

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 6 174 square meters ha of indigenous vegetation, located within a Terrestrial CBA 2 and an Aquatic CBA 1, in order to establish a Clinic, located on Portion 64 (Portion of Portion 1) of the farm Buffelspoort No. 343-J.Q., 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 6 174 square meters ha of indigenous vegetation, located within a Terrestrial CBA 2 and an Aquatic CBA 1, in order to establish a Clinic, located on Portion 64 (Portion of Portion 1) of the farm Buffelspoort No. 343-J.Q., 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 SAHRA Specialist.
- Botanical Specialist (Fauna and Flora habitat specialist)
- Registered Environmental Assessment Practitioner (EAP)

They were responsible for the following actions:

- A SAHRA Specialist has been appointed to determine the possible impact of the development on Archaeological and Cultural features.
- A Fauna and Flora Habitat 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.
- The inputs from Specialists, interested and affected parties, together with the knowledge of the EAP is being used to determine measures to avoid, mitigate and manage potential impacts. These measures are described in the Environmental Management Programme.

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 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 be for the establishment of a Clinic, located on Portion 64 (Portion of Portion 1) of the farm Buffelspoort No. 343-J.Q., North West Province. In order to establish the proposed development 6 174 square meters of indigenous vegetation, located within a Terrestrial CBA 2 and an Aquatic CBA 1 will be cleared. The total development footprint will be 2,2489 ha. A Fauna and Flora Habitat Specialist has been appointed to assess the sensitivity of the site and to determine the extent of indigenous vegetation that will be removed. As most of the site has been used for residential purposes and gardens, the assessment revealed that of the 2,2489ha that the development entails, only 0,8851 ha can be defined as indigenous vegetation. Please see Figure 1 below for a copy of the proposed layout plan.

Although the existing / temporary facility was developed to accommodate all required medical needs, new Engineering Designs and Concept Drawings was done for the new Proposed Clinic. All stakeholders, medical personal and Platinum health Personal was involved in designing a more practical Clinic Flow. The design and layout of the new clinic was developed to be practical and able to accommodate the required employees and patients during medicals and additional treatment if required. It will also include a 24/7 emergency facility. The design includes placement of critical areas, such as the Reception area, Vitals, "Hearing Testing", X – Rays, archives, 24/7 treatment facility, consulting Rooms, Filing and storage facilities, Ablution / Toilet facility and IT Server Room.

The proposed development will make provision for the following:

- Clinic (702,29m²) with:
 - Waiting area
 - X-ray room
 - Consulting rooms
 - Emergency room (24/7)
 - Eye test room
 - Hearing audio room
- Ablution facility (104,90m²)
- Guard / gate house (for entrance and exit control)

- Parking area and ambulance parking (interlock brick paved drive-way)
 - Medical waste storage
 - Four (4) filling containers.
- Tharisa Mine used to make use of the Medical Services of a Dr Chibi, a Practical Practitioner, located in Mooinooi. Risk assessments has proven that transporting employees to and from Tharisa Mine to the clinic in Mooinooi poses a huge risk. During 2020/2021, the Mine decided to establish their own Medical Centre and then appointed Platinum Health as their service provider. Containers and park homes was used to establish a temporary medical centre / facility on the existing mine grounds while the Vulcan Plant was still under construction. As the number of employees and Tharisa Mine is growing, there is a need for a more permanent facility as currently it is too small and does not comply with all Health and Safety Standards. As the temporary Medical Clinic is located in close proximity to the now operational Vulcan Plant, its location is not ideal. A process to identify a new location was then performed. Criteria for the proposed new site included the following:
- The site must be located in a quieter area.
 - The site must be big enough, located in close proximity to the mine, be on level ground and must have easy access.

The mine has since bought more Properties south of the N4 and these sites were identified as potential locations for the Medical Centre. Two alternative sites were considered.

- Option 1 – Portion 64 (Portion of Portion 1) of the farm Buffelspoort No. 343-J.Q., North West Province
- Option 2 – Portion 66 of the farm Buffelspoort No. 343-J.Q., North West Province – Opposite Tharisa Quarantine / Conference facility)

The following was found:

Option 1 - Portion 64 (Portion of Portion 1) of the farm Buffelspoort No. 343-J.Q., North West Province The property is large enough to accommodate the required medical services and parking area. The property is situated in close proximity to the existing Tharisa Minerals Conference Centre. Water and electricity is available on the concerned property, as well as an existing fence to secure all assets. The intention is to provide “One” facility to accommodate all the employees and contractors of Tharisa Minerals, including medical fitness certification.

Option 2 - Portion 66 of the farm Buffelspoort No. 343-J.Q., North West Province – This Property is located opposite the Tharisa Quarantine / Conference facility – this facility was deemed to not be suitable as it is located on a steep slope with rocky outcrops.

The proposed development will strengthen the health sector within the Rustenburg Local Municipality, due to the provision of a new clinic within the Rustenburg Local Municipality. By strengthening the existing health and business sector within the Rustenburg Local Municipality, the development will stimulate economic growth, improve competitiveness and will contribute to the broadening of the income base of the Rustenburg Local Municipality.

The proposed development will give rise to the creation of job opportunities in the construction sector, as well as during the operational phase of the clinic, resulting in the lowering of the poverty level within the area of jurisdiction of the Rustenburg Local Municipality

In terms of the Rustenburg Land Use Scheme, 2021, the usage "Clinic" is defined as follows:

"Means a permanently equipped medical facility providing a range of primary health care services for the treatment of day patients with no overnight accommodation which may include ancillary uses and also include concepts like day hospitals and day medical theatres and procedure rooms".

The intention is to demolish the existing dwelling house. A Heritage consultant has been appointed to determine the age of the structures on site. It was determined that none of the structures are older than 60 years and as such does not need a Permit from SAHRA prior to demolition.

PROVISION OF ENGINEERING SERVICES

WATER

Water to the concerned property will be provided by means of a borehole, to serve:

A 20 000 litres for fire suppression.

40 000 litres for domestic water.

SEWER

Sewer to the concerned property will be provided by means of a septic tank.

WASTE

Domestic waste will be dumped at a licensed municipal dumping site.

Medical waste will be collected and removed by a registered service provider.

ELECTRICITY

Electricity to the concerned property will be provided by Eskom, with a 350KVA to 500KVA backup generator

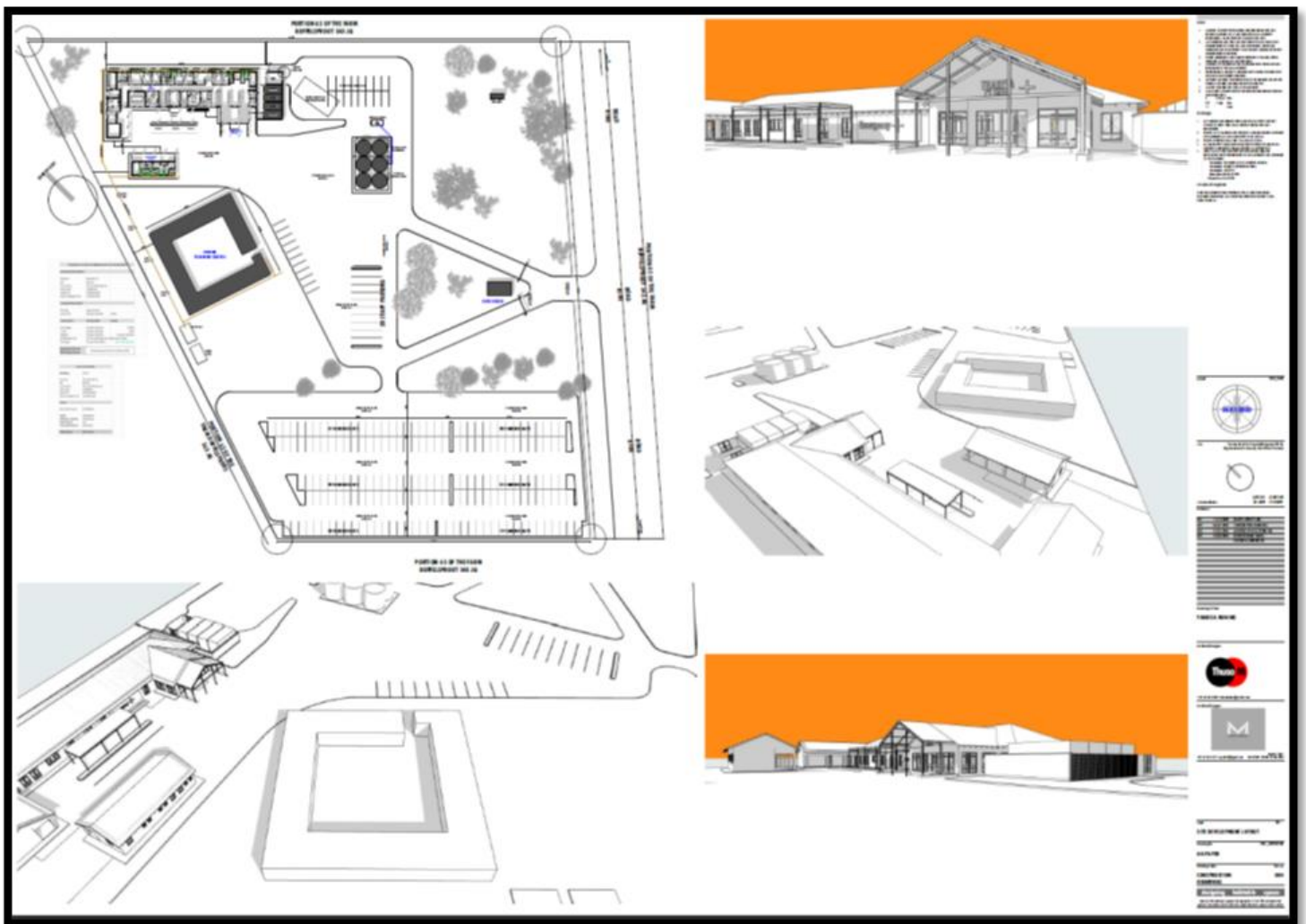


FIGURE 1: LAYOUT PLAN

6. DESCRIPTION OF THE PROPERTY

The site is located on Portion 64 (Portion of Portion 1) of the farm Buffelspoort No. 343-J.Q., North West Province. In order to establish the proposed development 6 174 square meters of indigenous vegetation, located within a Terrestrial CBA 2 and an Aquatic CBA 1 will be cleared. Please refer to Figure 3 for a Locality Map and Figure 4 and Figure 5 for Maps indicating the site in relation to the two CBAs. The total development footprint will be 2,2489ha. The proposed development site is located within the area of jurisdiction of the Rustenburg Local Municipality (NW 373) which in turn falls within the area of jurisdiction of the Bojanala District Municipality. Rustenburg local municipality is located in the North West Province of South Africa. The city is situated at the foot of the Magalies mountain range and is referred to as “town of rest” or “resting place”.

Rustenburg is the most populous municipality in the North West province and also the fastest growing municipality in South Africa. The municipality’s economy is mainly based on the surrounding mining and agricultural activities. The city of Rustenburg is situated some 112 km northwest, from both Johannesburg and Pretoria. Rustenburg, is situated on the N4 highway, forming part of the main route between Gauteng and Botswana.

The proposed development site is located directly adjacent and to the north-north-east of Road R104 (Rustenburg - Mooinooi/Hartbeespoort Dam road), approximately 1,6 km east of the ATKV Buffelspoort Resort. A large part of the site consists of buildings and old garden areas where alien invasive plant species are conspicuous. Extensive covers of alien invasive weed species are present at some areas. Alien invasive herbaceous weeds at the site include *Tagetes minuta*, *Bidens bipinnata*, *Bidens pilosa*, *Gomphrena celosioides*, *Schkuhria pinnata*, *Chenopodium album*, *Guileminea densa*, *Alternanthera pungens*, *Coreopsis lanceolata*, *Zinnia peruviana* and *Flaveria bidentis*. Vegetation at the remaining disturbed savanna patches contains indigenous grasses, forbs and trees. Indigenous trees at the site include *Vachellia nilotica*, *Vachellia tortilis* subsp. *heteracantha*, *Dichrostachys cinerea*, *Searsia lancea* and *Ziziphus mucronata*. Alien invasive trees include *Melia azedarach*, *Jacaranda mimosifolia* and *Opuntia ficus-indica*. Other exotic plant species such as *Bougainvillea x buttiana*, *Plumeria rubra* and *Catharanthus roseus* are also part of old gardens at the site. Indigenous herbaceous species include *Helichrysum argyrosphaerum*, *Commelina africana* and *Corchorus asplenifolius*. Indigenous grass species include *Aristida congesta*, *Cynodon dactylon*, *Eragrostis lehmanniana*, *Heteropogon contortus*, *Melinis repens* and *Panicum maximum*.

The proposed development site is located directly adjacent and to the north-north-east of Road R104 (Rustenburg - Mooinooi/Hartbeespoort Dam road), approximately 1,6 km east of the ATKV Buffelspoort Resort.

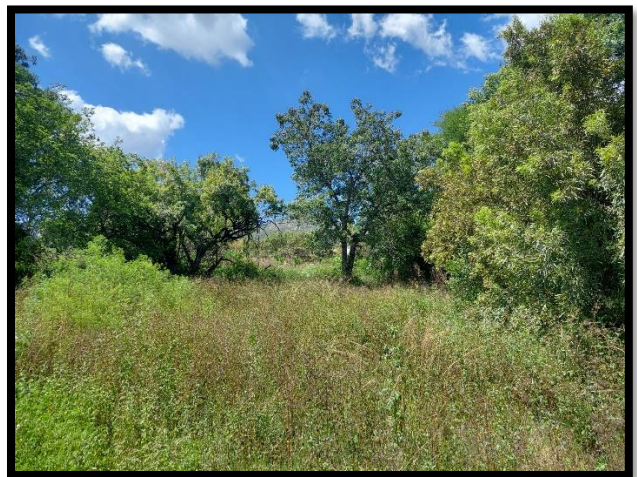
The site currently lies abandoned. There are three dilapidated/abandoned houses and out buildings on site. Most of the site was part of a garden, and exotic plant species are the predominant vegetation found on more than two thirds of the site. Please see photographs below.



View of the entrance to site



Abandoned buildings on site



Abandoned remains of gardens that used to be found on site

SURROUNDING LAND USES AND ZONINGS

The site is situated within an area utilized for a variety of purposes, including:

- Church complex

- Tharisa Minerals Conference Centre
- Transport business
- Agricultural
- Karani's Store



View of adjacent church complex



View of adjacent agricultural property



View of entrance to Tharisa Minerals Conference Centre



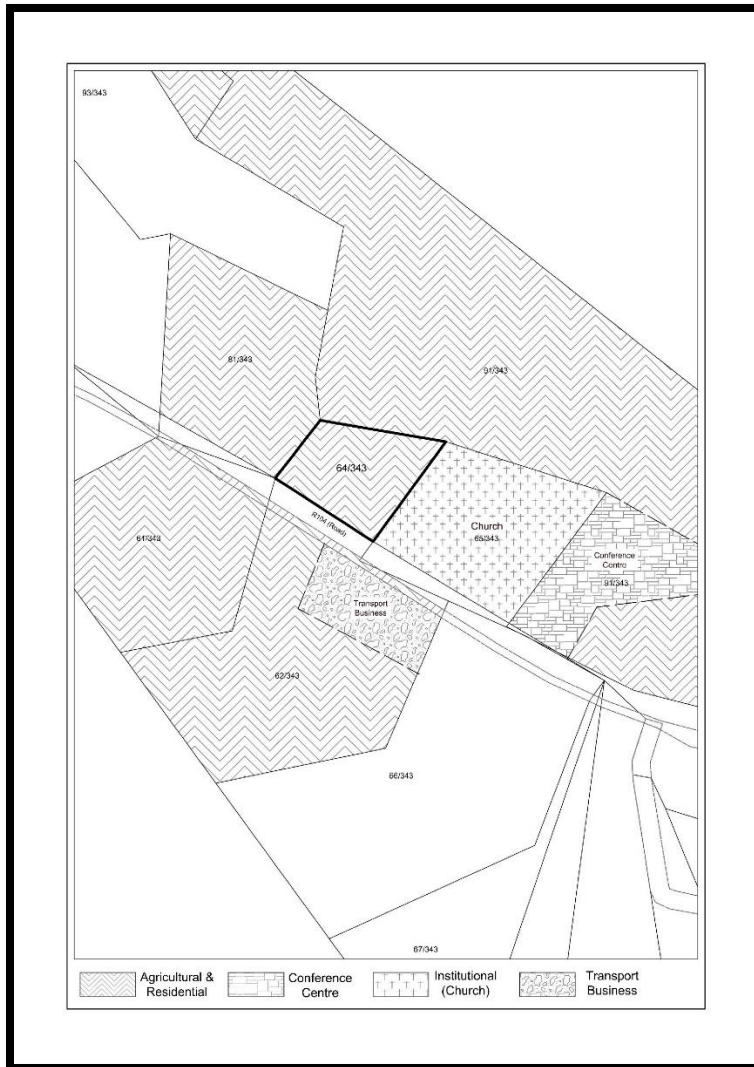
View of sign to Tharisa Minerals Conference Centre



View of transport business



View of Karani's Store



Map indicating surrounding land uses

In terms of the Rustenburg Land Use Scheme, 2021, the surrounding properties are zoned for “Agricultural”, “Business 1”, “Special”, “Residential 1” and “Residential 2” purposes.

The Surveyor-general 21 digit site (erf/farm/portion) reference numbers are.

T	O	J	Q	0	0	0	0	0	0	0	0	0	0	3	4	3	0	0	0	6	4
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Site Co-ordinates

Latitude (S):

Longitude (E):

Alternative S1 (preferred or only site alternative)

25°	45'	45.73"	27°	30'	14.04"
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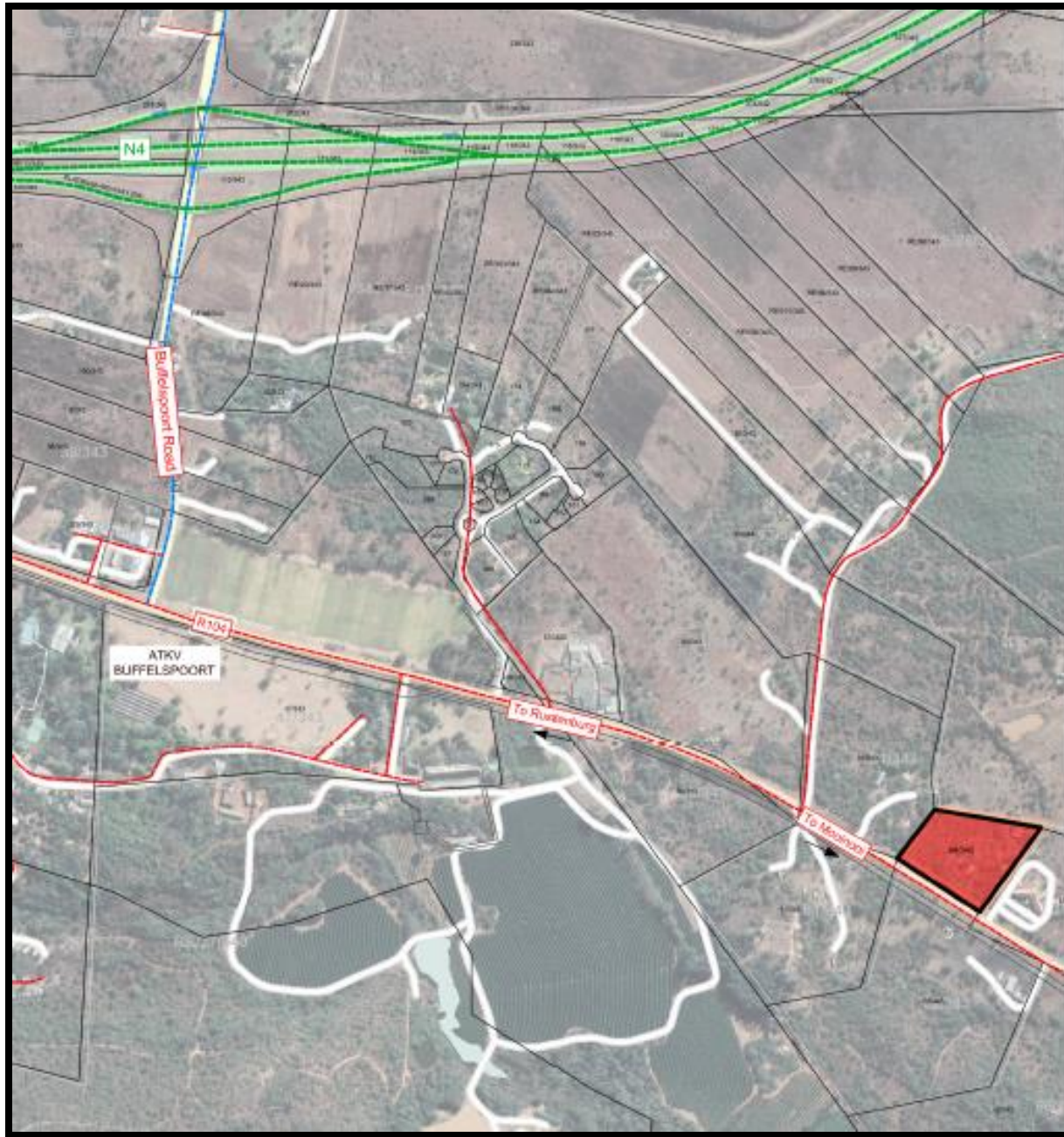


FIGURE 3: LOCALITY MAP

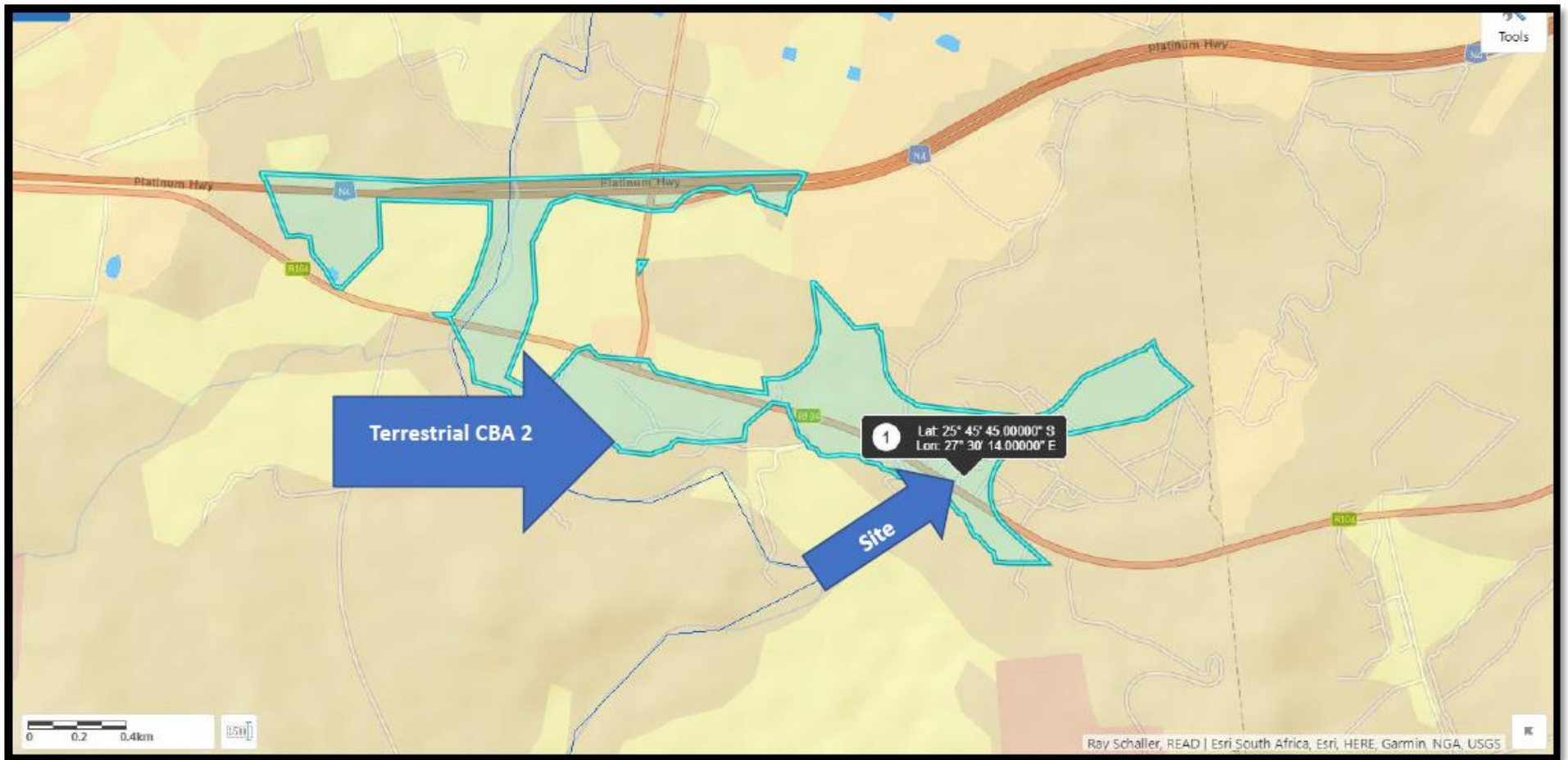


FIGURE 4: TERRESTRIAL BIODIVERSITY MAP

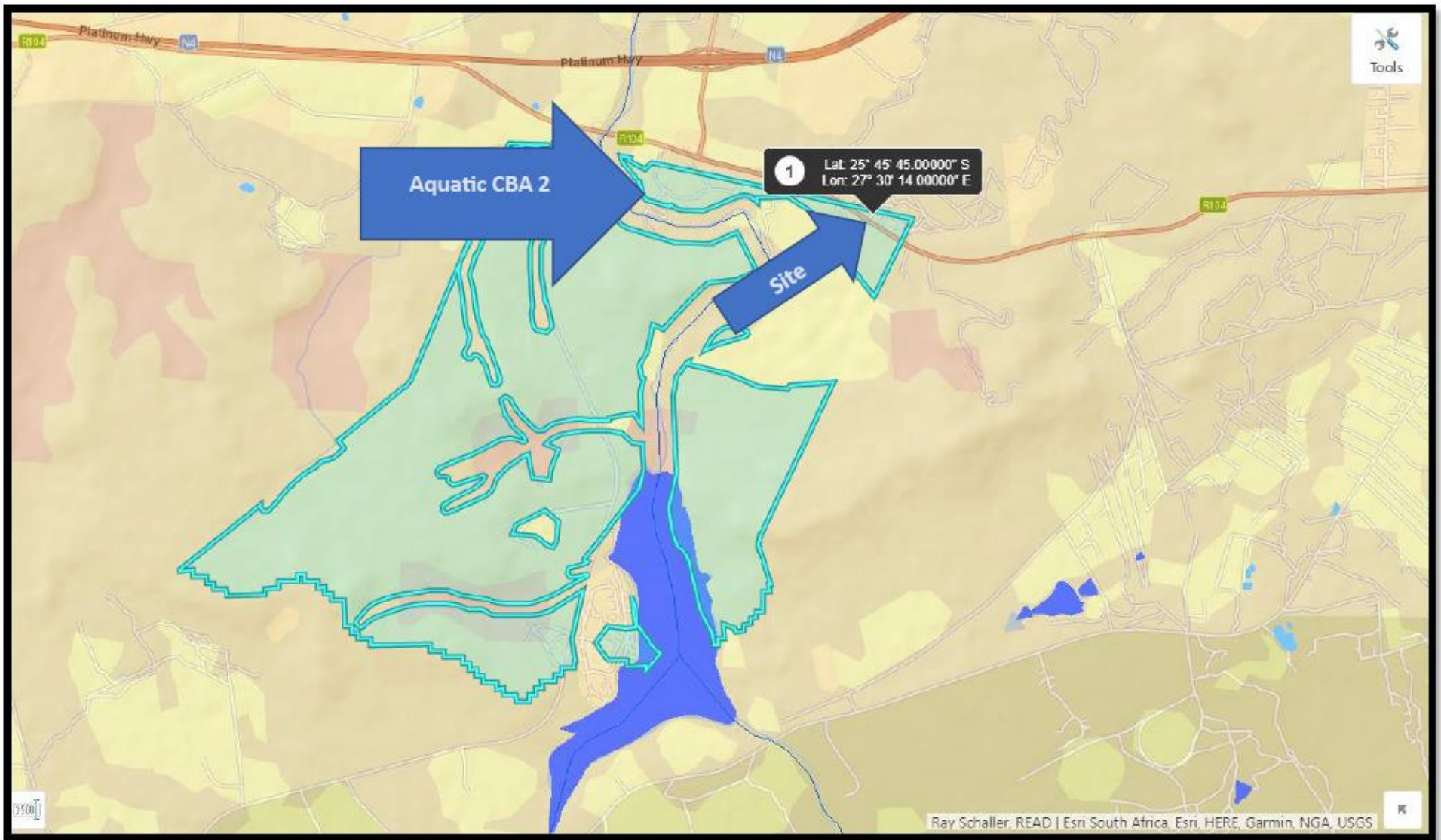





Figure 5: AQUATIC BIODIVERSITY MAP



FIGURE 6: FAUNA AND FLORA HABITAT SPECIALIST'S SENSITIVITY MAP

- | | | |
|---|----------------------------------|------------------------|
|  | Red outline | Boundaries of the site |
|  | Light yellow outline and shading | Low Sensitivity |
|  | Orange outline and shading | Medium Sensitivity |

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

7.1 BIO-PHYSICAL ASPECTS

7.1.1 GEOLOGY AND SOIL

The area is underlain by the Tweehoogte Bronzitite, Groenfontein Harzburgite, Makgope Bronzitite, Eerlyk Bronzitite and the Kroondal Norite as well as the Kolobeng Norite of the Rustenburg Layered Suite of the Bushveld Complex.

No dolomite occurs in the area and no stability investigation is required (the necessity is usually determined by the Council for Geoscience).



Geotechnical Zoning

7.1.2 TOPOGRAPHY

The site is located on a shallow slope towards the west (Lowest altitude of 1 258 meters above sea level in the west) with a highest point in the east at an altitude of 1 265 meters above sea level. There are no streams on or adjacent to the site. 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. The topography of the area is ideal for the proposed development.

7.1.3 CLIMATE

The Rustenburg region is characterized by summer rainfall with thunderstorms, with annual rainfall figures of 685 mm (Agriculture) and 703 mm (Buffelspoort) recorded at the closest weather stations to the site. Winters are dry with frost common. The warmest months are normally December and January and the coldest months are June and July. Extreme climatic events may have an influence on the project during the construction and operation phase and will have to be considered.

Month	Rainfall (mm)	Min temp (°C)	Max temp (°C)	Average frost dates
Jan	109.9	16.6	29.8	Start date: 24/05 End date: 38/8 Days with frost: 32
Feb	89.7	16.3	29.2	
Mar	76.6	14.5	28.2	
Apr	40.2	10.7	25.7	Heat units (hrs > 10°C) Summer (Oct-Mar): 2213 Winter (Apr-Sept): 796
May	18.0	5.6	23.0	
Jun	6.5	2.0	20.4	
Jul	6.2	1.8	20.8	
Aug	6.5	4.0	23.6	
Sep	14.2	8.6	27.0	
Oct	51.9	12.7	28.8	
Nov	97.1	14.6	28.7	
Dec	102.2	15.8	29.4	
Year	619.0 mm	18.2°C (Average)		

Climate Data

The variability of rainfall as well as high intensity events can influence the project. Prolonged wet spells may affect the proposed development as excess water may accumulate on uneven portions. During extremely dry spells, the possibility of dust generation, as well as the detrimental effects on vegetation, will have to be taken into consideration. Droughts occur as part of the long-term climatic cycles throughout the country.

The influence of temperature on the project is considered as very low and of very little significance, whilst the project cannot influence this variable. This variable will only play a minor role during the different phases of the project. Because extremely high temperatures may occur, (mostly during dry spells) the adverse effects due to temperature will be negative in relation to the project; however, the general nature of the average conditions will on the other hand be positive. The impacts should therefore be considered as “variable”. It is important to ensure proper management steps are taken in the different phases of the project. The influence of the environment on the project during these phases is considered positive, as extreme events are

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 may 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 central part of 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 the passing of thundershowers.

7.1.3.4 Climate Change

Climate change is a natural phenomenon that takes place over geological time. However, over the past few decades the rate of climate change has been more rapid and the magnitude of global warming has increased dramatically (Warburton, M.L and Schulze, R 2006; Warburton, M.L 2012). This change has been attributed to increased anthropogenic greenhouse gas emissions (Koske, J and Ochieng, M.A 2013). For example, the burning of coal to generate electricity, the burning of petrol incars, some chemical processes in industries, and many farming activities all contribute to the increased concentration of greenhouse gasses in the atmosphere.

Climate change is not just an increase in average global temperatures but changes in regional climate characteristics such as rainfall, relative humidity and severe weather extremes (Davis, C.L 2011). Climate change can manifest as a

shock or a stress (Ziervogel, G and Calder, R 2003). Shocks are defined as discrete, extreme events (rapid onset) such as floods, while gradual change (slow onset) such as long-term climate variability is classified as a stress (Ziervogel, G and Calder, R 2003).

The negative impacts of climate change “are already felt in many areas, including in relation to, inter alia, agriculture, and food security; biodiversity and ecosystems; water resources; human health; human settlements and migration patterns; and energy, transport and industry” (United Nations WomenWatch 2009, 1).

Measures should be implemented to reduce or eliminate carbon emissions or enhance greenhouse gas sinks (mitigation) (Böckmann, M 2015). However, due to lag times in the climate and biophysical systems, the positive impacts of past and current mitigation will only be noticeable in the next 25 years (Jiri, O 2016). In the meanwhile, adaptation is regarded as inevitable and a necessary response to the changes that are projected to take place.

A summary of the key vulnerability indicators is provided in the table below.

No	Sector	Indicator Title	Exposure Answer	Sensitivity Answer	Adaptive Capacity Answer
7	Agriculture	Change in other crop production areas (e.g. vegetables, nuts, etc.)	Yes	High	Low
10	Agriculture	Increased risks to livestock	Yes	High	Low
12	Biodiversity and Environment	Loss of High Priority Biomes	Yes	High	Low
15	Biodiversity and Environment	Loss of Priority Wetlands and River ecosystems	Yes	High	Low
25	Human Health	Increased malnutrition and hunger as a result of food insecurity	Yes	High	Low
32	Human Settlements, Infrastructure and Disaster Management	Increased migration to urban and peri-urban areas	Yes	High	Low
33	Human Settlements, Infrastructure and Disaster Management	Increased risk of wildfires	Yes	High	Low
37	Water	Less water available for irrigation and drinking	Yes	High	Low
38	Water	Increased impacts of flooding from litter blocking storm water and sewer systems	Yes	High	Low

Key Vulnerability indicators

Based on the key indicators identified in the table above, the following objectives and projects are prioritised as a response to each of the indicators.

Agriculture

The agricultural sector will be adversely affected by climate change. Increased temperatures, drought, and the increase in frequency and severity of storm events will impact on the crops that can be grown and potentially result in a loss of livestock.

Biodiversity and Environment

Climate change predictions include the shifting of biomes across South Africa. It is projected that, with the changes in climate under a high-risk scenario, the Savanna biome will replace large areas of the Grassland biome. Terrestrial,

wetland, and river ecosystems and their associated species will be negatively impacted. Furthermore, development and changes in land use will impact negatively on the environment.

Biodiversity is crucial to ecosystem health, and healthy ecosystems are central to human well-being. Healthy ecosystems interlinked with working landscapes and other open spaces form the ecological infrastructure of the country and are the foundation for clean air and water, fertile soil and food. All South Africans depend on healthy ecosystems for economic and livelihood activities, including agriculture, tourism and a number of income generating and subsistence level activities. These natural ecosystems are under pressure from land use change and related processes causing degradation, as well as invasive alien species. Accelerated climate change (resulting in increasing temperature, rising atmospheric CO₂ and changing rainfall patterns) is exacerbating these existing pressures.

Well-functioning ecosystems provide natural solutions that build resilience and help society adapt to the adverse impacts of climate change. This includes, for example, buffering communities from extreme weather events such as floods and droughts, reducing erosion and trapping sediment, increasing natural resources for diversifying local livelihoods, providing food and fibre, and providing habitats for animals and plants which provide safety nets for communities during times of hardship. Sustainably managed and/or restored ecosystems help in adapting to climate change at local or landscape level.

Objectives

The following objectives have been identified

- Manage Loss of High Priority Biomes
- Manage Loss of Priority Wetlands and River ecosystems

Human Health

Climate change impacts affect the social and environmental determinants of health and will therefore affect human health in several ways. Projected temperature increases due to climate change will negatively affect the young and elderly population of the district. People working in the informal sector usually work outdoors and are therefore exposed to all weather elements and are particularly vulnerable to temperature increases.

South Africa faces complex and pressing public health challenges exacerbated by adverse socio-economic conditions including dense informal settlements which constrain effective service delivery. These health challenges include a disease complex with the highest global prevalence of Human Immunodeficiency Virus (HIV) and tuberculosis (TB), complicated by water-borne and chronic respiratory disease.

Under-nutrition and socio-economic stress are important contributors to poor human resilience and contribute to conditions that facilitate the emergence and propagation of disease. Malnutrition and disease interact strongly, and there is a key relationship between environmental quality, food security, and the disease burden of communities. Adaptation to the potential effects of climate change on human health is viewed in this context. However, significant knowledge and information gaps are preventing well supported quantitative projections of human health impacts in South Africa.

Objectives

The following objectives have been identified.

- Manage increased malnutrition and hunger as a result of food insecurity

Disaster Management, Infrastructure and Human Settlements

Climate change impacts will affect Disaster Management, Infrastructure and Human Settlements in several ways. Increases in the severity of storm events and increase in flooding will damage infrastructure which may result in a loss of industrial productivity and service delivery disruptions. The impacts of storm events will particularly affect communities located in informal settlements, on flood plains and where there is poor drainage infrastructure. In addition, communities

in rural areas that depend on subsistence farming may be unable to grow crops that they have grown in the past due to the changing climate. It is predicted that there will therefore be an increase in rates of rural-urban migration. Rural communities may also become more physically isolated due to extreme events impacting on key infrastructure.

South Africa is a diverse country, not just in terms of populations and biodiversity, but also in terms of its human settlements. These settlements face severe challenges, even before climate change is taken into account. The implications of the compounding impacts of climate change will be profound, and human settlements therefore represent a crucial part of national adaptation strategies. The overarching strategic framework for the development of human settlements is described in the National Development Plan (NDP) and, more specifically in relation to the implications for climate change, in the National Climate Change Response White Paper (NCCRWP).

However, to develop appropriate adaptation responses a more nuanced understanding of the challenges and options for human settlements is required, building on the insights of the NCCRWP. This understanding needs to take into account the unusually diverse urban forms of human settlement in the South African context, and the importance of ecological infrastructure in supporting service delivery and building resilient communities.

Objectives

The following objectives have been identified

- Manage potential increase migration to urban and peri-urban areas.

Manage potential increased risk of wildfires

Water

Water resources are the primary medium through which climate change impacts will be felt by South Africans (Schulze et al., 2014). Climate change will affect water accessibility, quantity, and quality (Parikh, J 2007). Drought, reduced runoff, increased evaporation, and an increase in flood events will impact on both water quality and quantity.

South Africa's climate is generally arid to semi-arid, with less than 9% of annual rainfall ending up in rivers, and only about 5% recharges groundwater in aquifers. In addition, rainfall and river flow are unpredictable in time and unevenly distributed in space, with only 12% of the land area generating 50% of stream flows. Decadal rainfall variability also results in extended dry and wet periods across the country. The main users of surface water resources are agricultural irrigation, domestic, industrial, mining and power generation, while plantation forestry intercepts and reduces runoff before it reaches the rivers and groundwater.

Surface water resources were already over-allocated by the year 2000 in five of nineteen water management areas historically used for water planning and management purposes. The potential demand for water is expected to increase with economic growth, increased urbanisation, higher standards of living, and population growth. Because of the critical importance of water in the South African economy the country has a sophisticated water resources planning capacity, founded on a good understanding of the country's variable rainfall. This planning capacity will be a key capability for adaptation planning under ongoing and future climate change.

Objectives

The following objectives have been identified

- Manage the quantity of water available for irrigation and drinking
- Manage the increased impacts of floods due to litter blocking the sewer system

Cross-Cutting

The projected impacts of climate change could ultimately negatively impact the economy. Since the Agricultural sector is an important contributor to the economy and the projected impacts of climate change on agriculture could negatively impact on the economy.

The projected impacts of climate change for Harry Gwala District could ultimately negatively impact the economy of district. Since the Agricultural sector is an important contributor to the district economy and the projected impacts of climate change on agriculture could negatively impact on the district economy as a whole. It should also be noted that the project impacts of climate change could also negatively impact on the finances of the municipality. For instance, water shortages will require the implementation of demand management measures by the district resulting in lower water sales.

Climate change is a relatively new field in South Africa and research on economic impact of climate change is required for the field to get the attention that is needed.

Objectives

The following objectives have been identified

Generate knowledge and disseminate information on climate change”.

7.1.4 SURFACE DRAINAGE, WETLANDS AND RIPERIAN ZONES

Plate flow is the dominant drainage pattern on site, and no drainage channel intersects the site. Drainage occurs in an westerly direction towards the Sterkstroom that flows into the Elands River, that ultimately flows into the Crocodile River.

Wetlands are defined by the National Water Act (Act 36 of 1998) as: “land which is transitional between terrestrial and aquatic ecosystems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil”. Wetlands such as floodplain wetlands, channelled valley-bottom wetlands, unchannelled valley-bottom wetlands, depressions, seeps and wetland flats appear to be absent at the site. No wetlands are found at the site

7.1.5 GROUND WATER

The permanent water table on site is deeper than 1,5m below ground surface. Storm water diversion measures such as ponding pools are recommended to control peak flows during thunderstorms. All embankments must be adequately compacted and planted with grass to stop any excessive erosion and scouring of the landscape. Special care must be taken to ensure adequate surface drainage to prevent the accumulation of water next to structures.

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. These aspects are addressed in the EMP.

7.1.6 FLORA AND FAUNA

The study area is situated in the Savanna Biome. The Savanna Biome at the site is represented by the Marikana Thornveld Vegetation type (SVcb 6). A brief overview of the vegetation type, which serves as an outline of the ecological context of the site, follows.

SVcb 6 Marikana Thornveld

Distribution: The Marikana Thornveld is found in South Africa in the North West and Gauteng Provinces: Occurs on plains from the Rustenburg area in the west, through to Marikana and Brits to Pretoria area in the east. Altitude at the Marikana Thornveld varies from 1050 – 1450 m (Mucina & Rutherford 2006).

Vegetation and landscape features: Open *Acacia karroo* woodland, occurring in valleys and slightly undulating plains, and some lowland hills. Shrubs are more dense along drainage lines, on termitaria and rocky outcrops or in other habitat protected from fire (Mucina & Rutherford 2006).

Geology and soils: Most of the area is underlain by the mafic intrusive rocks of the Rustenburg Layered Suite of the Bushveld Igneous Complex. Rocks include gabbro, norite, pyroxenite and anorthosite. The shales and quartzites of the Pretoria Group (Transvaal Supergroup) also contribute. Mainly vertic melanic clays with some dystrophic or mesotrophic plinthic catenas and some freely drained, deep soils (Mucina & Rutherford 2006).

Climate: Summer rainfall with very dry winters. Mean annual precipitation about 600 and 700 mm. Frost is fairly frequent in winter.

Important taxa: Tall tree: *Acacia burkei*. Small trees: *Acacia caffra*, *Acacia gerrardii*, *Acacia karroo*, *Combretum molle*, *Searsia lancea*, *Ziziphus mucronata*, *Acacia nilotica*, *Acacia tortilis* subsp. *heteracantha*, *Celtis africana*, *Dombeya rotundifolia*, *Pappea capensis*, *Peltophorum africanum*, *Terminalia sericea*. Tall shrubs: *Euclea crispa* subsp. *crispa*, *Olea europaea* subsp. *africana*, *Searsia pyroides* var. *pyroides*, *Diospyros lycioides* subsp. *guerkei*, *Ehretia rigida* subsp. *rigida*, *Euclea undulata*, *Grewia flava*, *Pavetta gardeniifolia*. Low Shrubs: *Asparagus cooperi*, *Rhyncosia nitens*, *Indigofera zeyheri*, *Justicia flava*. Woody Climbers: *Clematis brachiata*, *Helinus integrifolius*. Herbaceous Climbers: *Pentarrhinum insipidum*, *Cyphostemma cirrhosum*. Graminoids: *Elionurus muticus*, *Eragrostis lehmanniana*, *Setaria sphacelata*, *Themeda triandra*, *Aristida scabrivalvis* subsp. *scabrivalvis*, *Fingerhutia africana*, *Heteropogon contortus*, *Hyperthelia dissoluta*, *Melinis nerviglumis*, *Pogonarthria squarrosa*. Herbs: *Hermannia depressa*, *Ipomoea obscura*, *Barleria macrostegia*, *Dianthus mooiensis* subsp. *mooiensis*, *Ipomoea oblongata*, *Vernonia oligocephala*. Geophytic Herbs: *Ledebouria revoluta*, *Ornithogalum tenuifolium*, *Sansevieria aethiopica*.

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

A large part of the site consists of buildings and old garden areas where alien invasive plant species are conspicuous. Extensive covers of alien invasive weed species are present at some areas. Alien invasive herbaceous weeds at the site include *Tagetes minuta*, *Bidens bipinnata*, *Bidens pilosa*, *Gomphrena celosioides*, *Schkuhria pinnata*, *Chenopodium album*, *Guileminea densa*, *Alternanthera pungens*, *Coreopsis lanceolata*, *Zinnia peruviana* and *Flaveria bidentis*. Vegetation at the remaining disturbed savanna patches contains indigenous grasses, forbs and trees. Indigenous trees at the site include *Vachellia nilotica*, *Vachellia tortilis* subsp. *heteracantha*, *Dichrostachys cinerea*, *Searsia lancea* and *Ziziphus mucronata*. Alien invasive trees include *Melia azedarach*, *Jacaranda mimosifolia* and *Opuntia ficus-indica*. Other exotic plant species such as *Bougainvillea x buttiana*, *Plumeria rubra* and *Catharanthus roseus* are also part of old gardens at the site. Indigenous herbaceous species include *Helichrysum argyrosphaerum*, *Commelina africana* and *Corchorus asplenifolius*. Indigenous grass species include *Aristida congesta*, *Cynodon dactylon*, *Eragrostis lehmanniana*, *Heteropogon contortus*, *Melinis repens* and *Panicum maximum*.

No wetlands or rocky ridges are found at the site. A Vulnerable ecosystem, the Marikana Thornveld (SVcb 6), is mapped for the site. During surveys at the site, it was found that the original vegetation type is extensively and highly modified, at a large part of the site and that the scope for the remaining, partly isolated patch of more natural vegetation at the site to contribute significantly to the conservation of Marikana Thornveld, is small.

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.

Protected tree species *Sclerocarya birrea* (Marula Tree) and *Combretum imberbe* (Leadwood) that occur very sparingly (only one individual of each was observed) at the site. Protected Tree species are listed under the National Forests Act No. 84 of 1998. In terms of a part of section 15(1) of Act No. 84 of 1998, no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate

or in any other manner acquire or dispose of any protected tree, except under a license granted by the Minister. A permit will be needed to if any damage or removal of the individual Protected trees, at the site, cannot be avoided.

There is little scope for the site to be part of a corridor of particular conservation importance.

Possible ecological sensitivities at the site were indicated by a report generated from the screening tool of DFFE. An assessment of these ecological sensitivities at the site, follow.

Animal species theme sensitivity

Relative animal species theme sensitivity is medium. The animal species that are flagged (with a medium sensitivity indication) by the DFFE screening tool are the mammal species *Crocidura maquassiensis* and *Dasymys robertsii* as well as the reptile species *Kinixys lobatsiana*. There appears to be no ideal habitat for the *Crocidura maquassiensis*, a mammal species which often prefers rocky habitats, at the site. The mammal species *Dasymys robertsii* is patchily distributed in the lowveld of northern South Africa and Zimbabwe. In South Africa *Dasymys robertsii* occurs predominantly in the Limpopo, Mpumalanga and Gauteng Provinces (Mullin *et. al.*, 2005). Power (2014) recorded the *D. robertsii* in the North West Province at a tributary of the Waterkloofspruit at Kgaswane. No signs of the listed mammal species have been found at the site and also no ideal habitats for these species. The Lobatse hinged-back tortoise, *Kinixys lobatsiana*. is found in southeastern Botswana and in South Africa from the north-eastern parts of the North West Province, through northern Gauteng, northwestern parts of Mpumalanga and into the Limpopo Province south of the Soutpansberg (Bates *et. al.*, 2014). *Kinixys lobatsiana* is present in savanna habitats, though absent from the subtropical lowveld, and is also absent from the highveld grassland (Bates *et. al.*, 2014). Vegetation at its habitats ranges from dens, short bushveld to open tree savanna. The tortoise species prefers rocky hillsides and rocky ridges (Boycott & Bourquin, 2000). The Lobatse hinged-back tortoise have not been recorded at the site and this site which is partly isolated and disturbed as well, does not appear to contain ideal habitat for this tortoise species. Following the inspection of the site, there is no distinct indication that the animal species listed above occur or should occur at the specific site.

Plant species theme sensitivity

Relative plant species theme sensitivity is low. Plant species that are included in the list of sensitive species, which are not threatened but prone to illegal harvesting in the North West Province, are listed in Table 4.8 and Table 4.9. None of these plant species prone to illegal harvesting which are found at the site. The occurrence of any Threatened plant species or any other plant species of particular conservation concern at the site, is highly unlikely. Therefore, the listing of the plant species theme sensitivity as low at the site, is upheld. Protected tree species *Sclerocarya birrea* (Marula Tree) and *Combretum imberbe* (Leadwood) occur very sparingly (one individual of each have been noted) at the site. These protected tree species are not threatened species. Protected Tree species are listed under the National Forests Act No. 84 of 1998. In terms of a part of section 15(1) of Act No. 84 of 1998, no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a license granted by the Minister. A permit will be needed to if any damage or removal of the individual Protected trees, at the site, cannot be avoided.

Terrestrial biodiversity theme sensitivity

Terrestrial biodiversity theme sensitivity at the site is listed as very high. This high sensitivity that is ascribed to the site, is because of the presence of Critical Biodiversity Area 2, which in turn is based on a Vulnerable ecosystem, the Marikana Thornveld (SVcb 6), mapped for the site, as well as the site being part of a Protected Areas Expansion Strategy. During surveys at the site, it was found that the original vegetation type is extensively and highly modified, at a large part of the site and that the scope for the remaining, partly isolated patch of more natural vegetation at the site to contribute significantly to the conservation of Marikana Thornveld, is small. There is also no significant indication that the site is in particular viable and important for a Protected Area Expansion strategy. Because the site is also part of a sub-quaternary catchment of a strategic water source area, the aquatic theme also contributes to the perceived high terrestrial sensitivity. Such as addressed under the aquatic theme sensitivity, a distinct and significant impact of the development to the sub-quaternary catchment is not anticipated.

(Leadwood) that occur in low numbers at the site. Protected Tree species are listed under the National Forests Act No. 84 of 1998. In terms of a part of section 15(1) of Act No. 84 of 1998, no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a license granted by the Minister. A permit will be needed to if any damage or removal of the individual Protected trees, at the site, cannot be avoided.

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 Copper)**

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.

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

The proposed global red list status for *Chrysochrysis aureus* according to the most recent IUCN criteria and categories is Endangered (Mecenero *et al.*, 2013). *Chrysochrysis 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 *Chrysochrysis 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 *Chrysochrysis 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.

***Lepidochrysis praeterita* (Highveld Blue)**

The proposed global red list status for *Lepidochrysis praeterita* according to the most recent IUCN criteria and categories is Endangered (G.A. Henning, Terblanche & Ball, 2009; Mecenero *et al.*, 2013). *Lepidochrysis 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. *Lepidochrysis 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 *Lepidochrysis praeterita* would be present on the site and at the footprint proposed for the development.

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

The proposed global red status for *Orachrysis mijburghii* according to the most recent IUCN criteria and categories is Endangered (Mecenero *et al.*, 2013). *Orachrysis mijburghii* favours grassland depressions where specific *Indigofera* plant species occur (Terblanche & Edge 2007). The Heilbron population of *Orachrysis 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 *Orachrysis mijburghii* on the site and it is unlikely that *Orachrysis 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 atlassing 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 Rare (Habitat specialist) (Mecenero *et al.*, 2013). 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). Owing to a lack of habitat requirements and ideal habitat the presence of the taxon at the site is highly unlikely.

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 *Ichneostoma stobbiai* or *Trichocephala brincki* were found during the surveys. There appears to be no suitable habitat for *Ichneostoma 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

With 597 000 people, the Rustenburg Local Municipality housed 1.1% of South Africa's total population in 2014. Between 2004 and 2014 the population growth averaged 3.11% per annum which is more than double than the growth rate of South Africa as a whole (1.34%). Compared to Bojanala's average annual growth rate (2.26%), the growth rate in Rustenburg's population at 3.11% was slightly higher than that of the district municipality.

The population pyramid reflects a projected change in the structure of the population from 2014 and 2019. The differences can be explained as follows:

- In 2014, there is a significantly larger share of young working age people between 20 and 34 (32.1%), compared to what is estimated in 2019 (30.4%). This age category of young working age population will decrease over time.
- The fertility rate in 2019 is estimated to be slightly higher compared to that experienced in 2014.
- The share of children between the ages of 0 to 14 years is projected to be slightly larger (25.1%) in 2019 when compared to 2014 (24.5%).

In 2014, there were a total number of 50 200 people unemployed in Rustenburg, which is an increase of 7 350 from 42 900 in 2004. The total number of unemployed people within Rustenburg constitutes 35.14% of the total number of unemployed people in Bojanala District Municipality. The Rustenburg Local Municipality experienced an average annual increase of 1.59% in the number of unemployed people, which is worse than that of the Bojanala District Municipality which had an average annual increase in unemployment of 0.67%.

Rustenburg Local Municipality had a total number of 61 500 (29.07% of total households) very formal dwelling units, a total of 83 800 (39.60% of total households) formal dwelling units and a total number of 64 200 (30.35% of total households) informal dwelling units.

Tharisa Mine used to make use of the Medical Services of a Dr Chibi, a Practical Practitioner, located in Mooinooi. Risk assessments has proven that transporting employees to and from Tharisa Mine to the clinic in Mooinooi poses a huge risk. During 2020/2021, the Mine decided to establish their own Medical Centre and then appointed Platinum Health as their service provider. Containers and park homes was used to establish a temporary medical centre / facility on the existing mine grounds while the Vulcan Plant was still under construction. As the employees and Tharisa Mine is growing, there is a need for a more permanent facility as currently is too small and does not comply with all Health and Safety Standards. As the temporary Medical Clinic is located in close proximity to the now operational Vulcan Plant, its location is not ideal. A process to identify a new location was then performed. Criteria for the proposed new site included the following:

- The site must be located in a quieter area.
- The site must be big enough, located in close proximity to the mine, be on level ground and must have easy access.

The identified site, Portion 64 (Portion of Portion 1) of the farm Buffelspoort No. 343-J.Q., North West Province was found to be ideal. The property is large enough to accommodate the required medical services and parking area. The property is situated in close proximity to the existing Tharisa Minerals Conference Centre. Water and electricity is available on the concerned property, as well as an existing fence to secure all assets. The intention is to provide "One" facility to accommodate all the employees and contractors of Tharisa Minerals, including medical fitness certification.

The proposed development will strengthen the health sector within the Rustenburg Local Municipality, due to the provision of a new clinic within the Rustenburg Local Municipality. By strengthening the existing health and business sector within

the Rustenburg Local Municipality, the development will stimulate economic growth, improve competitiveness and will contribute to the broadening of the income base of the Rustenburg Local Municipality.

A well-diversified business sector curtails leakages or purchasing power to other towns and cities. To ensure that the purchasing power remains “healthy” within the Rustenburg Local Municipality and for a sustainable economic growth, a variety of land uses should be established locally. This creates the opportunity to development new businesses and to improve existing services. In view of the objectives contained within the Rustenburg Spatial Development Framework, (2010 Review), the Rustenburg Local Municipality envisages to serve the social needs and requirements of the population more properly and to become economically competitive, when compared to other towns and cities.

The proposed development will give rise to the creation of job opportunities in the construction sector, as well as during the operational phase of the clinic, resulting in the lowering of the poverty level within the area of jurisdiction of the Rustenburg Local Municipality

7.2.2 ARCHAEOLOGY AND CULTURAL SITES

“In terms of the National Heritage Resources Act, no 25 of 1999, heritage resources, including archaeological or palaeontological sites over 100 years old, graves older than 60 years, structures older than 60 years are protected. They may not be disturbed without a permit from the relevant heritage resources authority. This means that prior to development it is incumbent on the developer to ensure that a Heritage Impact Assessment is done. This must include the archaeological component (Phase 1) and any other applicable heritage components. Appropriate (Phase 2) mitigation, which involves recording, sampling and dating sites that are to be destroyed, must be done as required.

The quickest process to follow for the archaeological component is to contract an accredited specialist (see the web site of the Association of Southern African Professional Archaeologists www.asapa.org.za) to provide a Phase 1 Archaeological Impact Assessment Report. This must be done before any large development takes place. The Phase 1 Impact Assessment Report will identify the archaeological sites and assess their significance. It should also make recommendations (as indicated in section 38) about the process to be followed. For example, there may need to be a mitigation phase (Phase 2) where the specialist will collect or excavate material and date the site. At the end of the process the heritage authority may give permission for destruction of the sites.

Where bedrock is to be affected, or where there are coastal sediments, or marine or river terraces and in potentially fossiliferous superficial deposits, a Palaeontological Desk Top study must be undertaken to assess whether or not the development will impact upon palaeontological resources - or at least a letter of exemption from a Palaeontologist is needed to indicate that this is unnecessary. If the area is deemed sensitive, a full Phase 1 Palaeontological Impact Assessment will be required and if necessary, a Phase 2 rescue operation might be necessary. Please note that a nationwide fossil sensitivity map is available on SAHRIS to assist applicants with determining the fossil sensitivity of a study area.

If the property is very small or disturbed and there is no significant site the heritage specialist may choose to send a letter to the heritage authority motivating for exemption from having to undertake further heritage assessments. Any other heritage resources that may be impacted such as built structures over 60 years old, sites of cultural significance associated with oral histories, burial grounds and graves, graves of victims of conflict, and cultural landscapes or viewsapes must also be assessed.”

Last mentioned option was decided on for this project which entailed desktop research as part of the assessment. Previous work by the author of this Exemption Letter also serves as reference.

To conclude, based on the aerial images of the area, and the heritage desktop study, it is therefore deemed unlikely that any significant sites, features or material of cultural heritage (archaeological and/or historical) origin and/or significance will exist in the study area & proposed development area. Recent historical activities (mainly farming-related activities) would have impacted on any if they did exist here in the past and would have disturbed or destroyed these to a large degree. Known archaeological and historical sites, features and material have been identified in the larger geographical area and this needs to be taken into consideration during actions related to the proposed development.

It is therefore recommended that Exemption from a Full Phase 1 Heritage Impact Assessment (HIA) for the Proposed Development of the Tharisa Clinic, on Portion 64 (a Portion of Portion 1) of the farm Buffelspoort 343JQ, between Mooinooi and Marikana in the Northwest Province, be granted to the applicants taking into consideration the following:

The subterranean nature of cultural heritage (archaeological and/or historical) resources must always be kept in mind. 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. This could include previously unknown and unmarked graves and/or cemeteries.

Should there be any questions or comments on the contents of this document please contact the author as soon as possible.

7.2.3 AESTHETICS

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 site is located directly adjacent and to the north-north-east of Road R104 (Rustenburg – Mooinooi/Hartbeespoort Dam road), approximately 1,6 km east of the ATKV Buffelspoort Resort. The site currently lies abandoned. There are three dilapidated/abandoned houses and out buildings on site. Most of the site was part of a garden, and exotic plant species are the predominant vegetation found on more than two thirds of the site. The visual intrusion is considered to be moderate as the proposed development would fit in well with the nearby 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.

7.2.4 AGRICULTURAL POTENTIAL

In 2002 the *Directorate of Land Use and Soil Management* (DLUSM) within DALRRD through the Agricultural Research Councils' (ARC), Institute of Soil, Climate and Water (ISCW) developed a national spatial land capability data set to depict the spatial delineation of the then defined eight land capability classes. The approach followed was based on the approach of Klingebiel and Montgomery (1961) but adapted for South Africa by the Multilateral Technical Committee for Agriculture and Environmental Affairs' Task team, to develop a system for soil and land capability classification, but it further aimed to incorporate the parameters within a Geographic Information System (GIS). The resulted spatial data set was derived

at a scale of 1:250 000 with the land type data set being the main input data set for the derived land capability classes together with climatic and terrain parameters.

This dataset is used within the screening tool. While the new dataset is more complex than that of Klingebiel *et al*, the latter has clear guidelines and is generally still followed when assigning capability to land. A comparison between the two systems is provided below.

DALRRD (2016)	Klingebiel	Capability	Arability
1-2	viii	Very low	Not arable
3-4	vii	Very low to low	
5-6	vi	Low	
7	v	Low to moderate	
8	iv	Moderate	Arable
9-10	iii	Moderate to high	
11-12	ii	High	
13-14	i	High to very high	
15	i	Very high	

Relationship between grading of the Screening tool and that of Klingebiel *et al*.

According to the agricultural potential map of NDA, the land is arable (*Department of Agriculture, 2019*).

The soil on the property was found to be arable but there is no water available for irrigation, making the soil medium potential.

Land capability classes are interpretive groupings of land with similar potential and limitations or similar hazards. Land capability involves consideration of difficulties in land use owing to physical land characteristics, climate and the risks of land damage from erosion and other causes.

The classic eight-class land capability system (Klingebiel & Montgomery, 1961) was adapted for use by the South African Department of Agriculture in their Agriculture Geographic Information System (AGIS).

Land capability is classified according to guidelines published by the National Department of Agriculture in AGIS.

Land Capability is determined by the collective effects of soil, terrain and climate features and shows the most intensive long-term use of land. At the same time, it indicates the permanent limitations associated with the different land-use classes.

- Order A: Arable land – high potential land with few limitations (Classes i and ii);
- Order B: Arable land – moderate to severe limitations (Classes iii and iv);
- Order C: Grazing and forestry land (Classes v, vi and vii);
- Order D: Land not suitable for agriculture (Class viii).

LAND CAPABILITY			Wildlife	Grazing and Forestry			Crop production			
Order		Class		Forestry	Veld	Pastures	Limited	Moderate	Intensive	Very intensive
Arable	A	i								
		ii								
	B	iii								
Non arable	C	iv								
		v								
	D	vi								
		vii								
	viii									

Note: the shaded area indicates the suitable land use.

Land capability classes – intensity of land uses

The following were found:

- There is no *highly sensitive* land on the site, no irrigation takes place and there is no irrigation water available.
- There is no cultivated land on the site. With the low animal grazing capacity of the veld, the entire property can only not even carry one head of cattle. This is not sustainable as the basis for a viable farming unit

Land capability description

The property is not used for any farming activities. There are a number of homesteads that are vacant

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.	Land clearing must be restricted to 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	Clean environment	No spills of chemicals
Availability of safety kits to prevent oils/toxic materials spreading in the environment	Safe storage of materials	Proper storage provided
Proper storage must be provided for chemicals , paint and construction materials needed		
STORAGE OF OIL AND FUEL		
Safe handling of fuel and oil and prevention of spills.	Clean environment	No spills of oil or fuel

ENVIRONMENTAL ASPECTS	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS
		No leakages of oil
USE OF OIL AND CHEMICALS		
Drip trays must be provided for vehicles in storage yard	No spills of oil	No oil spills from vehicles
Wash bay and oil trap to be provided	Cleaning area for vehicles	No oil or fuel into environment due to cleaning of vehicles or equipment
STORAGE OF CEMENT		
Safe handling of cement	Clean environment	No spills of cement
STORAGE OF EQUIPMENT AND MATERIALS		
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		
<p>Stockpiles</p> <p>All stockpiled material must be easily accessible without any environmental damage to adjacent grasslands/farmlands.</p> <p>All temporarily stockpiled material must be stockpiled in such a way that the spread of materials are minimised.</p> <p>The stockpiles may only be placed within the demarcated areas - the location of which must be approved by the ER or ECO.</p> <p>Stockpiled material at batching plant must be contained to prevent the spread of gravel in the area.</p> <p>Erosion, sedimentation and storm water</p> <p>No erosion and or sedimentation</p> <p>Vegetation</p> <p>The contractor must avoid vegetated areas that will not be cleared.</p>	<p>Properly constructed and well maintained stockpiles</p> <ul style="list-style-type: none"> Minimise scarring of the soil surface and land features Minimise disturbance and loss of soil Minimise construction footprint <p>Minimise impacts on vegetation</p>	<p>No erosion or spread of material from stockpiles</p> <p>Gravel stockpiles must be properly managed</p> <p>No erosion or sedimentation.</p> <p>Limit impact on vegetation</p>
Waste management		

ENVIRONMENTAL ASPECTS	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS
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	<p>Children's access to construction site controlled,</p> <p>Access to construction camp controlled</p> <p>Safety aspects considered</p>	<p>No children on construction site</p> <p>Safety fence and controlled access available</p> <p>Safety signs with necessary information displayed</p>

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. At the end of the construction phase the site and its surrounding area must be free from any pollution that originated as a result of the construction activities.
8. No disturbance of topsoil & subsoil may commence until such time as the development footprint has been clearly defined.
9. No disturbance of topsoil & subsoil outside of the development footprint may occur.
10. At the end of the construction phase the site and its surrounding area must be free from any chemical, fuel, oil and cement spills that originated as a result of the construction activities.
11. At the end of the construction phase the site and its surrounding area must be free from any sewage that originated as a result of the construction activities.

12. At the end of the construction phase the site and its surrounding area must be free from any hazardous or general waste pollution that originated as a result of the construction activities.
13. Dust prevention measures must be applied to minimise the generation of dust.
14. Noise prevention measures must be applied to minimise the generation of unnecessary noise pollution as a result of construction activities on site.
15. Absolutely no burning of waste is permitted.
16. Fires will only be allowed in facilities especially constructed for this purpose.
17. No hunting of animals will be allowed.
18. No intentional destruction of any sites, features or material of cultural heritage (archaeological and/or historical) origin or significance may occur.
19. All Contractors and sub-contractors must abide to the rules and regulations of the Occupational Health and Safety Act, 85 of 1993.

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.	Construction vehicles, machinery and workers must be restricted to only operate within the approved development footprint.	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.
			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 Waterkloof Spruit.		
			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 Protected tree species <i>Sclerocarya birrea</i> (Marula Tree) and <i>Combretum imberbe</i> (Leadwood) that occur very sparingly (only one individual of each was observed) at the site	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.	Protected Tree species are listed under the National Forests Act No. 84 of 1998. In terms of a part of section 15(1) of Act No. 84 of 1998, no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except			

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
		under a license granted by the Minister. A permit will be needed to if any damage or removal of the individual Protected trees, at the site, cannot be avoided.			
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		

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			<p>fill sloped routes without erosion protection measures being in place</p> <p>Ensure that storm water channels do not discharge straight down contours. These must be aligned at such an angle to the contours that they have the least possible gradient</p> <p>To reduce the loss of material by erosion, the contractor must ensure that disturbance on site is kept to a minimum. The contractor is responsible for rehabilitating all eroded areas in such a way that the erosion potential is minimised after construction has been completed</p>		
TOPSOIL & SUBSOIL	No disturbance of topsoil & subsoil may commence until such time as the development footprint has been clearly defined.	A Land surveyor must peg the parameters of the development footprint.	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	<p>The developer must ensure that a Land surveyor pegs the parameters of the development footprint and that all concerned are trained in this regard.</p> <p>The Contractor will be responsible for the removal and correct stockpiling</p>
			Removed topsoil and subsoil should be stockpiled for the duration of the active construction period, and utilized for the final landscaping and rehabilitation of disturbed areas.		
			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		

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>construction and where it will not interfere with construction activities.</p> <p>Removed subsoil should be stockpiled separately from topsoil. Handling of topsoil should be minimized as much as possible, and the location of the topsoil berm should be chosen carefully to avoid needing to relocate the topsoil berm at a later date. Ideally, topsoil is to be handled twice only, once to strip and stockpile, and once to replace, level, shape and scarify. The topsoil berm may be a few meters wide but should ideally not be more than 0.5m high to allow sufficient light and air penetration.</p> <p>Topsoil should be the final layer applied during rehabilitation, after subsoil/ spoil material has been placed and shaped.</p>		<p>of the topsoil and subsoil.</p> <p>The ECO will monitor compliance.</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 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			

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			<p>Bunded areas to be suitably lined with a SABS approved liner</p> <p>An Alphabetical Hazardous Chemical Substance (HCS) control sheet must be drawn up and kept up to date on a continuous basis</p> <p>All hazardous chemicals that will be used on site must have Material Safety Data Sheets (MSDS);</p> <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>		The ECO will monitor compliance.
		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	The Contractor will be responsible for providing method statements. He will also be responsible for training of staff in this regard.
	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		The ECO will monitor compliance.		

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			<p>extend to the crest of the bund and the volume inside the bund must be 110% of the total capacity of all the storage tanks/ bowsers</p> <p>The floor of the bund must be sloped, draining to an oil separator</p> <p>Provision must be made for refuelling at the storage area by protecting the soil with an impermeable groundcover. Where dispensing equipment is used, a drip tray must be used to ensure small spills are contained</p> <p>All empty externally dirty drums must be stored on a drip tray or within a bunded area</p> <p>Spill kits must be available on site and in all vehicles that transport hydrocarbons for 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</p>		

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			<p>central location and disposed of according to the National Environmental Management: Waste Act 59 of 2008.</p> <p>During servicing of vehicles or equipment, a suitable drip tray must be used to prevent spills onto the soil.</p> <p>Leaking equipment must be repaired immediately or be removed from site to facilitate repair</p> <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	<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>	No Action required	The Contractor will be responsible for providing method statements. He will also be responsible for

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
		must provide information on proposed storage, washing & disposal of cement, packaging, tools and plants	<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> <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>		<p>training of staff in this regard.</p> <p>The ECO will monitor compliance.</p>
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</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>spillage occurs when the toilets are cleaned or emptied.</p> <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	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.
			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		

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			<p>Sufficient closed containers must be strategically located around the construction site to handle the amount of litter, wastes, rubbish, debris, and builder's waste generated on the site</p> <p>Subcontractor(s) contracts must contain a clause to the effect that the disposal of all construction-generated refuse / waste to an officially approved dumping site is the responsibility of the subcontractor in question and that the subcontractors are bound to the management activities stipulated in this EMP. Proof of this undertaking must be issued to the ECO</p> <p>All solid and chemical wastes that are generated must be removed and disposed of at a licensed waste disposal site. The contractor is to provide proof of such to the ECO</p> <p>Chemical containers and packaging brought onto the site must be removed for disposal at a suitable site</p> <p>A suitably positioned and clearly demarcated waste collection site must be identified and 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>		

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
DUST	Dust prevention measures must be applied to minimise the generation of dust.	The contractors must provide and maintain a method statement for "dust control". The method statement must provide information on the proposed source of water to be utilised.	All forms of dust pollution must be managed in terms of the National Environmental Management: Air quality Act, 2004 (Act No 39 of 2004)). 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	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.
			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.		
			Excavation, handling and transport of erodible materials must be avoided under high wind conditions or when a visible dust plume is present		
			The construction camp must be watered during dry and windy conditions to control dust fallout.		
			Dust production must be controlled by regular watering of roads and work area, should the need arise		
			During high wind conditions, the ECO must evaluate the situation and make recommendations as to whether dust damping		

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			<p>measures are adequate, or whether working will cease altogether until the wind speed drops to an acceptable level</p> <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</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>Sundays or outside of the abovementioned hours.</p> <p>Any complaints received by the Contractor regarding noise must be recorded and communicated. Where possible or applicable, provide transport to and from the site on a daily basis for construction workers.</p>		
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	<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>
	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	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	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	
		Animal Protection Act, 1962 (Act No. 71 of 1962)	<p>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 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>		<p>will also be responsible for training of staff in this regard.</p> <p>The ECO will monitor compliance.</p>
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>	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	
			All work must cease immediately, if any human remains are uncovered. Such material, if exposed, must be reported to the South African Police Services, so that a systematic and professional investigation can be undertaken. Sufficient time must be allowed to remove/collect such material before development recommences		
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.		

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			<p>Maintain an incidents and complaints register in which all incidents or complaints involving the public are logged.</p> <p>Ensure that the workforce is sensitised to the effects of sexually transmitted diseases, especially HIV AIDS. The Contractor must ensure that information posters on AIDS are displayed in the Contractor Camp area</p> <p>Workers must be instructed not to trespass onto adjacent land. Trespassers will be prosecuted.</p>		

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 **Tharisa Minerals Proprietary Limited**. Ultimately, they will be responsible for the development and implementation of the EMP and for ensuring that the conditions in the eventual Environmental Authorization (EA) are satisfied. Although construction activities will be contracted out, the liability associated with non-compliance still rests with the Project Proponent. The Project Proponent (and not the Contractor) 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 (taking account of the 30m buffer zone to the Molopo river) 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 on 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 were necessary i.e. dust masks, ear plugs etc.	Contractor, ECO, Health and Safety Officer	Monthly
		No person is to enter the portion of the site where construction activities are being undertaken without the necessary PPE.	Contractor, ECO, Health and Safety Officer	Monthly
		SABS Standards and specifications governing dangerous processes such as welding must be strictly applied, with a view to proper protection of the public and workers.	Contractor, ECO, Health and Safety Officer	As required
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 **Tharisa Minerals Proprietary Limited** 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.