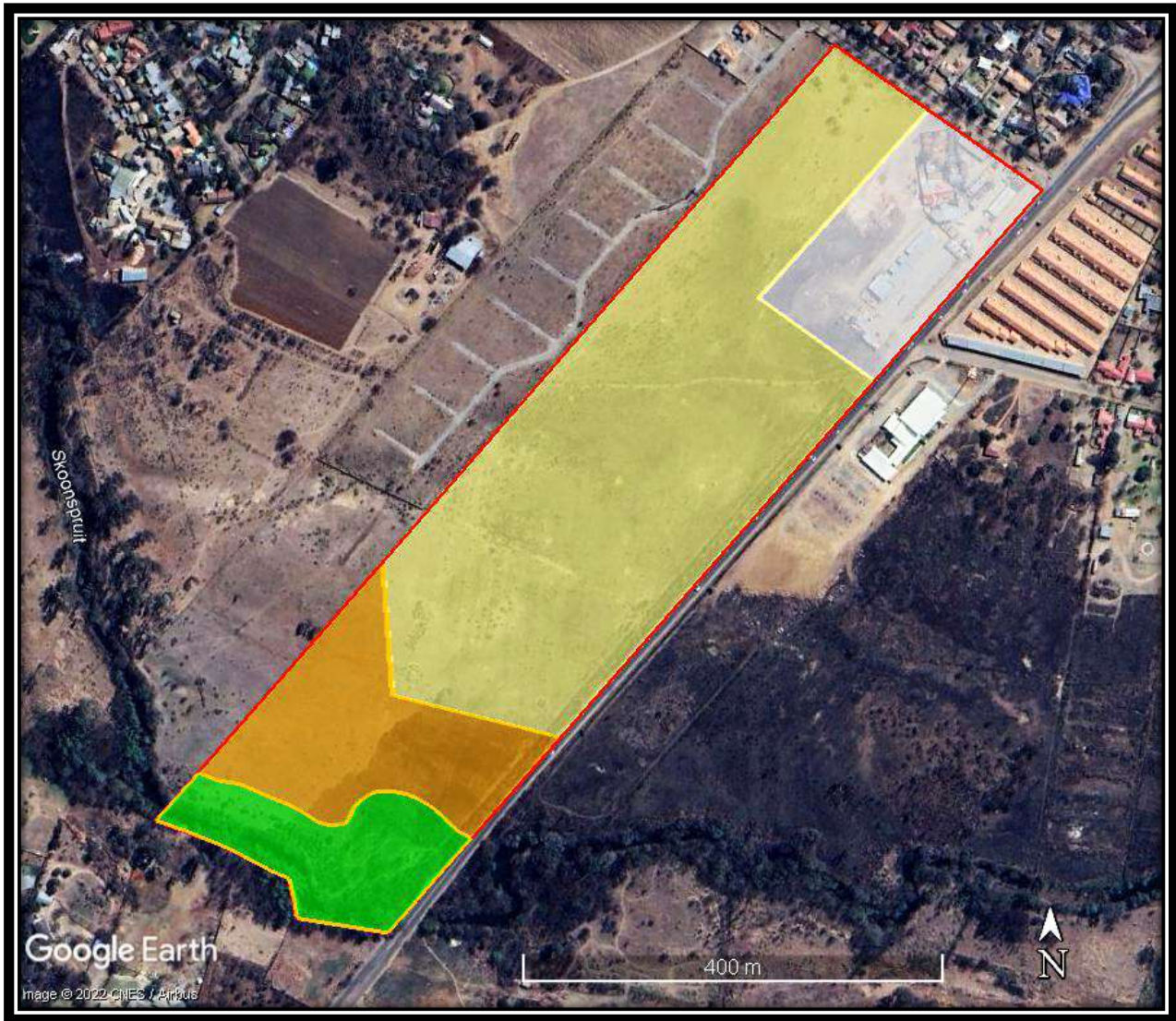


FIGURE 7 ECOLOGIST'S DELINEATION OF ECOLOGICAL SENSITIVITY AT THE SITE.

- | | |
|--|--|
| <p>— Red outline</p> <p>— Green outline and shading</p> <p>— Orange outline and shading</p> <p>— Light yellow outline and shading</p> <p>— White outline and shading</p> | <p>Boundaries of the site</p> <p>High sensitivity</p> <p>Medium sensitivity</p> <p>Low sensitivity</p> <p>Very Low sensitivity</p> |
|--|--|

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

7.1 BIO-PHYSICAL ASPECTS

7.1.1 GEOLOGY AND SOIL

According to the 1:250 ODO West Rand 2626 geological map, the site is underlain by Quartz Feldspar Porphyry of the Makwassie Formation, Platberg Group, Ventersdorp Supergroup and bordered by thick alluvium transported soils.

Alluvium transported, followed by a pedogenic horizon, in the form of partly and /or fully developed ferricrete, is generally underlain by residual quartz porphyry granular material over the **largest portion of the site. However, no residual soils were encountered over the remaining, south western section of the site.**

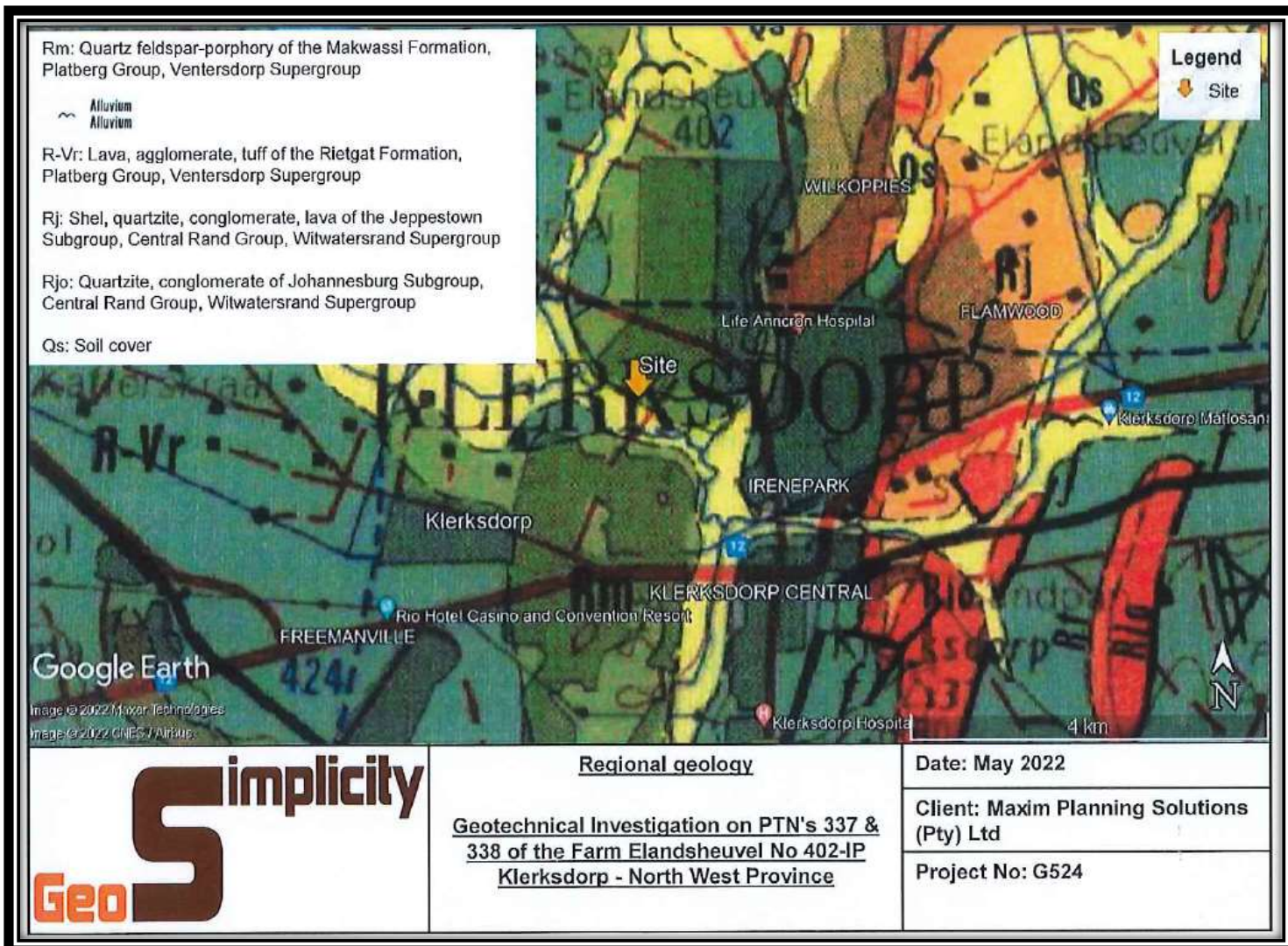


Figure 8: Geotechnical Zoning

7.1.2 TOPOGRAPHY

The site generally falls slightly from the north to the south with an estimated slope in the order of 2%. No rocky ridges are present at the site. A detailed site survey has been carried out to establish levels. The Layout plan will address issues regarding storm water. As the proposed development will be in close proximity to residential areas, safety of children and people need to be taken into consideration.

7.1.3 CLIMATE

The climate of the area is typical of the South African interior. In the discussion of this variable, certain aspects of rainfall, temperature and wind that can influence the project will be highlighted.

It must be noted that the climatic data are recorded in the Department of Environmental Affairs (1988) climatic data records. Data for Klerksdorp weather station (0436/292) is available. This records were only taken between 1903-1952.

7.1.3.1 Rainfall

The average annual rainfall for the area is 625mm per annum. The highest annual rainfall recorded during the period for which the record is available is 980 mm (1976), while a yearly low of 365mm was recorded in 1903. Of note is the maximum-recorded daily rainfall of 140mm that was recorded during December 1943. Of importance is the fact that monthly minima of zero rainfall have been recorded for 6 months of the year. More recent data (last 10 years' average rainfall) is indicated below for Klerksdorp:



Source: www.worldweatheronline.com/klerksdorp-weather-averages/north-west/za.aspx

(Visited: 14/10/2020)

The variability of rainfall as well as the high intensity events will definitely influence the project. On average however, the impact of rainfall can be considered as positive, as sufficient water is generally available for sustaining vegetation. Extreme dry conditions during dry spells will negatively affect the project due to the secondary effects on vegetation as well as the possibility of fire hazards. Extreme maximum events can also have a negative effect on the project during all its phases.

The overall impact can therefore be considered to be “variable” during the construction and operational phases (local in extent and long term in duration). The likelihood that these impacts may occur is probable, medium in intensity and significance. Steps to mitigate negative effects will be described in various sections of the Management Plan.

Due to the scale of the operation, the rainfall of the area cannot be affected by the project and is therefore “Not Applicable”.

7.1.3.2 Temperature

The average daily maximum temperature for the winter months for the area is approximately 20° C. The average daily minimum for that time of the year is in the order of 2,0° C.

During the summer months, the average daily maximum is in the order of 28° C and the daily average minimum approximately 14°C. The highest daily maximum recorded was 39,2°C while the lowest recorded temperature was -10,2°C.



Source: www.worldweatheronline.com/klersdorp-weather-averages/north-west/za.aspx

(Visited: 14/10/2020)

In combination with a dry spell, such hot temperatures may be favourable for the spreading of veldfires.

The general impact of this variable on the project can be considered as positive during the construction and operational phases. The impacts can however be considered as having low intensity impacts of low significance. The extent is local and short term in duration.

Due to the scale of the project, it is clear that it will have no impact on the environment”.

7.1.3.3 Wind

The average wind direction for the area during the summer months is from the north-to-north easterly quadrant, while during the early spring the direction is more north westerly. Southerly winds generally occur during the winter, but are not frequent. Normally very little wind is experienced during the winter due to the presence of the high-pressure cell situated over the country during that time of the year.

The wind speeds are normally fairly low, but high wind speeds may occur during early spring and during of thundershowers.

Wind can be considered as having a low intensity, and a low significance negative impact on the construction and operational phases of the project. The probability is probable and the impacts are local but short in duration. The project can have no influence on the wind and is therefore “not applicable.

7.1.3.4 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”.

7.1.4 SURFACE DRAINAGE, WETLANDS AND RIPERIAN ZONES






Absence of wetlands

Wetlands such as floodplain wetlands, channelled valley-bottom wetlands, un-channelled valley-bottom wetlands, depressions, seeps and wetland flats appear to be absent at the site. No wetlands are found at the site. An active channel and riparian zone of the Schoonspruit non-perennial river is present at the southern boundary of the site

Relative aquatic biodiversity theme sensitivity at the site is low apart from a small section of the southern part of the site which is very high owing to the presence of an aquatic Critical Biodiversity Area. The site is not part of a Freshwater Ecosystem Priority Area. There is an active channel and riparian zone of the Schoonspruit non-perennial river at the southern part of the site. This Schoonspruit non-perennial river, its riparian zone and its buffer zone of 32 m are excluded from the proposed developments. There is no distinct impact that the proposed development will have on the river of which the outer edge of the riparian zone. A Specialist has delineated the riparian zone and has indicated a buffer zone. See Figure 9.



Figure 9: Riparian zone and buffer zone of the Schoonspruit.

	Red outline	Boundaries of the site
	Blue outline	Route of active channel of a non-perennial river (Schoonspruit)
	Green outline	Outer edge of riparian zone
	Orange outline	Outer edge of buffer zone (32 m)
	Dark blue outline and shading	Artificial waterbody at the site

7.1.5 GROUND WATER

Groundwater seepage, ranging from localized pinhole seepage to strong groundwater flow occurred in 60% of the test holes dug with groundwater standing between 100mm and 300mm in test holes, 30 minutes after digging was completed. Possible infiltration into the groundwater must be taken into account. During the construction phase, no spills of lubricants or construction worker sewage should be allowed to pollute the ground water.

7.1.6 FLORA AND FAUNA

Grassland at the site is represented by the Vaal-Vet Sandy Grassland (Gh 10) vegetation type (Mucina & Rutherford, 2006).

Gh 10 Vaal-Vet Sandy Grassland

Distribution: In South Africa the Vaal-Vet Sandy Grassland is present in the North-West Province and Free State Province. Vaal-Vet Sandy Grassland ranges from south of Lichtenburg and Ventersdorp to Klerksdorp, Leeudoringstad, Bothaville and to the Brandfort areas north of Bloemfontein. Altitude ranges from 1 220 – 1560 m for the entire vegetation type (Mucina & Rutherford 2006).

Vegetation and landscape features: Plains-dominated landscape with some scattered, slightly undulating plains and hills. Mainly low-tussock grasslands with an abundant karroid element are present. Dominance of *Themeda triandra* is an important feature of this vegetation unit. Locally low cover of *Themeda triandra* and the associated increase in *Elionurus muticus*, *Cymbopogon pospischilii* and *Aristida congesta* is attributed to heavy grazing and/or erratic rainfall. Geology and soils: Aeolian and colluvial sand overlying sandstone, mudstone, and shale of the Karoo Supergroup (mostly the Ecca group) as well as older Ventersdorp Supergroup and basement gneiss in the north (Mucina & Rutherford 2006).

Climate: Warm-temperate, summer-rainfall climate, with overall mean annual precipitation of 530 mm. High summer temperatures. Severe frost (37 days per year on average) occurs in winter (Mucina & Rutherford 2006).

Important taxa of the Vaal-Vet Sandy Grassland listed by Mucina & Rutherford (2006): Graminoids: *Antheophora pubescens*, *Aristida congesta*, *Chloris virgata*, *Cymbopogon caesius*, *Cynodon dactylon*, *Digitaria argyrograpta*, *Elionurus muticus*, *Eragrostis chloromelas*, *Eragrostis lehmanniana*, *Eragrostis plana*, *Eragrostis trichophora*, *Heteropogon contortus*, *Panicum gilvum*, *Setaria sphacelata*, *Themeda triandra*, *Tragus berteronianus*, *Brachiaria serrata*, *Cymbopogon pospischilii*, *Digitaria eriantha*, *Eragrostis curvula*, *Eragrostis obtusa*, *Eragrostis superba*, *Panicum coloratum*, *Pogonarthria squarrosa*, *Trichoneura grandiglumis*, *Triraphis andropogonoides*. Herbs:

Stachys spathulata, *Barleria macrostegia*, *Berkheya onopordifolia* var. *onopordifolia*, *Chamaesyce inaequilatera*, *Geigeria aspera* var. *aspera*, *Helichrysum caespitium*, *Hermannia depressa*, *Hibiscus pusillus*, *Monsonia burkeana*, *Rhynchosia adenodes*, *Selago densiflora*, *Vernonia oligocephala*. Geophytic Herbs: *Bulbine narcissifolia*, *Ledebouria marginata*. Succulent Herb: *Tripteris aghillana* var. *integrifolia*. Low shrubs: *Felicia muricata*, *Pentzia globosa*, *Anthospermum rigidum* subsp. *pumilum*, *Helichrysum dregeanum*, *Helichrysum paronychioides*, *Ziziphus zeyheriana*.

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

Vegetation at the terrestrial zone of the site is a disturbed grassland of which a large part has been ploughed or cultivated in the past. Terrestrial vegetation consists of a grass layer that contains some forbs, a few trees and areas where the cover of the shrub *Asparagus larcinus* approaches bush encroachment. Conspicuous clumps of the indigenous dwarf-shrub *Ziziphus zeyheriana*, is also indicative of disturbance at the site. Indigenous grass species include *Cynodon dactylon*, *Aristida congesta*, *Eragrostis lehmanniana*, *Eragrostis curvula*, *Eragrostis superba*, *Melinis repens*, *Setaria sphacelata*, *Sporobolus africanus* and *Chloris virgata*. Indigenous forb species include *Hilliardiella oligocephala*, *Gazania krebsiana*, *Senecio consanguineus*, *Bulbine narcissifolia*, *Conyza podocephala* and *Monsonia angustifolia*. Alien invasive herbaceous weed species are conspicuous at the site and include *Physalis viscosa*, *Argemone ochroleuca*, *Plantago lanceolata*, *Tagetes minuta*, *Bidens bipinnata*, *Bidens pilosa*, *Gomphrena celosioides*, *Schkuhria pinnata*, *Conyza bonariensis*, *Guilleminea densa*, *Verbena bonariensis*, *Alternanthera pungens*, *Verbena aristigera* and *Chenopodium album*.

Vegetation at the riparian zone consists of a visibly dense tree layer that abruptly ends at the intersection with the terrestrial zone. Exotic tree species are conspicuously frequent at the riparian zone and include *Melia azedarach*, *Salix babylonica*, *Gleditsia triacanthos*, *Eucalyptus camaldulensis* and *Morus alba*. Indigenous tree species such as *Vachellia karroo*, *Searsia pyroides*, *Combretum erythrophyllum*, *Ziziphus mucronata* and *Gymnosporia buxifolia* are found at the riparian zone at the site.

No Threatened or Near Threatened plant or animal species appear to be resident at the site. No other plant- or animal species of particular conservation concern appear to be present at the site.

An Endangered ecosystem, the Vaal-Vet Sandy Grassland vegetation type, is mapped for the site. During surveys at the site, it was found that the original vegetation type has been transformed at developed parts, modified at areas that were hitherto ploughed or cultivated and visibly degraded at the remaining part of the grassland at the site. The scope for the site to distinctly contribute to the conservation of Vaal-Vet Sandy Grassland, is small.

Possible ecological sensitivities at the site were indicated by a report generated from the screening tool of DEFFE.

These ecological sensitivities that could possibly/ are present at the site, follow.

Animal species theme sensitivity

Relative animal species theme sensitivity is medium. The possible presence of *Hydriectus maculicollis* (Spotted-necked Otter) that should be investigated is indicated by the screening tool. During the surveys this status quo has been confirmed or could be low instead of medium. The watercourse, the Schoonspruit non-perennial river at the western boundary of the site as well as the small artificial waterbody associated with it, are not ideal habitats for *Hydriectus maculicollis* (Spotted-necked Otter), which favours more open permanent waters. No distinct possibility that the site could be used as specific habitat or foraging area by *Hydriectus maculicollis* could be observed.

Aquatic biodiversity theme sensitivity

Relative aquatic biodiversity theme sensitivity at the site is low apart from a small section of the southern part of the site which is very high owing to the presence of an aquatic Critical Biodiversity Area. The site is not part of a Freshwater Ecosystem Priority Area. There is an active channel and riparian zone of the Schoonspruit non-

perennial river at the southern part of the site. This Schoonspruit non-perennial river, its riparian zone and its buffer zone of 32 m are excluded from the proposed developments. There is no distinct impact that the proposed development will have on the river of which the outer edge of the riparian zone.

Plant species theme sensitivity

Relative plant species theme sensitivity is low and medium, the latter owing to the possible occurrence of a sensitive species which is not threatened but which could be prone to harvesting. Possible sensitive plant species of which the likely presence or absence have been investigated are listed in Tables 4.2 – 4.9 and include plant species on a local and provincial scale which could be prone to harvesting. No Threatened or Near Threatened plant species or any of the plant sensitive species that are not threatened but which are prone to harvesting, appear to be present at the site.

Terrestrial biodiversity theme sensitivity

Relative terrestrial biodiversity at the site is very high. This high sensitivity that is ascribed to the site area, is because of the presence of Critical Biodiversity Area 2, the presence of an Endangered ecosystem, the Vaal-Vet Sandy Grassland that is mapped for the site and the possibility of including the site in a Protected Area Expansion strategy. During surveys at the site, it was found that the original vegetation type has been transformed at developed parts, modified at areas that were hitherto ploughed or cultivated and visibly degraded at the remaining part of the grassland at the site. The scope for the site to distinctly contribute to the conservation of Vaal-Vet Sandy Grassland, is small.

Ecological sensitivity at the site is very low at the developed area, low at the areas that were hitherto cultivated and medium at the remainder of the terrestrial zone. The ecological sensitivity, at the active channel (streambed) and riparian zone of the Schoonspruit non-perennial river, and the small associated artificial waterbody, is high. The active channel, riparian zone and buffer zone (32 m) of the Schoonspruit non-perennial river, which are an important corridor in the larger area, are excluded from the development. Please see Figure 10 for a sensitivity map generated by the Specialist.

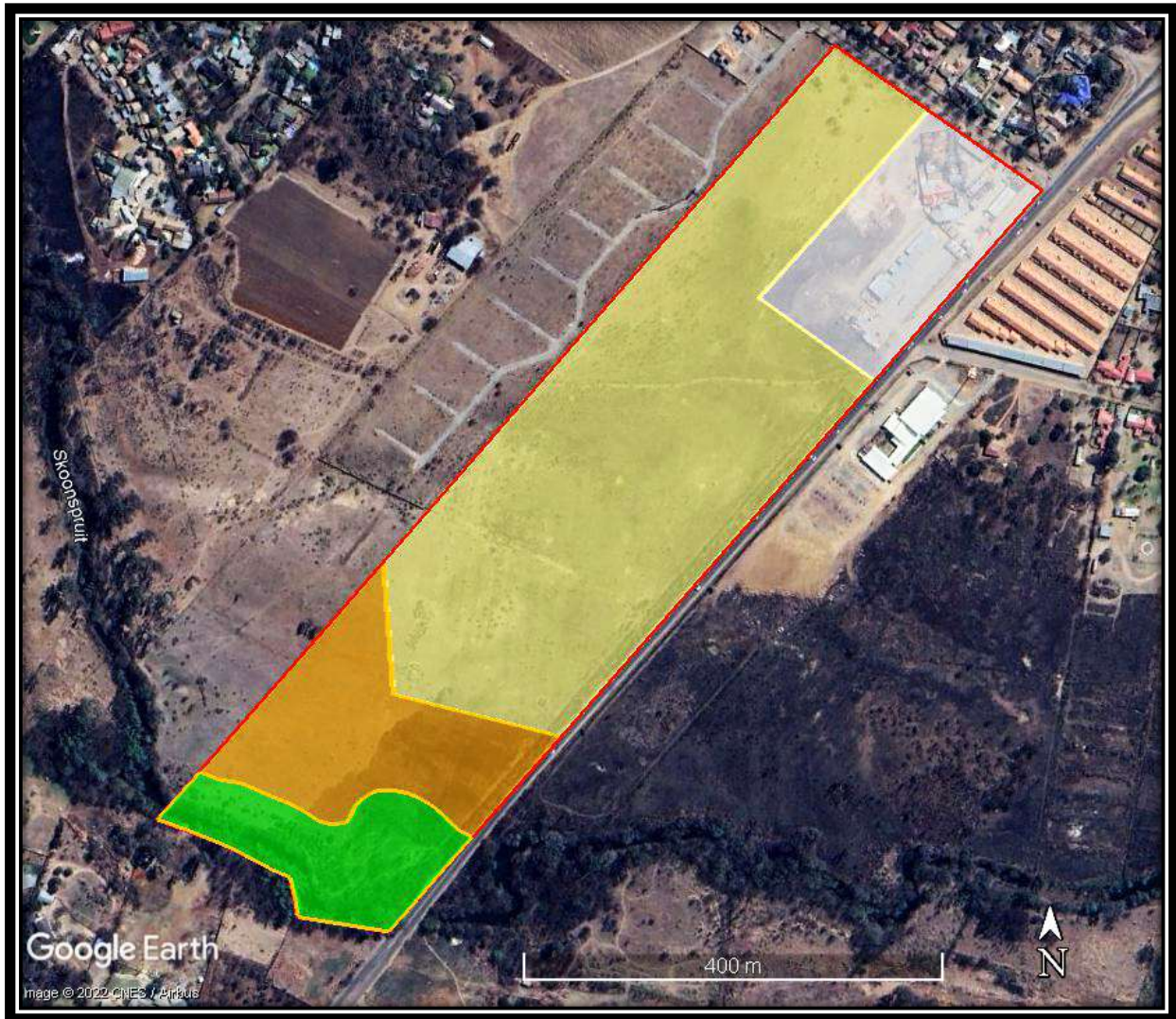







FIGURE 10: INDICATIONS OF ECOLOGICAL SENSITIVITY AT THE SITE.

	Red outline	Boundaries of the site
	Green outline and shading	High sensitivity
	Orange outline and shading	Medium sensitivity
	Light yellow outline and shading	Low sensitivity
	White outline and shading	Very Low sensitivity

Habitat and vegetation characteristics (Reference to Tables listed in this section refers to the Fauna and Flora Habitat Report. Appendix C of this Report.)

Plants

Extinct, threatened, near threatened and other plant species of high conservation priority in North West Province are listed in Tables 4.2 – 4.8. (Of the Fauna and Flora Habitat Report. Appendix C of this Report.) Protected tree species

are listed in Table 4.9. (Of the Fauna and Flora Habitat Report. Appendix C of this Report.). The presence or not of all the species listed in the tables were investigated during the survey. None of the Threatened and Near Threatened plant species are likely to occur on the site. No other plant species of particular conservation concern is likely to occur at the site.

Threatened, Near Threatened and other plant species of high conservation priority in North West Province are listed in Tables 4.2 – 4.8. Protected tree species are listed in Table 4.9. The presence or not of all the species listed in the tables were investigated during the survey.

None of the Threatened and Near Threatened plant species are likely to occur on the site. One plant species that is not threatened but listed as Declining occurs at the site, *Hypoxis hemerocallidea* (African Star Flower).

Apart from *Hypoxis hemerocallidea* which is a Declining plant species, none of the other plant species of particular conservation priority appear to occur at the site.

Vertebrates

Mammals

Table 4.10, Table 4.11 and Table 4.12 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. Literature sources that were used are Friedman & Daly (2004), Skinner & Chimimba (2005) and Child *et al.* (2017). Since the site falls outside reserves, threatened species such as the black rhinoceros (*Diceros bicornis*) and the African wild dog (*Lycaon pictus*) are obviously not present. No smaller mammals of particular high conservation significance are likely to be found on the site as well.

Birds

Table 4.13 and Table 4.14 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 are on the particular likely dependence or not of bird species on the site. Literature sources that were mainly consulted are Barnes (2000), Hockey, Dean & Ryan (2005) and Chittenden *et. al.* (2016). No threat to any threatened bird species or any bird species of particular conservation importance are foreseen.

Reptiles

Table 4.15 and Table 4.16 list the possible presence or absence of Threatened and Near Threatened reptile species on the site. Main Source used for the conservation status and identification of reptiles are Bates, Branch, Bauer, Burger, Marais, Alexander & de Villiers (2014). Alexander & Marais (2007) as well as Tolley & Burger 2007) give useful indications of distributions, habitats and identification of the reptile species. There appears to be no threat to any reptile species of particular high conservation importance if the site is developed.

Amphibians

No frog species that occur in the North West are listed as Threatened species (Vulnerable, Endangered or Critically Endangered) or Near Threatened species according to IUCN Amphibian Specialist Group (2013). Table 4.17 lists *Pyxicephalus adspersus* (Giant Bullfrog) as Least Concern globally. According to the Biodiversity Management Directorate of GDARD (Gauteng Department of Agriculture and Rural Development) (2014) there are no amphibians in Gauteng that qualify for red listed status (red listed here indicates a category of special conservation concern such as threatened or near threatened). Suitable habitat for Giant Bullfrog at site appears to be absent.

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; Edge 2002, 2005; Terblanche, Morgenthal & Cilliers 2003; Lubke, Hoare, Victor & Ketelaar 2003; Edge, Cilliers & Terblanche, 2008). Threatened butterfly species in South Africa can then be regarded as bio-indicators of rare ecosystems.

Four species of butterfly in Gauteng Province and North West Province combined are listed as threatened in the recent butterfly conservation assessment of South Africa (Mecenero *et al.*, 2013). The expected presence or not of these threatened butterfly species as well as species of high conservation priority that are not threatened, at the site (Table 4.18 and Table 4.19) follows.

Assessment of threatened butterfly species

***Aloeides dentatis dentatis* (Roodepoort Toothed Russet)**

The proposed global red list status for *Aloeides dentatis dentatis* according to the most recent IUCN criteria and categories is Endangered (Mecenero *et al.*, 2013). *Aloeides dentatis dentatis* colonies are found where one of its host plants *Hermannia depressa* or *Lotononis eriantha* is present. Larval ant association is with *Lepisiota capensis* (S.F. Henning 1983; S.F. Henning & G.A. Henning 1989). The habitat requirements of *Aloeides dentatis dentatis* are complex and not fully understood yet. See Deutschländer and Bredenkamp (1999) for the description of the vegetation and habitat characteristics of one locality of *Aloeides dentatis* subsp. *dentatis* at Ruimsig, Roodepoort, Gauteng Province. There is not an ideal habitat of *Aloeides dentatis* subsp. *dentatis* on the site and it is unlikely that the butterfly is present at the site.

***Chrysothrix aureus* (Golden Opal/ Heidelberg Copper)**

The proposed global red list status for *Chrysothrix aureus* according to the most recent IUCN criteria and categories is Endangered (Mecenero *et al.*, 2013) *Chrysothrix aureus* (Golden Opal/ Heidelberg Copper) is a resident where the larval host plant, *Clusia pulchella* is present. However, the distribution of the butterfly is much more restricted than that of the larval host plant (S.F. Henning 1983; Terblanche, Morgenthal & Cilliers 2003). One of the reasons for the localised distribution of *Chrysothrix aureus* is that a specific host ant *Crematogaster liengmei* must also be present at the habitat. Fire appears to be an essential factor for the maintenance of suitable habitat (Terblanche, Morgenthal & Cilliers 2003). Research revealed that *Chrysothrix aureus* (Golden Opal/ Heidelberg Copper) has very specific habitat requirements, which include rocky ridges with a steep slope and a southern aspect (Terblanche, Morgenthal & Cilliers 2003). Owing to a lack of habitat requirements and ideal habitat the presence of the taxon is highly unlikely.

***Lepidochrysops praeterita* (Highveld Blue)**

The proposed global red list status for *Lepidochrysops praeterita* according to the most recent IUCN criteria and categories is Endangered (G.A. Henning, Terblanche & Ball, 2009; Mecenero *et al.*, 2013). *Lepidochrysops praeterita* is a butterfly that occurs where the larval host plant *Ocimum obovatum* (= *Becium obovatum*) is present (Pringle, G.A. Henning & Ball, 1994), but the distribution of the butterfly is much more restricted than the distribution of the host plant. *Lepidochrysops praeterita* is found on selected rocky ridges and rocky hillsides in parts of Gauteng, the extreme northern Free State and the south-eastern Gauteng Province. No ideal habitat appears to be present for the butterfly on the site. It is unlikely that *Lepidochrysops praeterita* would be present on the site and at the footprint proposed for the development.

***Orachrysops mijburghii* (Mijburgh's Blue)**

The proposed global red status for *Orachrysops mijburghii* according to the most recent IUCN criteria and categories is Endangered (Mecenero *et al.*, 2013). *Orachrysops mijburghii* favours grassland depressions where specific *Indigofera* plant species occur (Terblanche & Edge 2007). The Heilbron population of *Orachrysops mijburghii* in the Free State uses *Indigofera evansiana* as a larval host plant (Edge, 2005) while the Suikerbosrand population in Gauteng uses *Indigofera dimidiata* as a larval host plant (Terblanche & Edge 2007). There is no suitable habitat for *Orachrysops mijburghii* on the site and it is unlikely that *Orachrysops mijburghii* would be present on the site.

Conclusion on threatened butterfly species

There appears to be no threat to any threatened butterfly species if the site is developed.

Assessment of butterfly species that are not threatened but also of high conservation priority

Metisella meninx (Marsh Sylph)

Henning and Henning (1989) in the first South African Red Data Book of Butterflies, listed *Metisella meninx* as threatened under the former IUCN category Indeterminate. Even earlier in the 20th century Swanepoel (1953) raised concern about vanishing wetlands leading to habitat loss and loss of populations of *Metisella meninx*. According to the second South African Red Data Book of butterflies (Henning, Terblanche & Ball, 2009) the proposed global red list status of *Metisella meninx* has been Vulnerable. During a recent large scale atlasing project the Conservation Assessment of Butterflies of South Africa, Lesotho and Swaziland: Red List and Atlas (Mecenero et al., 2013) it was found that more *Metisella meninx* populations are present than thought before. Based on this valid new information, the conservation status of *Metisella meninx* is now regarded as Near Threatened (Mecenero et al., 2020). Though *Metisella meninx* is more widespread and less threatened than perceived before, it should be regarded as a localised rare habitat specialist of conservation priority, which is dependent on wetlands with suitable patches of grass at wetlands (Terblanche In prep.). Another important factor to keep in mind for the conservation of *Metisella meninx* is that based on very recent discoveries of new taxa in the group the present *Metisella meninx* is species complex consisting of at least three taxa (Terblanche In prep., Terblanche & Henning In prep.). The ideal habitat of *Metisella meninx* is treeless marshy areas where *Leersia hexandra* (rice grass) is abundant (Terblanche In prep.). The larval host plant of *Metisella meninx* is wild rice grass, *Leersia hexandra* (G.A. Henning & Roos, 2001). There is no ideal habitat for the butterfly at the site and the butterfly species is likely to be absent at the site.

Fruit chafer beetles

Table 4.20 lists the fruit chafer beetle species (Coleoptera: Scarabaeidae: Cetoninae) that are of known high conservation priority in the North West Province. No *Ichneustoma stobbiai* or *Trichocephala brincki* were found during the surveys. There appears to be no suitable habitat for *Ichneustoma stobbiai* or *Trichocephala brincki* at the site. There appears to be no threat to any of the fruit chafer beetles of particular high conservation priority if the site were developed.

Scorpions

Table 4.21 lists the rock scorpion species (Scorpiones: Ischnuridae) that are of known high conservation priority in the North West Province. None of these rock scorpions have been found at the site and the habitat does not appear to be optimal.

7.1.7. 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.

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).

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.

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) 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).

7.1.9 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. It is unlikely that the project will create any more noise during the operational phase than that already experienced on site.

7.2 SOCIOLOGICAL AND ECONOMIC ISSUES

7.2.1 SOCIAL AMENITIES

7.2.2 ARCHAEOLOGY AND CULTURAL SITES

A number of known cultural heritage sites exist in the larger geographical area within which the study area falls. The author also identified and recorded some sites during previous studies on other portions of Elandsheuvel 402IP. There are no known sites on the specific land parcel, except for the possible remnants of an old water furrow. This assessment utilized old maps and aerial images as well as other sources on the cultural heritage of the study area. Based on this it is evident that there is a low likelihood (besides the water furrow remains) of any significant cultural heritage (archaeological and/or historical) sites or features being present in the area. If any did exist here in the past it would have been extensively disturbed or destroyed as a result of recent developments.

Finally, it is recommended that Exemption from a Full Phase 1 HIA be granted for the proposed Subdivision of a Portion of the Remaining Extent of Portions 337 & 338 of Elandsheuvel 402IP, located in Klerksdorp, Northwest Province. However, if any future development related to this Subdivision is planned then a detailed assessment of the old water furrow needs to be undertaken in order to determine its significance and state or preservation. Recommendations on the way forward will then be provided should there be any impacts on the feature as a result of the planned development.

The subterranean nature of the cultural heritage (archaeological and/or historical) resources, including low stone-packed or unmarked graves, should also always be taken into consideration. Should any previously unknown or invisible sites, features or material be uncovered during any development actions then an expert should be contacted to investigate and provide recommendations on the way forward.

7.2.3 AESTHETICS

Although the proposed new development for which this assessment was undertaken will not directly impact on the Schoonspruit, it is recommended that the new development should take the close proximity of the area into consideration during the related development actions. Any Visual Impacts on the Heritage Hill should be avoided therefore and the sense of place should be preserved. Visual Intrusion is defined as the level of compatibility or congruence of the project with the particular qualities of the area, or its 'sense of place'. This is related to the idea of context and maintaining the integrity of the landscape or townscape.

High visual intrusion – results in a noticeable change or is discordant with the surroundings;

Moderate visual intrusion – partially fits into the surroundings, but clearly noticeable;

Low visual intrusion – minimal change or blends in well with the surroundings.

The proposed development will change the scenic resources of the local area from an undeveloped Agricultural site to an Agricultural Small Holding and Recreational development. The visual intrusion is considered to be moderate as the proposed development would fit in well with the nearby residential developments, it is acknowledged that it will be noticeable, however due to the scale of the proposal, it is unlikely to have a detrimental visual impact.

The proposed development will require additional lighting on and in buildings and possibly along roads. This will change the night landscape from unlit to lit.

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		
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 taking into account the 1:100 year flood line and a 30m buffer zone from the edge of the riparian zone of the Molopo river to the ECO's satisfaction.	Land clearing must be restricted to the demarcated working area, with a form of demarcation clearly indicating the buffer zone to the non - perennial river 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. 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 Availability of safety kits to prevent oils/toxic materials spreading in the environment	Clean environment Safe storage of materials	No spills of chemicals Proper storage provided

ENVIRONMENTAL ASPECTS	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS
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 Wash bay and oil trap to be provided	No spills of oil Cleaning area for vehicles	No oil spills from 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		
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	<ul style="list-style-type: none"> • Minimise scarring of the soil surface and land features • Minimise disturbance and loss of soil 	No erosion or sedimentation.
Vegetation		

ENVIRONMENTAL ASPECTS	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS
The contractor must avoid vegetated areas that will not be cleared.	<ul style="list-style-type: none"> Minimise construction footprint 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.	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> Disposal of rubble and refuse in an appropriate manner with no rubble and refuse lying on site Sufficient containers available on site
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

The following **Environmental Impact Management Outcomes** has been identified:

1. A full copy of the signed EA from DEDECT 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. No construction workers or machinery will be allowed within the no-go area that is defined as the non-perennial river, including its riparian and buffer zone.
8. 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.

9. No disturbance of topsoil & subsoil may commence until such time as the development footprint has been clearly defined.
10. No disturbance of topsoil & subsoil outside of the development footprint may occur.
11. At the end of the construction phase the site and its surrounding area (Including the non-perennial stream) must be free from any chemical, fuel, oil and cement spills that originated as a result of the construction activities.
12. At the end of the construction phase the site and its surrounding area (Including the non-perennial stream) must be free from any sewage that originated as a result of the construction activities.
13. At the end of the construction phase the site and its surrounding area (Including the non-perennial stream) must be free from any hazardous or general waste pollution that originated as a result of the construction activities.
14. Dust prevention measures must be applied to minimise the generation of dust.
15. Noise prevention measures must be applied to minimise the generation of unnecessary noise pollution as a result of construction activities on site.
16. Absolutely no burning of waste is permitted.
17. Fires will only be allowed in facilities especially constructed for this purpose.
18. No hunting of animals will be allowed.
19. No intentional destruction of any sites, features or material of cultural heritage (archaeological and/or historical) origin or significance may occur.
20. All Contractors and sub-contractors must abide to the rules and regulations of the Occupational Health and Safety Act, 85 of 1993.

10. MITIGATION MEASURES

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 from DEDECT 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 document must explain the roles and responsibilities of everyone involved	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

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
		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 must be kept to the approved development area.	A Land surveyor must peg the parameters of the development footprint. Ensure No encroachment on the Buffer zone of the Schoonspruit.	Construction vehicles, machinery and workers must be restricted to only operate within the approved development footprint.	Ensure that the Buffer zone of the Schoonspruit is not intruded upon.	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.
			The development footprint must be clearly demarcated and the extent of this area must be communicated to all contractors and sub-contractors. Demarcate the Buffer zone of the Schoonspruit.		
			Existing access roads must be utilised to access the site camp(s) and working/ construction areas		
			Appropriate traffic management strategies must be implemented to ensure the safety of construction vehicles and other road-users.		

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			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.		
VEGETATION CLEARING	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.	Land clearing must be restricted to the demarcated working area, and no vegetation may be cleared outside of the demarcated working area.	No action required	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.
	No clearance of vegetation outside of the development footprint may occur.				
NO-GO AREA	No construction workers or machinery will be allowed within the no-go area that is defined as the Buffer zone of the Schoonspruit.	The no-go area must be clearly defined.	The no-go area that is defined as the Buffer Zone of the Schoonspruit must be clearly demarcated.	The no-go area must be preserved.	The developer must ensure that a Land surveyor pegs the parameters of the no-go area and that all concerned are trained in this regard. The ECO will monitor compliance.

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
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	No action required	The developer must ensure that a storm water management plan is developed. The ECO must monitor compliance.
			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 fill sloped routes without erosion protection measures being in place		
			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		

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			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		
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.	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.	No action required	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 Contractor will be responsible for the removal and correct stockpiling of the topsoil and subsoil. The ECO will monitor compliance.
			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.		
			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/ 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.		
			Removed subsoil should be stockpiled separately from topsoil. Handling of topsoil should be minimized as much as possible, and the location of the		

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
	No disturbance of topsoil & subsoil outside of the development footprint may occur.		<p>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.</p> <p>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.</p> <p>Topsoil should be the final layer applied during rehabilitation, after subsoil/ spoil material has been placed and shaped.</p>		
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.	CHEMICALS			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.
		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;	No Action required	
			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					

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			<p>All hazardous chemicals that will be used on site must have Material Safety Data Sheets (MSDS);</p> <p>All employees working with HCS must be trained in the safe use of the substance and according to the safety data sheet</p> <p>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</p>		
		FUEL AND OIL			
		The Contractor must provide method statements for the storage and handling of fuel and oil on site.	The Contractor must ensure that diesel and other liquid fuel, oil and hydraulic fluid is stored in appropriate storage tanks or in bowsers	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>
			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 water courses)		
			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		
			The floor of the bund must be sloped, draining to an oil separator		

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			<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 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>		

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			<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> <p>Construction area must be monitored for oil and fuel spills</p> <p>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.</p>		
		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,	<p>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</p> <p>Cleaning of cement mixing and handling equipment must be done using proper cleaning trays</p> <p>All empty containers must be stored in a dedicated area and later removed from the site for appropriate disposal at a licensed facility</p>	No Action required	The Contractor will be responsible for providing method statements. He will also be responsible for training of staff in this regard.

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
		washing & disposal of cement, packaging, tools and plants	<p>Any spillage that may occur must be investigated and immediate remedial action must be taken</p> <p>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</p> <p>Cement batching areas must be located in an area where residues are contained and that the location does not fall within storm water channels</p>		The ECO will monitor compliance.
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	<p>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.</p> <p>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</p> <p>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.</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>

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	Waste must be separated into recyclable and non-recyclable waste, and must be separated as follows: <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 	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>
			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.		
			Bins must be clearly marked for ease of management		
			All refuse bins must have a lid secured so that animals cannot gain access		
			Sufficient closed containers must be strategically located around the construction site to handle the amount of litter, wastes,		

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			<p>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 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</p>		
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	All forms of dust pollution must be managed in terms of the National Environmental Management: Air quality Act, 2004 (Act No 39 of 2004)).	No Action required	The Contractor will be responsible for providing method statements. He

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
		method statement must provide information on the proposed source of water to be utilised.	<p>Acceptable dust fall rates for residential areas are: Dust fall rate (D) (mg/m²/day, 30 days average): D<600 Permitted frequency of exceeding dust fall rate: Two within a year, not sequential months</p> <p>Removal of vegetation must be avoided until such time as soil stripping is required and similarly exposed surfaces must be revegetated or stabilised as soon as is practically possible.</p> <p>Excavation, handling and transport of erodible materials must be avoided under high wind conditions or when a visible dust plume is present</p> <p>The construction camp must be watered during dry and windy conditions to control dust fallout.</p> <p>Dust production must be controlled by regular watering of roads and work area, should the need arise</p> <p>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</p>		<p>will also be responsible for training of staff in this regard.</p> <p>The ECO will monitor compliance.</p>

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			<p>Where possible, soil stockpiles must be located in sheltered areas where they are not exposed to the erosive effects of the wind</p> <p>Where erosion of stockpiles becomes a problem, erosion control measures must be implemented at the discretion of the ECO</p> <p>Vehicle speeds must not exceed 40 km/h along dust roads or 20 km/h when traversing unconsolidated and non-vegetated areas</p>		
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.	<p>All vehicles and machinery must be fitted with appropriate silencing technology and must be properly maintained.</p> <p>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.</p> <p>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.</p> <p>Any complaints received by the Contractor regarding noise must be recorded and</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>

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			communicated. Where possible or applicable, provide transport to and from the site on a daily basis for construction workers.		
FIRES	Absolutely no burning of waste is permitted.	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.	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.
	Fires will only be allowed in facilities especially constructed for this purpose.		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		
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 Act, 1962 (Act No. 71 of 1962)	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 caught poaching will be dismissed. Employees must be trained on how to deal with fauna species as intentional killing will not be	No Action required	The Contractor will be responsible for providing method statements. He will also be responsible for training of staff in this regard.

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			<p>tolerated. In the case of a problem animal e.g. a large snake, a specialist must be called in to safely relocate the animal.</p> <p>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.</p>		The ECO will monitor compliance.
HERITAGE	No intentional destruction of any sites, features or material of cultural heritage (archaeological and/or historical) origin or significance may occur.	Identify any sites, features or material of cultural heritage (archaeological and/or historical) origin or significance.	<p>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.</p> <p>Carry out general monitoring of excavations for potential fossils, artefacts and material of heritage importance.</p> <p>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.</p> <p>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</p>	No Action required	<p>The developer and applicant.</p> <p>Study to be conducted by a suitable qualified specialist.</p> <p>Findings to be monitored by the ECO.</p>

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			professional investigation can be undertaken. Sufficient time must be allowed to remove/collect such material before development recommences		
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	No actions required	Health and safety officer.
		Compile an Emergency Response Action Plan (ERAP) prior to the commencement of the project	The contractor must ensure that all emergency procedures are in place prior to commencing work. 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.		
			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.		
			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		
			All unattended open excavations must be adequately fenced or demarcated.		
			Maintain an incidents and complaints register in which all incidents or complaints involving the public are logged.		

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			<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>		

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 should make allowance for all construction workers, including all subcontractors 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 process and how the EMP fits into this process.

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 **Mnr. Joachim Michiel Hendrik Bester** Ultimately, he 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) 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 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 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 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.

11.3 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	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).	Proponent	Once-off
	The Proponent must provide the ECO with a copy of the EMPr.	ECO	Once-off
	The ECO must form part of the project management team and should attend the monthly project progress meetings.	ECO	Continuous
	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.	ECO, Contractor	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	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.	Contractor, Proponent, ECO	Prior to commencement of work
	The Contractor must maintain a database of all pertinent permits and permissions required for the contract.	Contractor, Proponent, ECO	Continuous
5. Method Statements	The Contractor must submit written Method Statements to the PM and ECO for the activities identified during consultation.	Contractor, PM, ECO	As required
	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.	Contractor, PM, ECO	As required
	The Contractor may not commence work on that activity until such time as the Method Statement has been approved in writing.	Contractor, PM, ECO	Continuous
	The Contractor must carry out the activities in accordance with the approved Method Statement.	Contractor, PM, ECO	Continuous
	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	The Contractor must ensure that existing services (e.g. roads, pipelines, power lines and telephone services) are not damaged or disrupted unless	Contractor, PM, ECO	Continuous

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
	required by the contract and with the permission of the PM, ensuring the necessary way-leaves; permissions and permits are in place.		
	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.	Contractor	As required
	The Contractor must adhere to any time limits for the repairs that may be stipulated by the PM in consultation with the Contractor.	Contractor, ECO	As required
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	Local labour must be used wherever possible to stimulate the local economy.	Contractor	Once-off
	The Contractor should use labour intensive construction measures where appropriate, practical and financially feasible.	Contractor	Once-off
	The workforce should be trained to benefit individuals beyond the completion of the project.	Contractor	Once-off
	The Contractor should use local suppliers where possible.	Contractor	Once-off
	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.	PM	Continuous
	Equal opportunities for employment should be created to ensure that all sectors of society (especially women) have equal access to such opportunities.	Contractor	Continuous
9. Training of staff	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.	Contractor, ECO	Once-off
	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.	Contractor, ECO	Once-off
	Training must be provided to the staff members in the use of the appropriate fire-fighting equipment.	Contractor, Health and Safety Officer	Once-off
	The Contractor must ensure that all staff operating machinery/construction vehicles are adequately trained to carry out the designated tasks.	Contractor, Health and Safety Officer	Once-off
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

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
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. 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	Contractor	Continuous
	Ensure vehicles are checked weekly for faults and serviced timeously if faulty	Contractor	As required
	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	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
	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. Stockpiles	Soil stockpiles must not be situated within 50m of any water course.	Contractor, ECO	Monthly
	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.	Contractor, ECO	Monthly
	Stockpiles must be kept clear of weeds and alien vegetation growth by regular weeding.	Contractor, ECO	Monthly
	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.	Contractor, ECO	Monthly
	Stockpiles must not exceed 2m in height unless otherwise permitted by the PM and / or ECO.	Contractor, ECO	Monthly
20. Erosion control	Wind screening and stormwater control must be undertaken where required by the ECO to prevent soil loss from the site.	Contractor, ECO	Twice monthly

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
	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. 	Contractor, ECO Contractor, ECO	Twice monthly
	Sensitive areas need to be identified prior to construction so that the necessary precautions can be implemented.	Contractor, ECO	Twice monthly
	All erosion control mechanisms need to be regularly maintained.	Contractor, ECO	Twice monthly
	Re-vegetation of disturbed surfaces must occur as soon as possible after construction activities are completed.	Contractor, ECO	Twice monthly
	No impediment to the natural water flow o site other than approved erosion control or rehabilitation works is permitted.	Contractor, ECO	Twice monthly
	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
21. 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 watercourses 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
22. Cement batching and concrete	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

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
23. Hydrology and stormwater	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
	No rubble, litter or sand may be deposited into any freshwater systems or water courses.	Contractor, ECO	Monthly
24. General materials handling, use and storage	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.	Contractor, ECO, Health and Safety Officer	Once-off
	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.	Contractor, ECO	Monthly
	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
25. Fuel storage	Hazardous substances must be stored at least 50m away from any water bodies on site to avoid pollution.	Contractor, ECO	Monthly
	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
26. Transportation	Contaminated soil must be contained and disposed of off-site at an approved hazardous waste disposal site.	Contractor, ECO	Monthly
	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 clean-up resulting from the failure by his employees or suppliers to properly secure transported materials.	Contractor, ECO, Health and Safety Officer	Monthly
27. General waste management	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.	Contractor, ECO	Weekly/ Monthly

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
	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.	Contractor, ECO, PM, Health and Safety Officer	Monthly
	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.	Contractor, ECO	Monthly
	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.	Contractor, ECO	Monthly
	If possible and feasible, all waste generated on site must be separated into glass, plastic, paper, metal and wood and recycled.	Contractor, ECO	Monthly
28. Hazardous management	waste 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.	Contractor, ECO	As required
	Staff must be trained in the identification of hazardous waste.	Contractor, ECO	As required
	Temporary storage and disposal of hazardous waste is regulated by legislation which must be complied with, i.e. the Occupational Health and Safety Act.	Contractor, ECO	Monthly
29. Noise	The Contractor must aim to adhere to the relevant noise regulations and limit noise to within standard working hours.	Contractor, ECO	Monthly
	Construction site camp and other noisy facilities must be located well away from noise sensitive neighbours.	Contractor, ECO	Once-off
	Truck traffic must be routed away from noise sensitive areas, where possible.	Contractor, ECO	As required
	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.	Contractor, ECO	Monthly
	Noisy operations must be combined so that they occur where possible at the same time.	Contractor, ECO	Monthly
	Construction activities must be contained to reasonable working hours. Night-time activities near noise sensitive receptors must not be allowed.	Contractor, ECO	Monthly
	With regard to unavoidable noisy construction activities, the Contractor must liaise with local residents to inform them of such events.	Contractor	As required
	As construction workers operate in a noisy environment, it must be ensured that their working conditions comply with the requirements of the Occupational Health and Safety Act (Act No 85 of 1993). Where necessary, ear protection gear must be worn.	Contractor, ECO, Health and Safety Officer	Monthly
	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
30. 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

Activity/Impact		Action Required	Responsible Party	Monitoring Frequency	
		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	
31.	Personal Equipment	Protective	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 where 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	
32.	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 **Mnr. Joachim Michiel Hendrik Bester** 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 and the amount of the fine. 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, the Contractor shall be required to make good any damage caused as a result of the infringement at his own expense.