

# 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 5,0534 hectares of indigenous vegetation (of which 31 292 m<sup>2</sup> is located within a CBA) in order to establish a Township consisting of 88 "Residential 3" Erven and streets located on the Remaining Extent of Erf 175 and a Portion of Erf 174, Stewartstown, Ixopo, Ubuhlebezwe Local Municipality, KwaZulu-Natal 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 5,0534 hectares of indigenous vegetation (of which 31 292 m<sup>2</sup> is located within a CBA) in order to establish a Township consisting of 88 "Residential 3" Erven and streets located on the Remaining Extent of Erf 175 and a Portion of Erf 174, Stewartstown, Ixopo, Ubuhlebezwe Local Municipality, KwaZulu-Natal Province and incorporates specific project mitigation measures. This EMPr therefore identifies the following:

- Construction and operation activities that will impact on the environment;
- Specifications with which the contractor shall comply in order to protect the environment from the identified impacts; and
- Actions that shall be taken in the event of non-compliance.

It is important to note that the EMPr is a dynamic document subject to similar influences and changes as are brought by variations to the provisions of the project specification. Any substantial changes shall be submitted to the contractor, resident engineer and relevant environmental authorities in writing for approval.

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

- A Geotechnical Engineer
- A Civil Engineer
- A Town and Regional Planner
- A SAHRA Specialist.
- Ecological Specialist (Fauna and Flora habitat specialist)
- Registered Environmental Assessment Practitioner (EAP)

They were responsible for the following actions:

- A Geotechnical Engineer was appointed to determine whether the Geology and Soils of the site is suitable for the proposed development.
- A Civil Engineer was appointed to determine the availability of services in the area and to design the services for the proposed development.
- A Town and Regional Planner designed the proposed development in such a way that the layout of the proposed development satisfies the needs of future occupiers of the site.
- A SAHRA Specialist has been appointed to determine the possible impact of the development on Archaeological and Cultural features.
- A Ecological specialist has been appointed to determine the impact of the proposed development on the Fauna and Flora of the area.
- An Environmental Screening Process was conducted by the EAP to ensure that all the relevant Environmental Legislation is taken into consideration.
- Desk top studies were conducted and alternatives assessed.
- Site inspections were carried out to verify the outcomes of the desktop studies, and the preferred alternative defined.
- A full Public Participation Process is being followed to obtain inputs from interested and affected parties.
- All the information obtained from the above mentioned processes is being used to assess the Environmental Impact that the proposed development may have on the Environment and vice versa.

## 2. Contents of the Environmental Management Programme

The contents of an EMPr, shown below, are contained in Appendix 4 of the NEMA EIA Regulations 982 of 2014 as amended and published in Appendix 4 of Government Notice No. R 326 of 2017.

1. (1) An EMPr must comply with section 24N of the Act and include-
- (a) details of
    - (i) the EAP who prepared the EMPr; and
    - (ii) the expertise of that EAP to prepare an EMPr, including a curriculum vitae;
  - (b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;

- (c) a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that 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):<sup>1</sup>

**Mr. JP de Villiers of AB Enviro Consult CC**

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#### 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**

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

## 5. DESCRIPTION OF THE ACTIVITY

The proposed development will entail the clearance of 5,0534 hectares of indigenous vegetation in order to establish a Township consisting of 88 “Residential 3” Erven and streets located on the Remaining Extent of Erf 175 and a Portion of Erf 174, Stewartstown, Ixopo, Ubuhlebezwe Local Municipality, KwaZulu-Natal Province. Please see Figures 1a and b below for the Locality Maps and Figure 2 for a copy of the proposed layout plan.

The total development footprint as per the legend below is 7,3662 hectares. Of this, 0,9828 hectares is zoned as “Passive open space” and will not be developed. An area of 1, 33 Hectares has already been cleared by informal housing. This brings the total area of indigenous vegetation that will be removed to 5,0534 hectares. Of this area 31 292 m<sup>2</sup> is located within a CBA (KZN CBA Irreplaceable version 2016). Please see Figure 3 for a copy of the CBA Map.

The layout plan make provision for 88 “Residential 3” erven, with an average stand size of 492m<sup>2</sup>. These properties are aimed at providing affordable and bonded housing units and can also include GAP housing (finance linked individual subsidies – FLISP).

Housing the poor was an ingredient of the Department of Human Settlement’s three-part response to the State’s Vision 2030 Strategy. “Gap housing” is a term that describes the shortfall or gap in the market between units supplied by the State and houses delivered by the private sector. The gap housing market comprises people who typically earn between R3500 and R15000 per month, which is too little to enable them to participate in the private property market, yet too much for state assistance. Gap housing is a policy that addresses the housing aspirations of people such as nurses, fire-fighters, teachers, SAPS members and member of the armed forces who earn between R3500 and R15000 per month and therefore do not qualify for RDP houses and do not earn enough to obtain home loans.

One of the subsidy programmes further available from the Department of Human Settlements includes the Finance Linked Individual Subsidy Programme (FLISP).

FLISP was developed to enable first time home-ownership to households in the “affordable or gap” market, that is, people earning between R3501 and R15000 per month. Individuals in these salary bands generally find it hard to qualify for housing finance; their income is regarded as low for mortgage finance, but too high to qualify for the government subsidy scheme available to households earning less than R3500 per month. Depending on the applicant’s gross monthly income, their once-off FLISP subsidy qualifying amount may vary between R20 000 and R87 000, as defined in the FLISP Subsidy Quantum. Any residential property acquired with the FLISP subsidy may not exceed the R300 000 price margin. FLISP assists qualifying beneficiaries who wish to obtain mortgage finance from a lender to:

- Acquire ownership of an existing residential property
- Obtain vacant serviced residential stands which are linked to house building contracts with the home builders registered with the National Home Builders Registration Council (NHBRC); or
- Build a new house with the assistance of a home builder registered with the National Home Builders Registration Council (NHBRC) on serviced residential stand that is already owned by the beneficiary

The objective of the programme is to reduce the initial mortgage loan amount to render the monthly loan repayment instalments affordable over the loan payment term.

The proposed layout also makes provision for four erven to be zoned as “Passive Open Space”: These properties coincide with the areas not suitable for development due to

- Building line restrictions alongside the R56 road running along the northern boundary of the application site
- A water pipeline servitude along the south-eastern boundary of the proposed development and through portions of the western part of the development, as indicated on the attached layout plan

Ubuhlebezwe faces housing challenges in both the rural and urban settings of the municipality. The urban setting involves the growing of informal settlement challenges coupled with the rectification issues dealing with past housing developmental quality standards. There are also issues around the limited availability of renting spaces to house the forever growing working-class resulting in more expensive backyard renting as the main option available. The rural context largely includes robust growth of settlement patterns as well as the rural human shelter made of informal structures which are not applicable to the general housing standards.

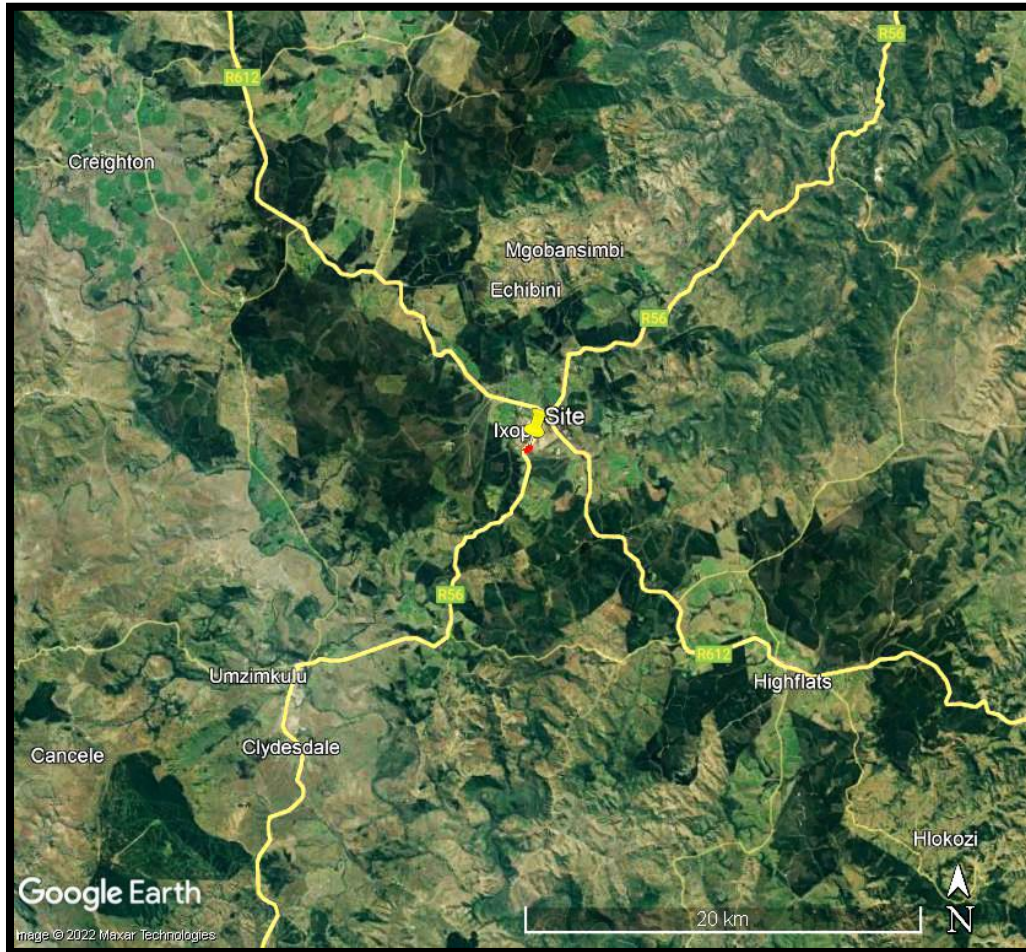
Multiple housing projects are underway and future housing projects have been planned for the municipality with a total housing provision of 12 609 units including the integrated residential development program, upgrading of informal settlements, housing assistance in emergency circumstances, community residential units programme and individual subsidy program.

Development within or adjacent to the towns of Ixopo and UMzimkhulu have substantially been adversely impacted due to the lack of well-located land and the large backlog in providing the required bulk and connector services to support such initiatives. These issues have resulted in a backlog in housing provision in the municipality with rising slums and poor housing conditions. As such there is a definite need for housing provision in Ubuhlebezwe.

Ixopo has been identified for significant residential development which could reduce the backlog of housing provision in the municipality and improve the living condition and quality of life of residents. Ixopo is a well-located town and has been identified as a primary node for infrastructural and services expansion (including housing), a provincial priority corridor (linking internal and external nodes) and a regional connector (playing a fundamental role in connecting this municipality with other neighbouring municipalities). This places Ixopo as a prime town for residential development.



<b>LEGEND</b>					
Land Use		Number of Erven	Erf Number	Area in Ha	% of Area
Residential 3	(Finance linked individual housing subsidy) (Min. 413m <sup>2</sup> ) (Max. 707m <sup>2</sup> )	88	*	4.3335ha	58.83%
Passive Open Space		4	*	0.9828ha	13.34%
Street				2.0499ha	27.83%
TOTAL		92	*	7.3662ha	100%
<b>STREETS</b>					
Reserve Width		Length in Metre		% of Street Length	
16metre		472m		28.89%	
13metre		444m		27.17%	
10metre		718m		43.94%	
TOTAL		1634m		100%	



**Figure 1a: Map of larger area with indication of the location of the site**



Figure 1b: Locality Map

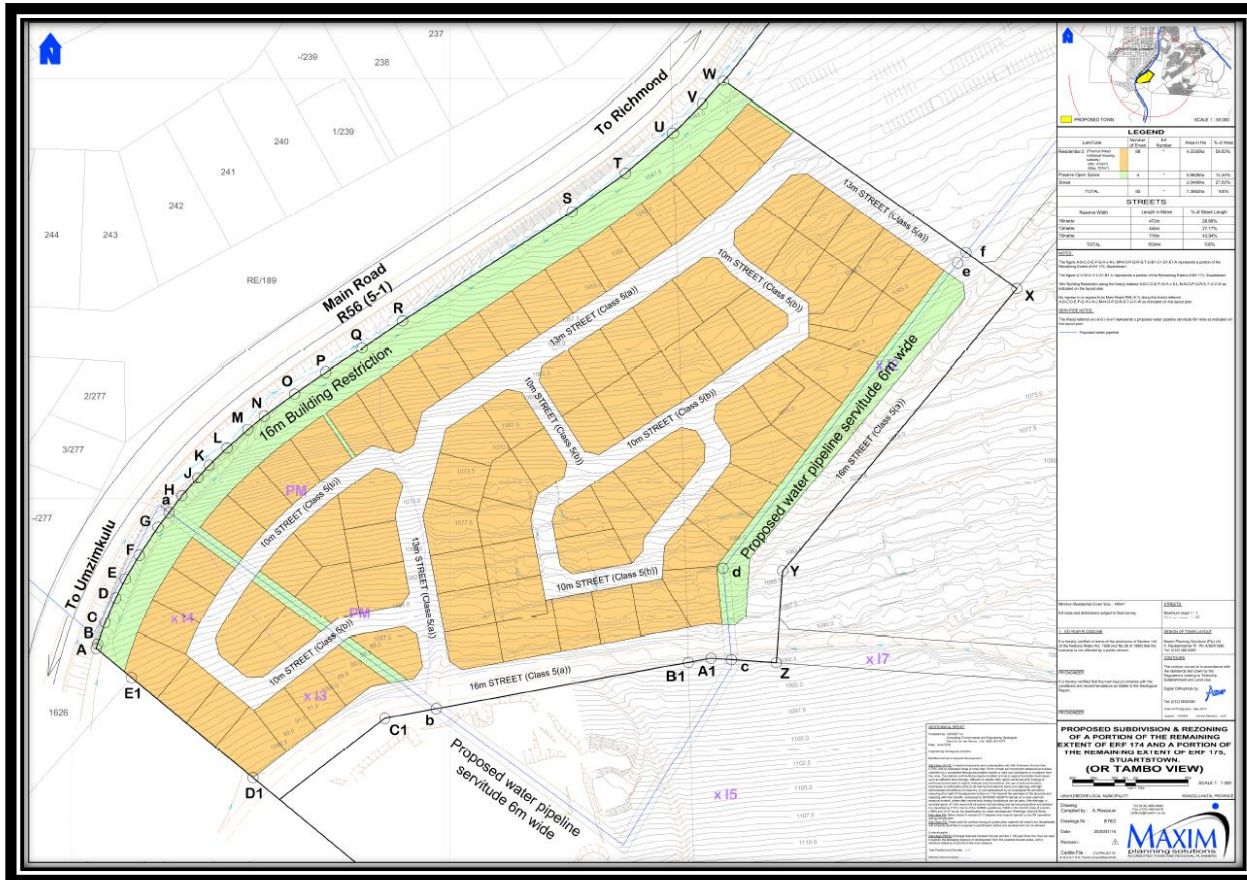


Figure 2a: Proposed layout plan



Figure 2b: Proposed layout plan (Base Map)

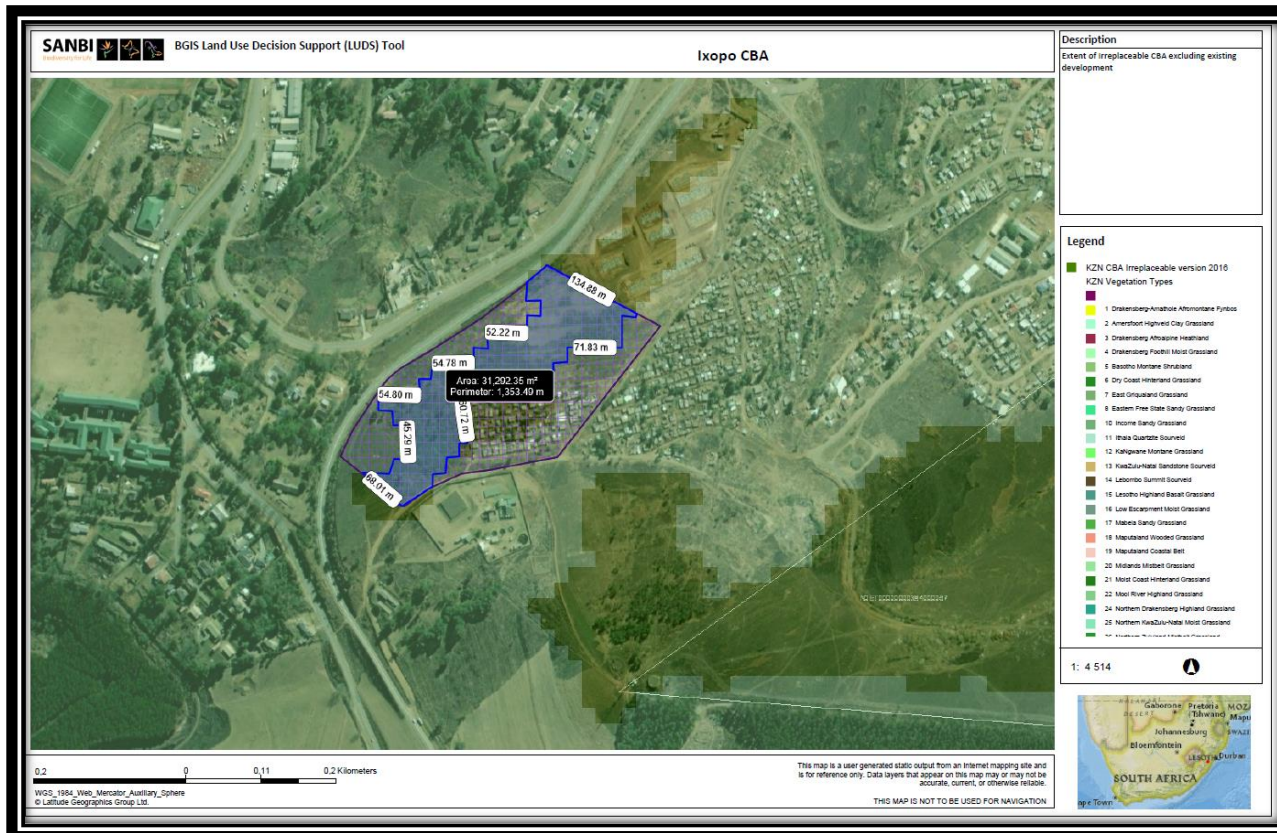


Figure 3: CBA Map

## **Bulk Services**

### **Bulk Water Supply**

The proposed development falls within the Umngeni Water system which is one of the largest systems within the uMkhomazi Water Resource Region. The Umngeni Water System is owned and operated by Ixopo System. Water is abstracted from the Home Farm Dam, located on the IXobho River a tributary of the UMkhomazi River, and a borehole, located on the local Ixopo

Golf Course and supplied to the Ixopo Water Treatment Plant for treatment.

The proposed OR Tambo View housing development will get its raw water from Ixopo Dam, potable water from Ixopo WTP

The bulk and internal infrastructure development will be designed taking into account all regulatory requirements as well as the conventional design standards used in the civil engineering industry.

The Harry Gwala District Municipality as the Water Service Authority has confirmed the existing water services in the immediate area to the proposed development have enough capacity to service the new development. The Water Service Authority (Harry

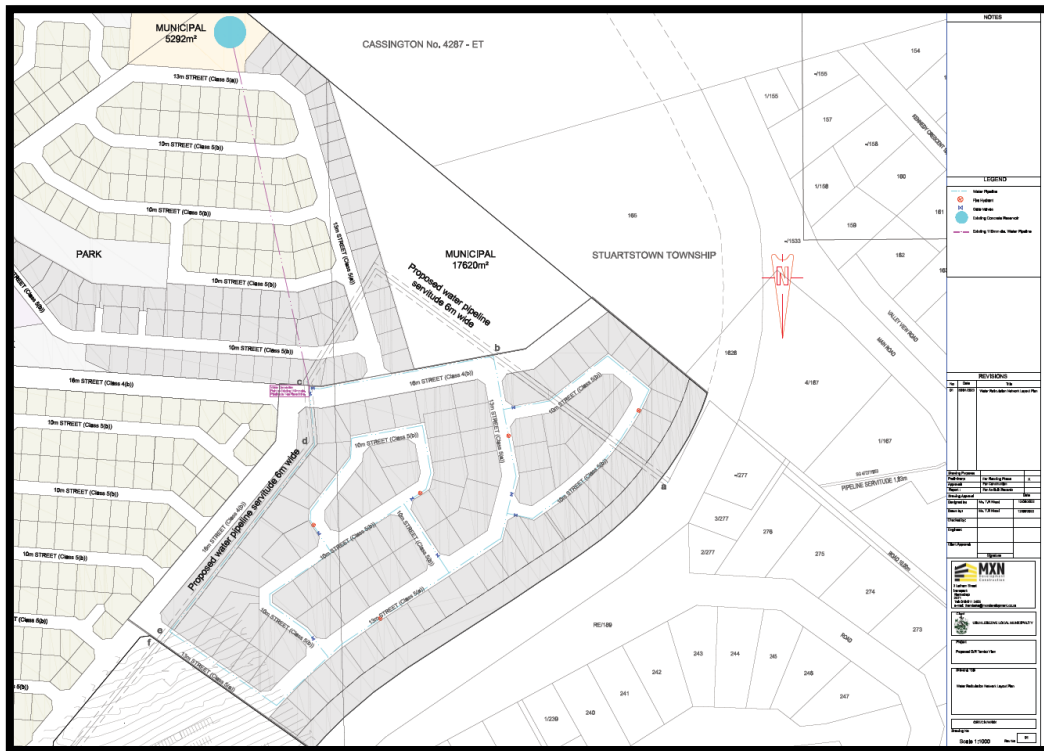
Gwala District Municipality) confirmed that they will provide the proposed OR Tambo View development with a new bulk water pipe with a pipe diameter of 160mm uPVC close to the development to supply portable water.

According to Umngeni Water's Infrastructure Master Plan Volume 3, The Ixopo Potable Water Reservoir is located at the Water Treatment Plant and acts as a balancing and service reservoir. It has a storage capacity of 2.5ML and sits at an elevation of 1001.23m ASL. Besides the above-mentioned reservoir, there is currently no water distribution networks in the proposed OR Tambo View area.

The initial and ultimate water demands for OR Tambo View Area are as follows;

- Initial water demand – 291.46 kl/day,
- Ultimate water demand – 352.13 kl/d,

A new water reticulation network of uPVC pipes with varying pipe diameters 75mm, 110mm, 160mm has been designed and will be constructed within the proposed OR Tambo View development. Please see Figure 4 below for design details.



**Figure 4: Internal water reticulation**

### Bulk Sewage

The Proposed OR Tambo View settlement falls within an area serviced by the Ixopo Wastewater Works (WWW). The Ixopo WWW is owned and operated by Umgeni Water. The Ixopo WWW operations use aeration basins for biological nutrient removal and clarifiers for the separation process. The proposed OR Tambo View will discharge its sewer into the exiting Ixopo WWW. According to Umgeni Water's Infrastructure Master Plan Volume 10, Ixopo WWW serves the town of Ixopo in the Harry Gwala District Municipality and is a Class D accredited WWW. It is located next to the R612 regional road and downstream of the Home Farm Dam, which supplies the raw water to Umgeni Water's Ixopo WTP.

According to Umgeni Water's Infrastructure Master Plan 2022 Volume 10, the maximum design capacity of Ixopo WWW is 1Ml/day. Flows to the WWW have been reduced as a result of blockages in the Ixopo sewer network and non-operational pump stations. The flows dropped to <0.2Ml/day. The anticipated return flows are approximately 1.3Ml/day. Therefore, there is a spare capacity of 0.7Ml/d. The Ixopo WWWP has sufficient capacity to meet the current waste water demand of OR Tambo View Development.

The bulk and internal infrastructure development have been designed taking into account all regulatory requirements as well as the conventional design standards used in the civil engineering industry.

The initial and ultimate wastewater demands for OR Tambo View Area are as follows;

- Initial wastewater demand – 109.638kl/day (1.27l/s),
- Ultimate wastewater demand – 132.46kl/day (1.53l/s),

### Proposed Bulk Sewer Supply

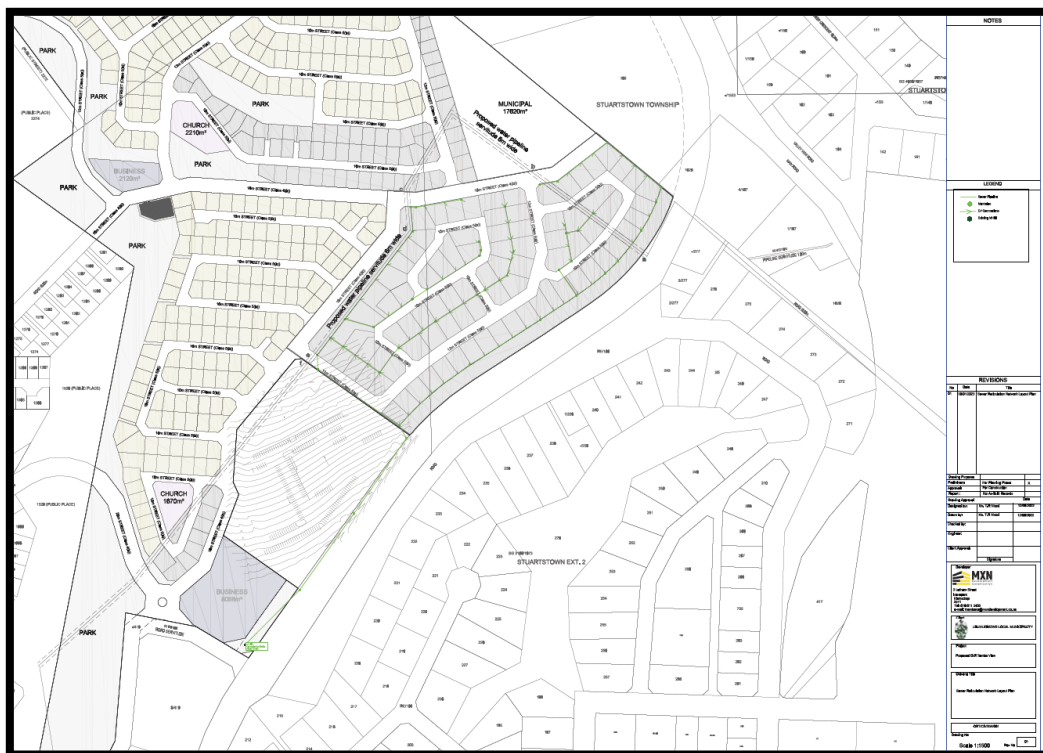
The proposed OR Tambo View Development will discharge its sewer effluent into an existing bulk sewer pipeline which is connected to the existing Ixopo WWW. Umgeni Water has confirmed that there is a newly constructed existing bulk sewer pipe with a pipe diameter of 250 mm uPVC close to the development to discharge sanitation on MH60. In the interim it should be noted however, that the diameter and depth of the sewer pipeline will be determined during detail



design stage. The proposed bulk sewer pipeline will be uPVC and will cross below any watercourse should there be any, gabions mattresses, dump rock and crusher stones as bedding and blanket to protect the pipe will be utilized.

### Proposed Sewer Reticulation Internal Services

A full water borne sanitation system is proposed connecting into the existing bulk/link sewer pipes. Materials used should be PVC with the minimum sizes of 160mm diameter with house connections to be 160mm diameter. Maximum manhole distances of 80m. Please see Figure 5 below.



**Figure 5: Internal sewer reticulation**

### Stormwater

A Storm water report has been compiled to address the requirements of the Ubuhebezwe Local Municipality Regarding the provision of municipal services. The report summarized the level and extent of services required and in terms of this report focus is given to the Stormwater Management Plan.

The main objective of the Storm Water Management Plan is to:

- Minimise the threat of flooding to the area
- Protect the receiving water bodies in the area
- Preserve biodiversity in the area
- Promote the multi-functional use of stormwater management systems (provide amenity to communities)
- Promote the use of the stormwater itself as a water resource
- Develop sustainable stormwater systems.

## 6. DESCRIPTION OF THE PROPERTY

The proposed development will be located on a Portion of the Remainder of Erf 174 and a Portion of the remaining extent of Erf 175 Stuartstown in Ixopo, which falls under the jurisdiction of the Ubuhebezwe Local Municipality (ULM).

Ubuhlebezwe Local Municipality (KZ5a5) is a Category B municipality located within the Harry Gwala District Municipality (DC43). The main administrative centre of the Municipality is the town of Ixopo, which is located approximately 85km south east of Pietermaritzburg, capital of KwaZulu-Natal, and is strategically located at the intersection of four major provincial routes leading to Pietermaritzburg, the Drakensberg, the Eastern Cape and the South Coast. The town of Ixopo forms the primary development node of the Municipality and has also been selected as the seat of the Harry Gwala District Council. The importance of Ixopo cannot be underestimated in the socio-economic development of the area as a whole. Ixopo plays an important role in terms of the possible location for industry, commerce and other economic activity. It is a major education and health centre and assists in the diffusion of new ideas and technologies to the rural areas. It is also the primary base for the operation of many departments and service providers. Please refer to Figure 6 below. The numbers indicate the locality of and direction in which the Photographs were taken.

The proposed development is located within the Urban area of Ixopo approximately 700 meters from the CBD (as the crow flies) and towards the south of the Provincial Route (R56) between Pietermaritzburg (approximately 85 km from Pietermaritzburg) and Kokstad (approximately 110 km from Kokstad). Please see Photograph 1. The site is bordered by the Ixopo water treatment plant towards the South (Please see Photograph 2), a formal Residential development towards the North (Please see Photograph 3) and informal settlement towards East (See photograph 4). A portion of the site currently lies vacant while almost a third of the site is occupied by the Choc City / Shayamoya informal settlement. See Photograph 5.

Ecological disturbances at the site include residential settlements where vegetation has been transformed. Extensive informal dumping (See Photograph 6) and roads (See Photograph 4) with ditches where stormwater is channelled, are found at the site. Extensive and visibly dense covers of alien invasive plant species are conspicuous at the site. See Photograph 7.

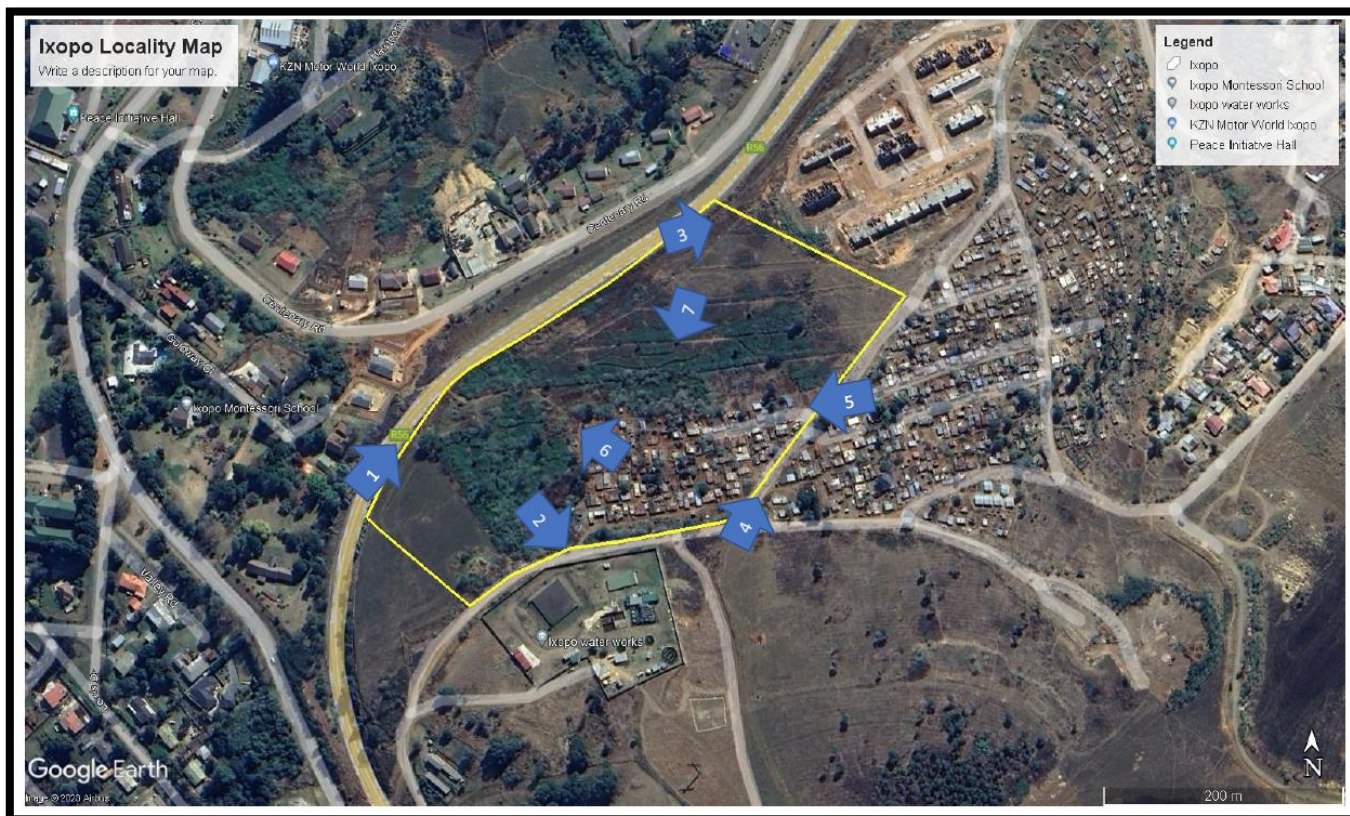


Figure 6: Locality Map



**Photograph 1: View of the Provincial Route (R56) that borders the site towards the North and North-West.**



**Photograph 2: The site is bordered by the Ixopo water treatment plant towards the South**



**Photograph 3: A formal Residential development borders the site towards the North**



**Photograph 4: Informal settlement towards the East. Also note the informal roads.**



**Photograph 5: Informal settlement on the left and vacant portion of the site on the right. Also note the informal roads.**



**Photograph 6: Informal dumping on site**



**Photograph 7: Alien invasive plant species are conspicuous at the site**

As mentioned in Paragraph 3, 31 292 m<sup>2</sup> of the site is located within a CBA (KZN CBA Irreplaceable version 2016). (Please see Figure 3 for a copy of the CBA Map). The Screening Tool Report generated, using the National Web Based Screening Tool, has also indicated that the site has a Medium Sensitivity for Plant Species Theme (See Figure 7), Very High Terrestrial Biodiversity Theme (See Figure 8) and Aquatic Biodiversity Theme (See Figure 9) and a High Animal Species Theme (See Figure 10). As a result of these classifications, a Specialist was appointed to determine the sensitivity of the site. He concluded as follows:

Extensive covers of alien invasive plant species are conspicuous at the site. Vegetation is transformed at parts of the site, owing to residences, and at other parts, modified or degraded.

#### *Animal species theme sensitivity*

Relative animal species theme sensitivity is listed as high. No suitable habitat for *Hirundo atrocaerula* (Blue Swallow) is present at the site and the occurrence of this species at the site is highly unlikely. No suitable habitat for the butterfly species *Chrysoritis phosphor borealis* is present at the site (needs specific indigenous forest habitat). No signs or observations of *Chrysospalax villosus*, *Dendrohyrax arboreus* or *Ourebia ourebi ourebi* were noted at the site and based on habitat conditions it is highly unlikely that any of these mammals occur at the site. Such as listed in Tables 4.9 – 4.17

(Of the Fauna and Flora Habitat Report, Appendix C of this Report) no animals of particular conservation concern are likely to be present at the site. The overall animal theme sensitivity, following the ground truthing at the site, appears to be low.

#### *Aquatic biodiversity theme sensitivity*

Relative aquatic biodiversity theme sensitivity at the site is listed as very high owing to the presence of an aquatic CBA and strategic water source area. The site is not part of a FEPA Freshwater Ecosystem Priority Area (Nel *et. al.*, 2011). There are important wetlands and watercourses in the larger area. The present rain water run off systems at the site, in particular given the presence of extensive informal dumping and informal residences, are of concern. There are no wetlands at the site and locally at the site the aquatic biodiversity theme sensitivity is low. However, because of the importance of the strategic water source area the stormwater system, if the development is approved, should be carefully planned,

#### *Plant species theme sensitivity*

Relative plant species theme sensitivity is listed as medium. Extensive covers of alien invasive plant species are conspicuous at the site. Vegetation is transformed at parts of the site, owing to residences, and at other parts, modified or degraded. It is highly unlikely that plant species such as *Stachys comosa*, *Woodia verruculosa*, *Helichrysum pannosum*, *Sisyrnthes fanninae* and *Senecio dregeanus* would be present at the site. No signs of these species were observed. It is also highly unlikely that other sensitive species, such as Declining species prone to harvesting (see Table 4.7 and Table 4.8) (Of the Fauna and Flora Habitat Report, Appendix C of this Report) would occur at the site. The overall plant theme sensitivity, following the ground truthing, appears to be low.

#### *Terrestrial biodiversity theme sensitivity*

Relative terrestrial biodiversity at the site is listed as very high. This high sensitivity that is ascribed to the site area, is because of the presence of Critical Biodiversity Area 1, an Ecological Support Area, a Protected Areas Expansion Strategy, Strategic Water Source Areas and a mapped Vulnerable Ecosystem, the Midlands Mistbelt Grassland. During surveys at the site, it was found that the original vegetation type is partly transformed, modified, visibly degraded and that the relatively small site is largely isolated. There is little scope to restore the grassland at the site and conserve it as a natural unit of Midlands Mistbelt Grassland. The terrestrial biodiversity theme at the proposed footprints appears to be low at the site.

Ecological sensitivity at the site is **low and very-low**. Ecological sensitivity at the parts of the site where residential settlements occur, and vegetation has been transformed, is very-low.

Ecological sensitivity at the remainder of the site where vegetation is modified and where extensive and visibly dense covers of alien invasive plant species are present, is low.

Please see Figure 11 for a Sensitivity Map generated by the Specialist.



Figure 7: Plant Species Theme according to the Screening Tool Report generated, using the National Web Based Screening Tool

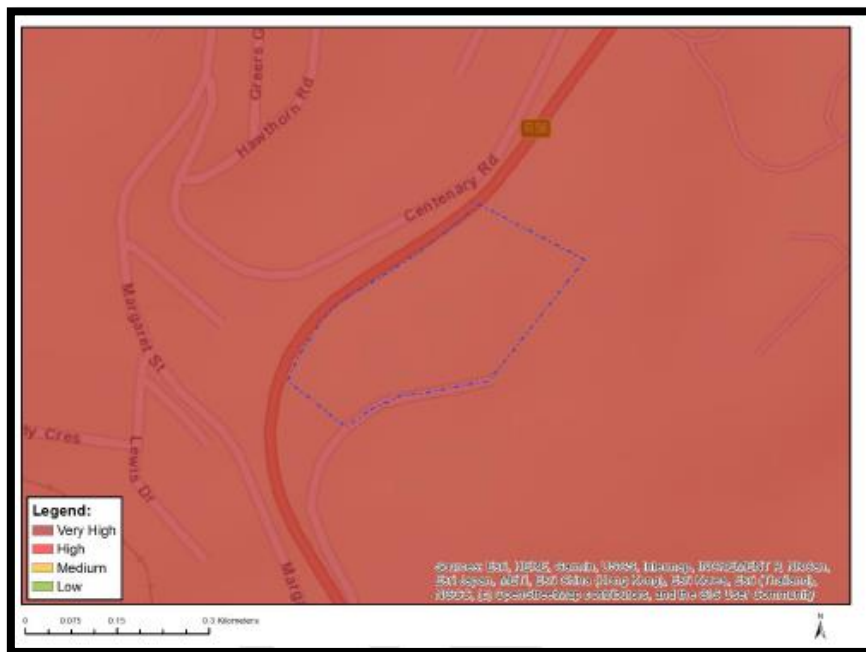


Figure 8: Terrestrial Biodiversity Theme according to the Screening Tool Report generated, using the National Web Based Screening Tool

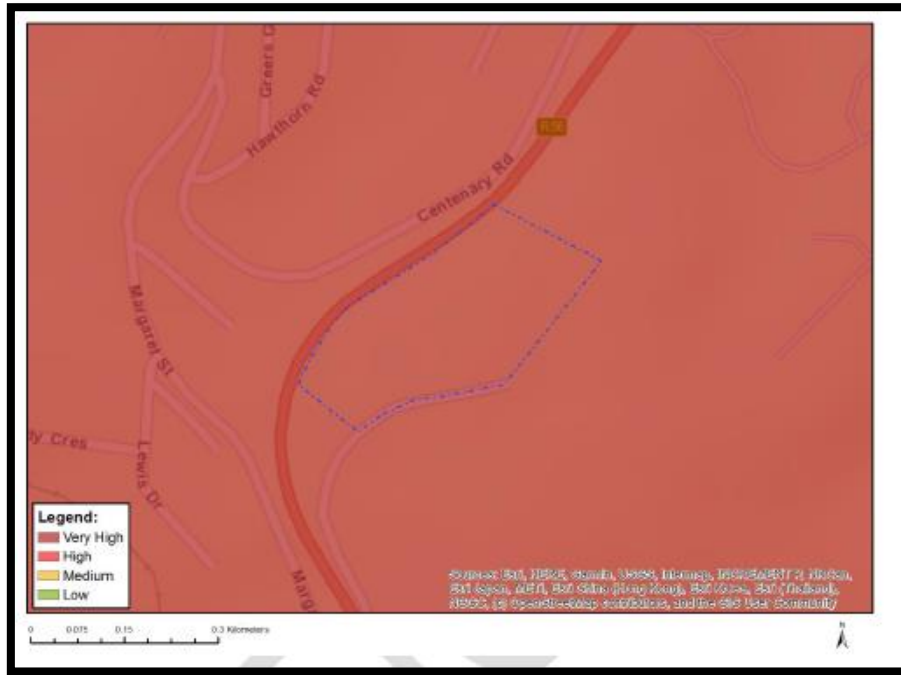


Figure 9: Aquatic Biodiversity Theme according to the Screening Tool Report generated, using the National Web Based Screening Tool



Figure 10: Animal Species Theme according to the Screening Tool Report generated, using the National Web Based Screening Tool



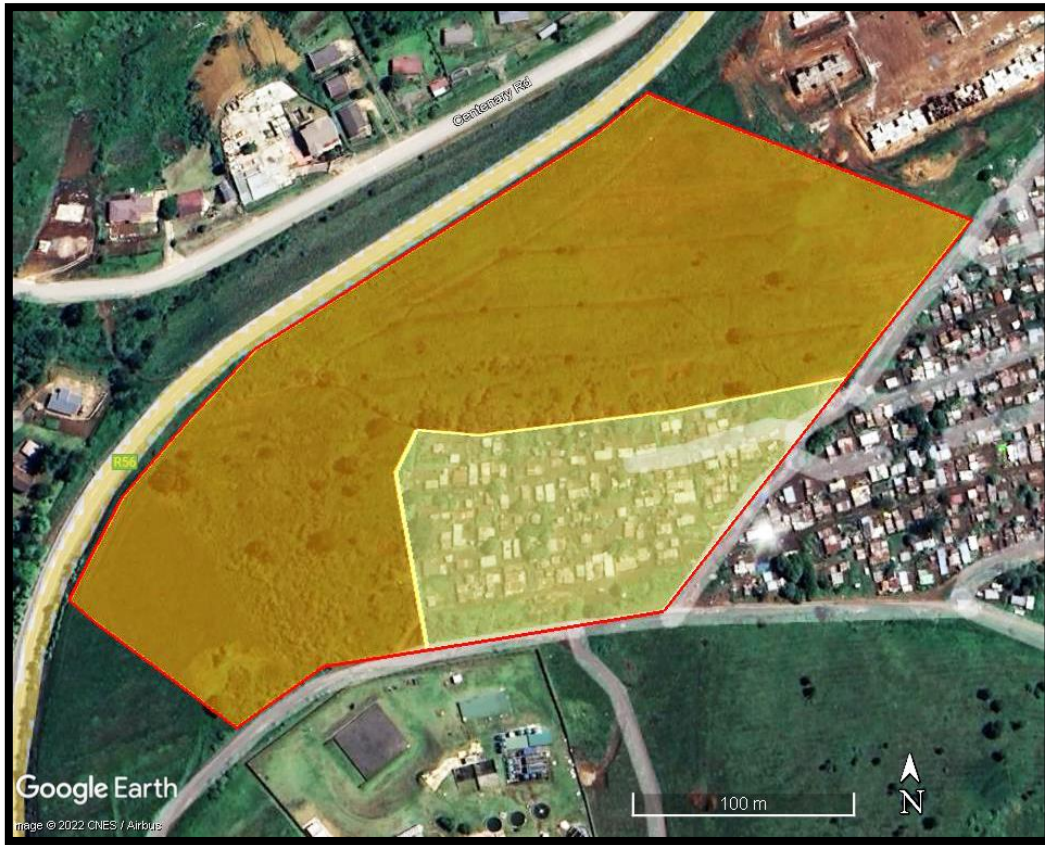


Figure 11: Sensitivity Map generated by the Specialist

- Red outline                                                  Boundaries of the site
- Light yellow outline and shading                          Very-low Sensitivity
- Orange outline and shading                                          Low Sensitivity

The Surveyor-general 21-digit site reference number are:

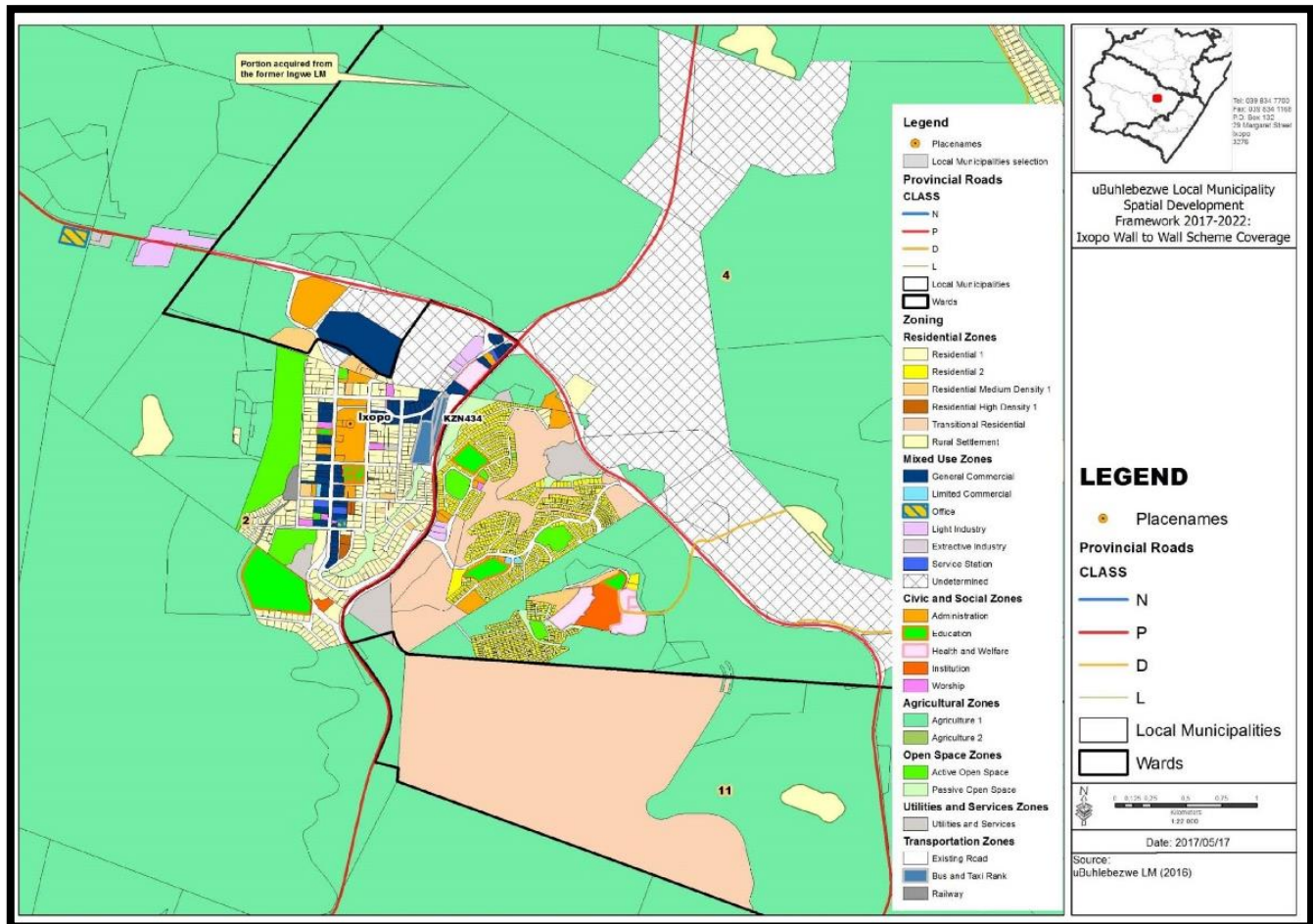
N	O	E	T	0	3	2	4	0	0	0	0	0	1	7	4	0	0	0	0	0
N	O	E	T	0	3	2	4	0	0	0	0	0	1	7	5	0	0	0	0	0

**geographical coordinates** for the site are:

Latitude /Longitude	Degrees	Minutes	Seconds
South	30°	09'	40,95"
East	30°	03'	42,93"

In terms of Ubuhlebezwe Local Municipality Land Use Scheme, 2018, the current zoning of the area is as follows:

- Remaining Extent of Erf 175 – “Utilities and services”
- Remaining Extent Erf 174 – “Transitional Residential”



Zoning Map

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

### 7.1 BIO-PHYSICAL ASPECTS

#### 7.1.1 GEOLOGY AND SOIL

The site is underlain by dark grey shale, carbonaceous shale or siltstone of the Pietermaritzburg Formation of the Ecca Group, Karoo Supergroup. Some dolerite intrusions in the form of dykes and sills are also present in the area. Locally the lithology is covered by hillwash. The topography of the site has a relatively steep to very steep north- north-easter slope from 1 049 meters above sea level in the north to 1 096 meters above sea level in the south.

Additional to local slope instability within opened trenches and the collapse of pit side walls, other slope instability of deeply weathered hillwash is expected within these relative steep areas, and the possibility of a major slope failure could be inflated during long periods of consistent rain fall. Cut and fill operations should also be concluded with proper compaction of the filling material to fit engineer's specification.

No problems are foreseen regarding the excavatability to 1,5m depth on site.

Zoning of the site revealed zones with some moderate constraints regarding the collapse potential and the compressibility of the soil.

The following zones were identified:

## Engineering Geological Zonation

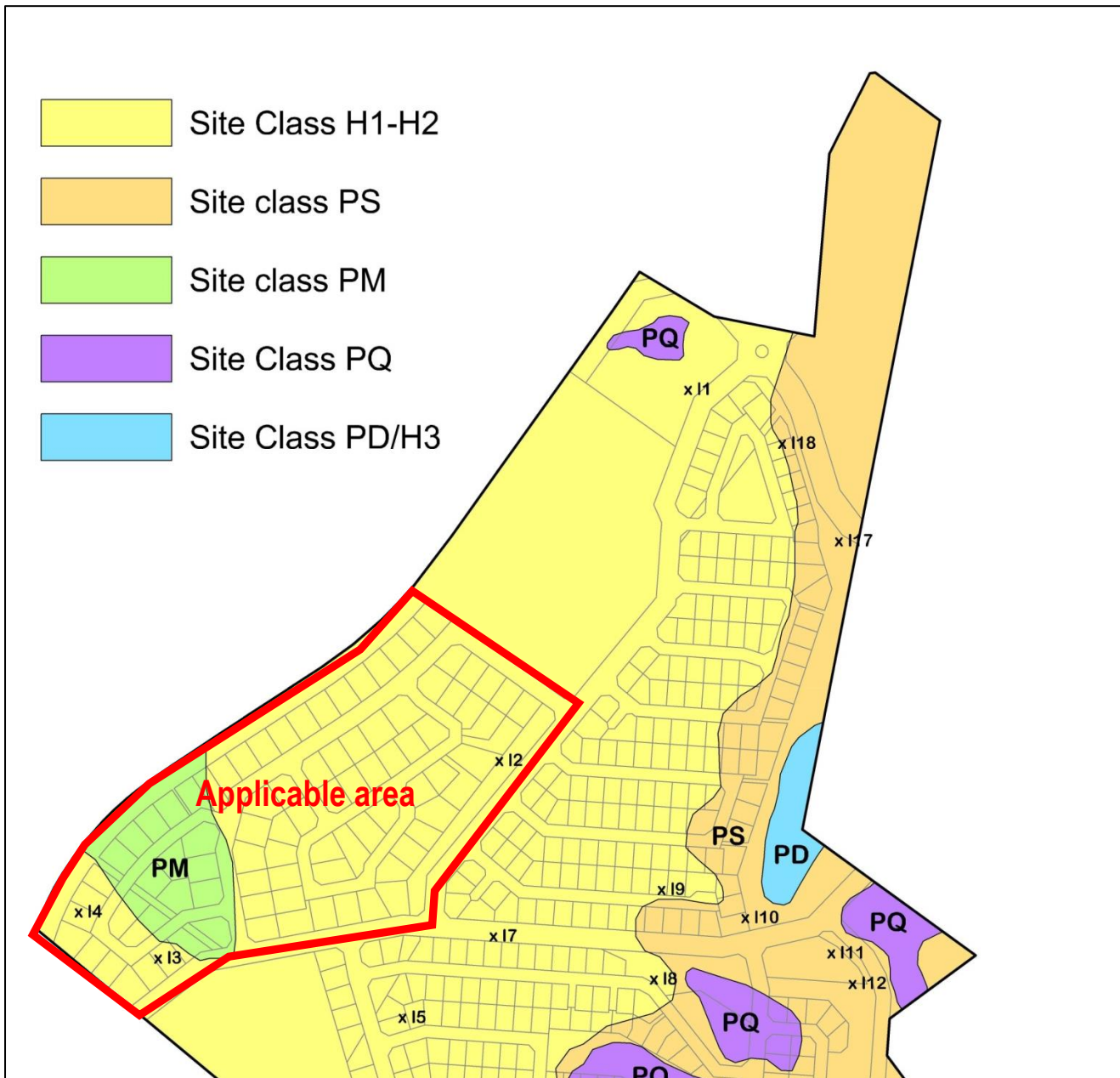
### **Modified Normal to Special Development:**

**Site Class H2-H3/C1:** This zone comprises mainly of a medium expansive and compressible soil, with thickness in excess of 0,75m, and an expected range of 15 up to 30mm and even more than 30mm of total soil movement measured at surface, underlain in depth by shale or mudstone. Foundations will therefore require modified normal to special foundation techniques such as soil replacement by an engineered fill soil raft by removing all or part of the expansive horizon to 1,0m beyond the perimeter of the structure and replacing with inert backfill, compacted to 93%MOD ASSHTO density at or near optimum moisture content, where after normal strip footing foundations can be used. Special foundation techniques may also include the use of stiffened strip footings, stiffened or cellular rafts, lightly reinforced strip footings or reinforced boxed steel in slightly widened strip foundations, the use of split construction techniques or articulation joints at all internal and external doors and openings with light reinforcement (brickforce) in masonry. Site drainage, a concrete apron of 1,0m around all structures and plumbing and service precautions are advised.

It is classified as H2 to H3 / C1 in terms of the NHBRC guidelines (1995) or the SAICE Code of practice (1995) and 2A2C2D2E as per the classification for urban development (Partridge, Wood & Brink).

**Site Class PM:** Marshy areas due to a large diameter sewage pipe leakage must be permanently repaired and the problem solved before commencement of construction.

The zones listed above are illustrated below:



**Engineering Geological Zone Map**

**Modified normal and special construction** techniques will be required to enable proper development. This includes the use of **compaction techniques** as described.

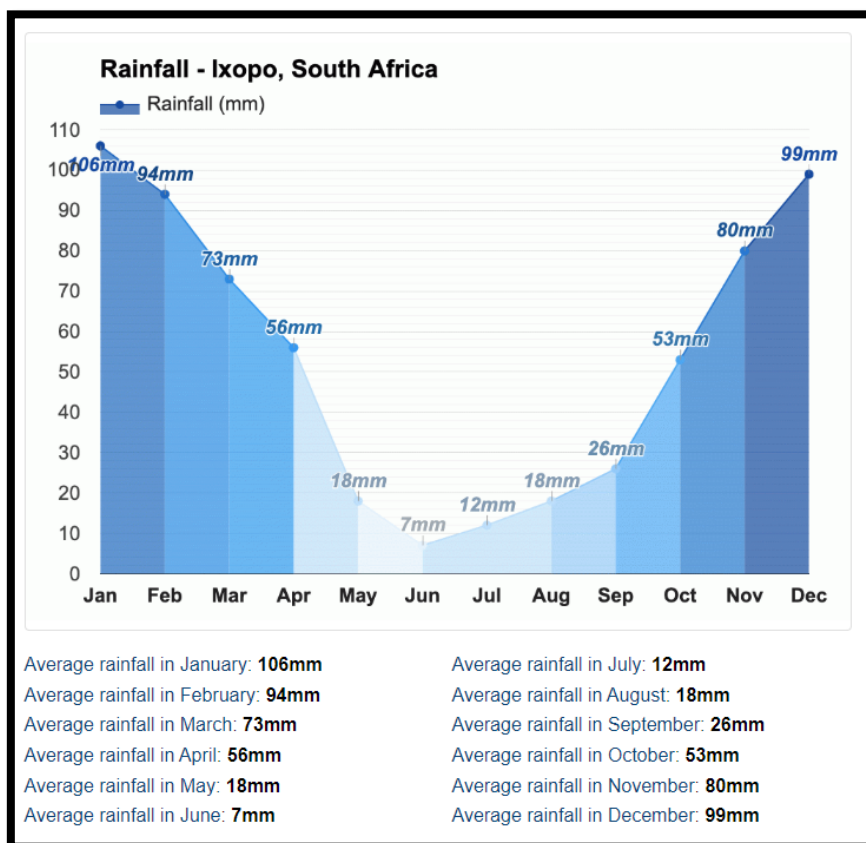
### 7.1.2 TOPOGRAPHY

The topography of the site has a relatively steep to very steep north- north-easter slope from 1 049 meters above sea level in the north to 1 096 meters above sea level in the south. A detailed site survey has been carried out to establish levels. The Layout plan addresses issues regarding storm water. As the proposed development will be in close proximity to residential areas, safety of children and people need to be taken into consideration.

### 7.1.3 CLIMATE

#### 7.1.3.1 Rainfall

The region is characterized by summer rainfall with thunderstorms, with annual high rainfall figures of 827 mm. The wettest month (with the highest rainfall) is **January** (106mm). The driest month (with the least rainfall) is **June** (7mm)



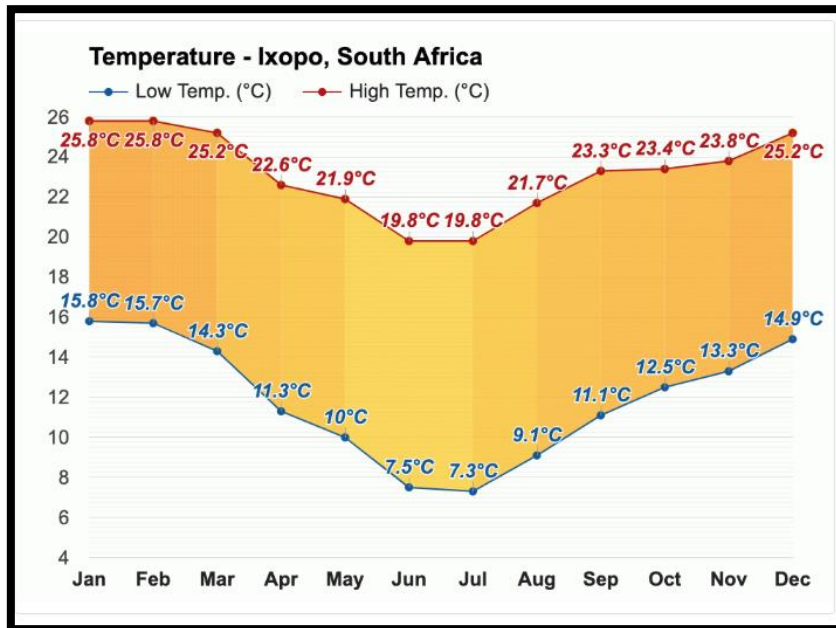
Average rainfall in January: 106mm  
 Average rainfall in February: 94mm  
 Average rainfall in March: 73mm  
 Average rainfall in April: 56mm  
 Average rainfall in May: 18mm  
 Average rainfall in June: 7mm  
 Average rainfall in July: 12mm  
 Average rainfall in August: 18mm  
 Average rainfall in September: 26mm  
 Average rainfall in October: 53mm  
 Average rainfall in November: 80mm  
 Average rainfall in December: 99mm

Average rainfall statistics for Ixopo.

(Source: <https://www.weather-atlas.com/en/south-africa/ixopo-climate#rainfall>)

7.1.3.2 Temperature

Winters are dry with no frost. The warmest months are normally December to March and the coldest months are June and July. The warmest months (with the highest average high temperature) are **January** and **February** (25.8°C). The months with the lowest average high temperature are **June** and **July** (19.8°C). The month with the highest average low temperature is **January** (15.8°C). The coldest month (with the lowest average low temperature) is **July** (7.3°C).



Average high temperature in January: <b>25.8°C</b>	Average high temperature in July: <b>19.8°C</b>
Average high temperature in February: <b>25.8°C</b>	Average high temperature in August: <b>21.7°C</b>
Average high temperature in March: <b>25.2°C</b>	Average high temperature in September: <b>23.3°C</b>
Average high temperature in April: <b>22.6°C</b>	Average high temperature in October: <b>23.4°C</b>
Average high temperature in May: <b>21.9°C</b>	Average high temperature in November: <b>23.8°C</b>
Average high temperature in June: <b>19.8°C</b>	Average high temperature in December: <b>25.2°C</b>

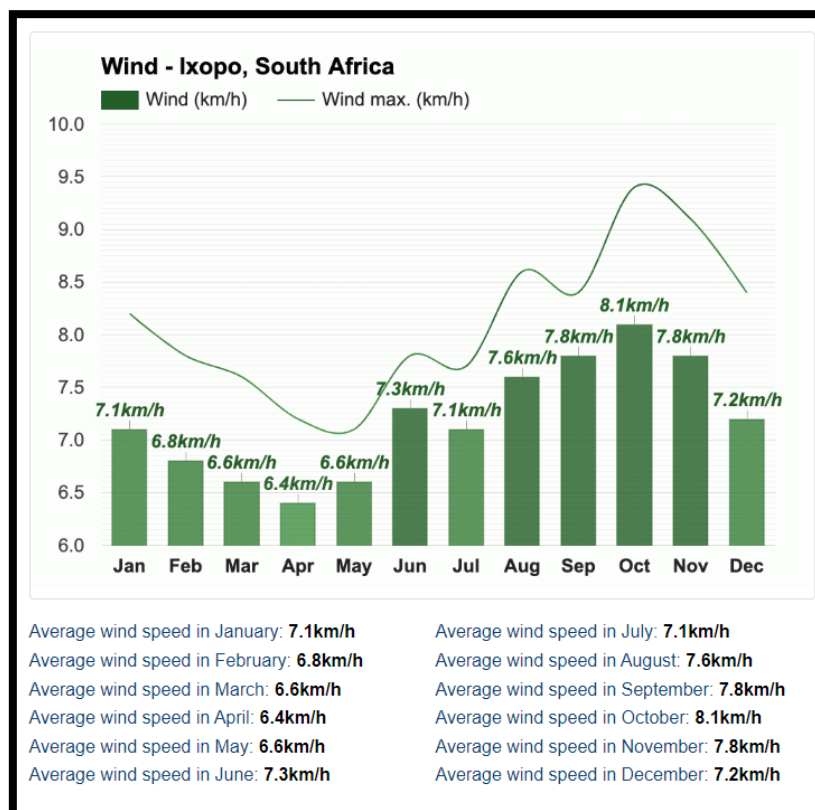
Average low temperature in January: <b>15.8°C</b>	Average low temperature in July: <b>7.3°C</b>
Average low temperature in February: <b>15.7°C</b>	Average low temperature in August: <b>9.1°C</b>
Average low temperature in March: <b>14.3°C</b>	Average low temperature in September: <b>11.1°C</b>
Average low temperature in April: <b>11.3°C</b>	Average low temperature in October: <b>12.5°C</b>
Average low temperature in May: <b>10°C</b>	Average low temperature in November: <b>13.3°C</b>
Average low temperature in June: <b>7.5°C</b>	Average low temperature in December: <b>14.9°C</b>

### Average temperature statistics for Ixopo.

(Source: <https://www.weather-atlas.com/en/south-africa/ixopo-climate#rainfall>)

### 7.1.3.3 Wind

The windiest month (with the highest average wind speed) is **October** (8.1km/h). The calmest month (with the lowest average wind speed) is **April** (6.4km/h).



Average wind speed statistics for Ixopo.

(Source: <https://www.weather-atlas.com/en/south-africa/ixopo-climate#rainfall>)

## Climate Change

(This Section has been taken from the Harry Gwala District Municipality Climate Change Vulnerability Assessment and Response Plan, March 2018, version 2. Report submitted by Urban Earth.)

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).

Harry Gwala District Municipality recognises climate change as a threat to the environment, its residents, and to future development. Therefore, 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 in the District. Harry Gwala District Municipality has therefore prioritised the development of a Climate Change Vulnerability Assessment and Climate Change Response Plan. Through this program key climate change vulnerability indicators for the Harry Gwala District Municipality were identified. These indicators demonstrate areas that maybe at high risk of climate change impacts.

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 for Harry Gwala District Municipality

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 Harry Gwala District Municipality’s 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. In the Harry Gwala District Municipality, 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 in the District.

#### Human Health

Climate change impacts affect the social and environmental determinants of health and will therefore affect human health in several ways in the Harry Gwala District Municipality. 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.

### Disaster Management, Infrastructure and Human Settlements

Climate change impacts will affect Disaster Management, Infrastructure and Human Settlements in several ways in Harry Gwala District Municipality. 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.

### 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 Harry Gwala District Municipality's 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.

### Cross-Cutting

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. 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.

## **Sector Response Plans**

The section below summarises responses that have been identified by the Harry Gwala District Municipality to address the key vulnerabilities that is applicable to this proposed development.

### **Biodiversity and Environment**

#### Overview of Key Issues

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 CO<sub>2</sub> 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 through the LGCCSP as priority areas for the biodiversity sector in the District Municipality

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

## **Human Health**

### Overview of Key Issues

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 through the LGCCSP as priority areas for the biodiversity sector in the District Municipality

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

## **Disaster Management, Infrastructure and Human Settlements**

### Overview of Key Issues

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 through the LGCCSP as priority areas for the biodiversity sector in the District Municipality

- Manage potential increase migration to urban and peri-urban areas.
- Manage potential increased risk of wildfires

## **Water**

### Overview of Key Issues

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 through the LGCCSP as priority areas for the biodiversity sector in the District Municipality

- 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**

#### Overview of Key Issues

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 through the LGCCSP as priority areas for the biodiversity sector in the District Municipality

Generate knowledge and disseminate information on climate change.

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## **7.1.4 SURFACE DRAINAGE, WETLANDS AND RIPERIAN ZONES**

The site is situated within the Mvoti to Umzimkulu Water Management Area, within the U10K quaternary catchment. The site is located within the uMkhomazi river catchment, more specifically a to a non-perennial tributary to the Xobho river draining through the town of Ixopo. The uMkhomazi river rises in some of the highest eastwards-facing slopes of the Drakensberg mountains, near the mighty Thabana Ntlenyana. The river flows southeast wards towards the Indian Ocean, which it enters through a navigable estuary at Umkomaas, about 40 km southwest of Durban. Its main tributaries are the Loteni, Nzinga, Mkomazane, Elands and the Xobho River. Presently the only dam in tis catchment is the Ixopo Dam.

Plate flow is the dominant drainage pattern on the site and no streams are found on site. The natural topography of the site is relatively steep to very steep. A few dominant drainage patterns exist adjacent to the site that drains mainly in a north easterly direction towards the uMkhomazi river. The site is mainly covered by grassland field with informal

settlements and currently drains as surface runoff across the site towards the earth channel located along R56 on the western boundary of the site. Please see Figure 12. The development is expected to increase the stormwater runoff since new hard surfaces will be constructed and therefore storm water systems must be designed to have minimal impact on the environment, through the careful implementation of sustainable drainage systems (SuDS) and stormwater management systems.



Figure 12 Indication of ditch that serves as stormwater canal at present.

— Red outline                      Study area

### Absence of wetlands

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.

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### 7.1.5 GROUND WATER

No seepage but the presence of perennial fluctuations of ground water were encountered on site, proving that a seasonal perched water table exist. A ferruginised profile indicates that some perennial water level fluctuations occur. Ground water in the form of seepage was not intersected in any test pits during the investigation, but some problems are foreseen and normal water tightening techniques such as damp course on foundation levels are required. The expected high permeability of the silty sand may lead to leachate from sanitation systems to reach the ground water, and a closed water borne sewage system is recommended.

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. During the operational phase, fuel storage tanks must also not pollute groundwater. These aspects are addressed in the EMP.

## 7.1.6 FLORA AND FAUNA

The study area is situated at the Grassland Biome (Mucina & Rutherford 2006). The Grassland Biome at the site is represented by Midlands Mistbelt Grassland (Gs 9) (Mucina & Rutherford 2006). The Midlands Mistbelt Grassland (Gs 9) vegetation type is listed as a Threatened Ecosystem, Vulnerable, according to the National List of Threatened Ecosystems (2011). A brief overview of the vegetation type, which serves as an outline of the ecological context of the site, follows.

### Gs 9 Midlands Mistbelt Grassland

**Distribution:** In South Africa the Midlands Mistbelt Grassland is found in the KwaZulu-Natal and Eastern Cape Provinces. In the KwaZulu-Natal Midlands the vegetation type is scattered in a broad belt in the form of several major patches including the Melmoth-Babanango area, Kranskop and Greytown, Howick Lions River, Karkloof, Balgowan, Cedara, Edendale, Hilton, Richmond, Ixopo-Highflats area, Mount Malowe in the Umzimkulu enclave of the Eastern Cape Province and the Harding-Weza area. The southwesternmost section in the Eastern Cape Province falls in the Bulemnu, Gxwaleni, Longweni and Flagstaff areas. Altitude ranges from 760 m – 1400 m (Mucina & Rutherford, 2006).

**Vegetation and landscape features.** Hilly and rolling landscape mainly associated with a discontinuous east-facing scarp formed by dolerite intrusions (south of the Thukela River). Dominated by forb-rich, tall, sour Themeda triandra grasslands transformed by the invasion of native 'Ngongoni grass (*Aristida junciformis*). Only a few patches of the original species-rich grasslands remain (Mucina & Rutherford, 2006).

**Geology and soils.** Apedal and plinthic soil forms derived mostly from Ecca Group (Karoo Supergroup) shale and minor sandstone and less importantly from Jurassic dolerite dykes and sills. Dominant land type Ac, followed by Fa (Mucina & Rutherford, 2006).

**Climate:** Summer rainfall, with MAP of 915 mm, range 730-1280 mm. Heavy and frequent occurrence of mist provides significant amounts of additional moisture (Cedara near Pietermaritzburg has 46 misty days per year). Some of the rain is in the form of cold frontal activity, mainly in winter, spring and early summer. Thunderstorms are common in summer and autumn (Cedara: 60 days of thunderstorms per year). Frosts are generally moderate, but occasional severe frost may also occur (Mucina & Rutherford, 2006).

**Important plant taxa:** Graminoids: *Andropogon appendiculatus*, *Aristida junciformis* subsp. *galpinii*, *Diheteropogon filifolius*, *Eragrostis plana*, *Hyparrhenia hirta*, *Sporobolus africanus*, *Themeda triandra*, *Tristachya leucothrix*, *Alloteropsis semialata* subsp. *eckloniana*, *Andropogon schirensis*, *Brachiaria serrata*, *Cymbopogon ceasius*, *Cymbopogon nardus*, *Digitaria diagonalis*, *Digitaria tricholaenoides*, *Diheteropogon amplexans*, *Elionurus muticus*, *Eragrostis capensis*, *Eragrostis curvula*, *Eragrostis racemosa*, *Eulalia villosa*, *Harporchloa falx*, *Heteropogon contortus*, *Loudetia simplex*, *Microchloa caffra*, *Monocymbium cerasiiforme*, *Panicum aequinerve*, *Panicum ecklonii*, *Panicum natalense*, *Paspalum dilatatum*, *Paspalum scrobiculatum*, *Paspalum urvillei*, *Setaria nigrirostris*, *Setaria sphacelata*, *Sporobolus centrifugus*, *Trachypogon spicatus*. Herbs: *Acalypha glandulifolia*, *Acanthospermum australe*, *Berkheya rhapontica* subsp. *aristosa*, *Berkheya setifera*, *Commelina africana*, *Conyza pinnata*, *Eriosema salignum*, *Helichrysum cephaloideum*, *Helichrysum simillimum*, *Indigastrium fastigiatum*, *Kohautia amatymbica*, *Nidorella auriculata*, *Pentanisia prunelloides* subsp. *latifolia*, *Sebaea sedoides* var. *schoenlandii*, *Spermacoce natalensis*, *Thunbergia atriplicifolia*, *Vernonia dregeana*, *Vernonia natalensis*, *Wahlenbergia undulata*. Herbaceous climber: *Vigna nervosa*. Geophytic herbs: *Pteridium aquilinum*, *Corycium nigrescens*, *Drimia macrocentra*, *Eriospermum ornithogaloides*, *Gladiolus ecklonii*, *Habenaria dives*, *Habenaria dregeana*, *Hypoxis multiceps*, *Hypoxis rigidula* var. *pilosissima*, *Rhodohypoxis baurii* var. *baurii*, *Rhodohypoxis baurii* var. *platypetala*, *Satyrium longicauda*. Low shrubs: *Helichrysum sutherlandii*, *Leonotis ocyimifolia*, *Otholobium caffrum*.

Note: The above is an outline of the vegetation type that serves as a larger ecological context within which the site occurs. Not all the plant species listed above for the vegetation type necessarily occur at the site.

### Habitat and vegetation characteristics found on site

Extensive covers of alien invasive plant species are conspicuous at the site. Vegetation is transformed at parts of the site, owing to residences, and at other parts, modified or degraded. Indigenous grass species at the site include *Aristida junciformis*, *Eragrostis curvula*, *Sporobolus africanus*, *Urochloa panicoides* and *Setaria sphacelata*. Indigenous herb species include such as *Senecio madagascariensis* and *Nidorella auriculata*. Alien invasive tree species such as *Solanum mauritianum*, *Acacia decurrens*, *Acacia mearnsii*, and *Melia azedarach* are present. The alien invasive tree *Solanum mauritianum* is in particular visibly abundant at the site. The shrubs *Lantana camara*, *Ricinus communis* and *Rubus cuneifolius* are noticeable at many parts of the site. Alien invasive grass species include *Paspalum dilatatum* and *Pennisetum clandestinum*. Numerous alien invasive herbaceous plant species occur at the site which include *Bidens pilosa*, *Amaranthus hybridus*, *Oenothera biennis*, *Plantago lanceolata*, *Galinsoga parviflora*, *Chenopodium album*, *Tagetes minuta*, *Oxalis corniculata*, *Canna indica* and *Hypochaeris radicata*.

No wetlands or rocky ridges appear to be present at the site.

Ecological disturbances at the site include residential settlements where vegetation has been transformed. Extensive informal dumping and roads with ditches where stormwater is channelled, are found at the site. Extensive and visibly dense covers of alien invasive plant species are conspicuous at the site.

### ASSESSMENT OF PLANT SPECIES OF CONSERVATION CONCERN

Threatened plant species of the KwaZulu-Natal Province that are listed in the **Critically Endangered** category. The list here follows the most recent updated red list of South African plant species (Raimondo *et al.* 2009). No = Plant species is not a resident on the site; Yes = Plant species is a resident at a site.

Species	Status: Global status or national status indicated	Resident at the site
<i>Aloe saundersiae</i>	Critically Endangered	No
<i>Brachystelma natalense</i>	Critically Endangered	No
<i>Encephalartos aemulans</i>	Critically Endangered	No

Threatened plant species of the KwaZulu-Natal Province that are listed in the **Endangered** category. The list here follows the most recent updated red list of South African plant species (Raimondo *et al.* 2009, SANBI updates). No = Plant species is not a resident on the site; Yes = Plant species is a resident at a site.

Species	Status: Global status or national status indicated	Resident at the site
<i>Begonia dregei</i>	Endangered	No
<i>Eriosema populifolium</i> subsp. <i>populifolium</i>	Endangered	No
<i>Eriosema umtamvunense</i>	Endangered	No
<i>Gerbera aurantiaca</i>	Endangered	No
<i>Helichrysum pannosum</i>	Endangered	No
<i>Ocotea bullata</i>	Endangered	No

<i>Tephrosia inandensis</i>	Endangered	No
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Threatened plant species of the KwaZulu-Natal Province that are listed in the **Vulnerable** category. The list here follows the most recent updated red list of South African plant species (Raimondo *et al.* 2009, SANBI updates). No = Plant species is not a resident on the site; Yes = Plant species is a resident at a site.

Species	Status: Global status or national status indicated	Resident at the site
<i>Alepidea amatymbica</i>	Vulnerable	No
<i>Asclepias woodii</i>	Vulnerable	No
<i>Asclepias concinna</i>	Vulnerable	No
<i>Aloe gerstnerii</i>	Vulnerable	No
<i>Aloe neilcrouchii</i>	Vulnerable	No
<i>Argyrobium longifalcum</i>	Vulnerable	No
<i>Asclepias concinna</i>	Vulnerable	No
<i>Brachystelma petraeum</i>	Vulnerable	No
<i>Crinum moorei</i>	Vulnerable	No
<i>Clivia gardenii</i>	Vulnerable	No
<i>Diaphanthe millarii</i>	Vulnerable	No
<i>Dierama luteo-albidum</i>	Vulnerable	No
<i>Dierama pallidum</i>	Vulnerable	No
<i>Dioscorea sylvatica</i>	Vulnerable	No
<i>Dracosciadium italaе</i>	Vulnerable	No
<i>Encephalartos ghellinckii</i>	Vulnerable	No
<i>Eriosemopsis subanisophylla</i>	Vulnerable	No
<i>Gerrardanthus tomentosa</i>	Vulnerable	No
<i>Hermannia sandersonii</i>	Vulnerable	No
<i>Impatiens flanaganiae</i>	Vulnerable	No
<i>Phyllica natalensis</i>	Vulnerable	No
<i>Senecio dregeanus</i>	Vulnerable	No
<i>Sisyranthus fanniniae</i>	Vulnerable	No
<i>Stachys comosa</i>	Vulnerable	No
<i>Stangeria eriopus</i>	Vulnerable	No
<i>Woodia verruculosa</i>	Vulnerable	No

**Near Threatened** plant species of the KwaZulu-Natal Province. The list here follows the most recent updated red list of South African plant species (Raimondo *et al.* 2009). No = Plant species is not a resident on the site; Yes = Plant species is a resident at the site.

Species	Status: Global status or national status indicated	Resident at the site
<i>Aloe dominella</i>	Near Threatened	No
<i>Aloe linearifolia</i>	Near Threatened	No
<i>Brachystelma pulchellum</i>	Near Threatened	No
<i>Encephalartos natalensis</i>	Near Threatened	No
<i>Haemanthus deformis</i>	Near Threatened	No
<i>Merwillia plumbea</i>	Near Threatened	No
<i>Moraea hiemalis</i>	Near Threatened	No
<i>Moraea graminicola</i> subsp. <i>graminicola</i>	Near Threatened	No



Least Concern (= not threatened) plant species of the KwaZulu-Natal Province that are however of particular conservation concern and listed in the **Rare** category. The list here follows the most recent red list of South African plant species (Raimondo *et al.* 2009). No = Plant species is not a resident on the site; Yes = Plant species is a resident at the site.

Species	Status: Global status or national status indicated	Resident at the site
<i>Brunsvigia undulata</i>	Rare	No

Not threatened plant species of the KwaZulu-Natal Province which are however of conservation concern and listed in the **Declining** category. The list here follows the most recent red list of South African plant species (Raimondo *et al.* 2009). No = Plant species is not a resident on the site; Yes = Plant species is a resident at the site.

Species	Status: Global status or national status indicated	Resident at the site
<i>Acridocarpus natalitius</i>	Declining	No
<i>Adenia gummifera</i>	Declining	No
<i>Aloe cooperi</i>	Declining	No
<i>Anselia africana</i>	Declining	No
<i>Boophone disticha</i>	Declining	No
<i>Cassipourea malosana</i>	Declining	No
<i>Cryptocarya latifolia</i>	Declining	No
<i>Eucomis autumnalis</i>	Declining	No
<i>Gunnera perpensa</i>	Declining	No
<i>Rapanea melanophloeos</i>	Declining	No
<i>Sandersonia aurantiaca</i>	Declining	No

Some of the tree species of the KwaZulu-Natal Province which are not threatened but listed as **Protected Species** under the National Forests Act No. 84 of 1998, Section 15(1) (Schedule A, Notice 536 of 2018). No = Plant species is not a resident on the site; Yes = Plant species is a resident at the site.

Species	Conservation status	Resident at the site
<i>Afzelia quanzensis</i>	Protected	No
<i>Balanites maughamii</i>	Protected	No
<i>Barringtonia racemosa</i>	Protected	No
<i>Boscia albitrunca</i>	Protected	No
<i>Breonadia salicina</i>	Protected	No
<i>Bruguiera gymnorhiza</i>	Protected	No



<i>Catha edulis</i>	Protected	No
<i>Ceriops tagal</i>	Protected	No
<i>Cleistanthus schlechteri schlechteri</i>	Protected	No
<i>Combretum imberbe</i>	Protected	No
<i>Curtisia dentata</i>	Protected	No
<i>Elaeodendron transvaalensis</i>	Protected	No
<i>Ficus trichopoda</i>	Protected	No
<i>Lumnitzera racemosa</i> var. <i>racemosa</i>	Protected	No
<i>Mimusops caffra</i>	Protected	No
<i>Newtonia hildebrandtii</i> var. <i>hildebrandtii</i>	Protected	No
<i>Ocotea bullata</i>	Protected	No
<i>Pittosporum viridiflorum</i>	Protected	No
<i>Podocarpus falcatus</i>	Protected	No
<i>Podocarpus henkelii</i>	Protected	No
<i>Podocarpus latifolius</i>	Protected	No
<i>Prunus africana</i>	Protected	No
<i>Pterocarpus angolensis</i>	Protected	No
<i>Rhizophora mucronata</i>	Protected	No
<i>Sclerocarya birrea</i> subsp. <i>caffra</i>	Protected	No
<i>Sideroxylon inerme</i> subsp. <i>inerme</i>	Protected	No
<i>Warburgia salutaris</i>	Protected	No

## ASSESSMENT OF VERTEBRATE SPECIES OF CONSERVATION CONCERN

### Mammals of particular high conservation priority

Threatened mammal species of the KwaZulu-Natal Province. Literature sources: Friedman & Daly, (2004), Skinner & Chimimba (2005), Child *et al.* (2017).

Species	Red Listed Status	Recorded at site during survey	Likely to be found based on habitat assessment
<i>Cercopithecus albogularis labiatus</i> Samango Monkey (EC and parts of KZN)	Vulnerable	No	No
<i>Chrysospalax villosus</i> Rough-haired golden mole	Vulnerable	No	No
<i>Cloeotis percivali</i> Short-eared Trident Bat	Endangered (RSA)	No	No
<i>Dendrohyrax arboreus</i> Tree Hyrax	Endangered	No	No
<i>Diceros bicornis</i>	Critically Endangered	No	No

Black Rhinoceros			
<b><i>Loxodonta africana</i></b> African elephant	Vulnerable	No	No
<b><i>Mystromys albicaudatus</i></b> White-tailed mouse	Endangered	No	No
<b><i>Neoromicia rendalli</i></b> Rendall's Serotine	Critically Endangered (RSA)	No	No
<b><i>Ourebia orebi orebi</i></b> Oribi	Endangered	No	No
<b><i>Panthera leo</i></b> Lion	Vulnerable	No	No
<b><i>Panthera pardus</i></b> Leopard	Vulnerable	No	No
<b><i>Smutsia temminckii</i></b> Ground Pangolin	Vulnerable	No	No

**Near Threatened** mammal species known to occur in the KwaZulu-Natal Province. Literature sources: Skinner & Chimimba (2005), Child *et. al.* (2017).

Species	Red Listed Status	Recorded at site during survey	Likely to be found based on habitat assessment
<b><i>Ceratotherium simum</i></b> White Rhinoceros	Near Threatened	No	No
<b><i>Cercopithecus albogularis erythrarchus</i></b> Samango Monkey (northern KZN and further north)	Near Threatened	No	No
<b><i>Otomops martiensseni</i></b> Large-eared free tailed bat	Near Threatened (Global)	No	No

### Birds of particular high conservation priority

**Threatened** bird species of the KwaZulu-Natal. Literature sources Barnes (2000), Hockey, Dean & Ryan, P.G. (2005) and Chittenden (2007).

Species	Common name	Red Listed Status	Recorded at site during survey	Likelihood of residential status at the site: Confirmed, Highly likely, Likely, Medium possibility, Unlikely, Highly unlikely
<i>Aegyptius tracheliotos</i>	<b>Lappet-faced Vulture</b>	Endangered	No	Unlikely
<i>Anthropoides paradiseus</i>	<b>Blue Crane</b>	Vulnerable	No	Highly unlikely
<i>Gypaetus barbatus</i>	<b>Bearded Vulture</b>	Critically Endangered (RSA)	No	Highly unlikely
<i>Anthus chloris</i>	<b>Yellow-breasted Pipit</b>	Vulnerable	No	Unlikely
<i>Balearica regulorum</i>	<b>Grey Crowned Crane</b>	Endangered	No	Unlikely
<i>Bucorvis leadbeateri</i>	<b>Southern Ground Hornbill</b>	Vulnerable	No	Unlikely
<i>Bugeranus carunculatus</i>	<b>Wattled Crane</b>	Critically Endangered (RSA) Vulnerable (Global)	No	Highly unlikely
<i>Circus maurus</i>	<b>Black Harrier</b>	Endangered	No	Unlikely
<i>Falco biarmicus</i>	<b>Lanner Falcon</b>	Vulnerable	No	Unlikely
<i>Geronticus calvus</i>	<b>Southern Bald Ibis</b>	Vulnerable	No	Unlikely
<i>Gyps coprotheres</i>	<b>Cape Vulture</b>	Endangered	No	Unlikely
<i>Hirundo atrocaerulea</i>	<b>Blue Swallow</b>	Critically Endangered (RSA)	No	Unlikely
<i>Neotis denhami</i>	<b>Denham's Bustard</b>	Vulnerable	No	Highly unlikely
<i>Poicephalus robustus</i>	<b>Cape Parrot</b>	Vulnerable	No	Unlikely
<i>Polemaetus bellicosus</i>	<b>Martial Eagle</b>	Vulnerable	No	Unlikely
<i>Sagittarius serpentarius</i>	<b>Secretarybird</b>	Vulnerable	No	Unlikely
<i>Sarothrura affinis</i>	<b>Striped Flufftail</b>	Vulnerable	No	Unlikely
<i>Sarothrura ayresi</i>	<b>White-winged Flufftail</b>	Critically Endangered	No	Highly unlikely
<i>Stephanoaetus coronatus</i>	<b>African Crowned Eagle</b>	Vulnerable	No	Unlikely
<i>Therathopius ecaudatus</i>	<b>Bateleur</b>	Endangered (RSA)	No	Unlikely
<i>Turnix nanus</i>	<b>Black-rumped Buttonquail</b>	Vulnerable	No	Unlikely
<i>Tyto capensis</i>	<b>African Grass-Owl</b>	Vulnerable	No	Unlikely

**Near Threatened** bird species of the KwaZulu-Natal Province. Literature sources Barnes (2000), Hockey, Dean & Ryan, P.G. (2005) and Chittenden (2007).

Species	Common name	Red Listed Status	Recorded at site during survey	Likelihood of residential status at the site: Confirmed, Highly likely, Likely, Medium possibility, Unlikely, Highly unlikely
<i>Ciconia nigra</i>	<b>Black Stork</b>	Near Threatened	No	Unlikely
<i>Lioptilus nigricapillus</i>	<b>Bush Blackcap</b>	Near Threatened	No	Unlikely
<i>Vanellus melanopterus</i>	<b>Black-winged Lapwing</b>	Near Threatened	No	Unlikely
<i>Zoothera gurneyi</i>	<b>Orange ground-thrush</b>	Near Threatened	No	Unlikely

### Reptiles of particular high conservation priority

The following table lists possible presence or absence of reptile species of particular conservation concern at the site. This list to assess the possible presence or not of reptile species of conservation concern was compiled by using mainly the source Bates, Branch, Bauer, Burger, Marais, Alexander & De Villiers (2014), that is the Atlas and Red List of South Africa, Lesotho and Swaziland.

**Threatened** reptile species in KwaZulu-Natal Province. Main source: Bates, Branch, Bauer, Burger, Marais, Alexander & De Villiers (2014). No = Reptile species is not a resident on the site; Yes = Reptile species is found to be resident on the site.

Species	Red Listed Status	Resident at site	Recorded at site during survey	Likely to be found based on habitat assessment
<b><i>Bradypodion thamnobates</i></b> Natal Midlands Dwarf Chameleon	Endangered	No	No	No
<b><i>Scelotes bourquinii</i></b> Bourquin's Dwarf Burrowing Skink	Vulnerable	No	No	No

**Near Threatened** reptile species in KwaZulu-Natal Province. Main source: Bates, Branch, Bauer, Burger, Marais, Alexander & De Villiers (2014). No = Reptile species is not a resident on the site; Yes = Reptile species is found to be resident on the site.

Species	Red Listed Status	Resident at site	Recorded at site during survey	Likely to be found based on habitat assessment
<b><i>Bradypodion melanocephalum</i></b> Black-headed Dwarf Chameleon	Near Threatened	No	No	No

### Amphibian species of particular high conservation priority

**Threatened** frog species of the KwaZulu-Natal Province. No = Amphibian species is not a resident on the site; Yes = Amphibian species is found to be resident on the site.

Species	Threatened Status	Resident at site	Recorded at site during survey	Likely to be found based on habitat assessment
<i>Anhydrophryne ngongoniensis</i> Mistbelt Moss Frog	Endangered	No	No	No
<i>Leptopelis xenodactylus</i> Long-toed Tree Frog	Endangered	No	No	No

## ASSESSMENT OF INVERTEBRATE SPECIES OF PARTICULAR CONSERVATION PRIORITY

### Butterflies of particular conservation priority

**Threatened** butterfly species in the KwaZulu-Natal Province (Mecenero *et al.* 2020). Sources of information: Henning, Terblanche & Ball (2009), Mecenero *et al.* (2013), Mecenero *et al.* (2020). Invertebrates such as threatened butterfly species are often very habitat specific and residential status imply a unique ecosystem that is at stake.

Species	Threatened Status	Recorded at site during survey	Residential status at the site: Yes confirmed, Highly likely, Likely, Medium possibility, Unlikely, Highly unlikely
<i>Capys penningtoni</i> iNkomasi Protea Butterfly	Critically Endangered	No	Highly unlikely
<i>Chrysoritis lyncurium</i> Tsono Golden Opal	Vulnerable	No	Highly unlikely
<i>Chrysoritis phosphor borealis</i> Phosphor Butterfly	Endangered	No	Highly unlikely
<i>Dingana dingana</i> Midlands Widow	Endangered	No	Highly unlikely
<i>Durbania amakosa albescens</i> Whitish Amakosa Rocksitter	Vulnerable	No	Highly unlikely
<i>Durbania amakosa flavida</i> Yellowish Amakosa Rocksitter	Endangered	No	Highly unlikely
<i>Hypolycaena lochmophila</i> Coastal Hairstreak	Vulnerable	No	Highly unlikely
<i>Iolais lulua</i> White-spotted Sapphire	Vulnerable	No	Highly unlikely
<i>Lepidochrysops ketsi leucomacula</i> White-spotted Ketsi Giant Cupid	Endangered	No	Highly unlikely
<i>Lepidochrysops pephredo</i> Estcourt Giant Cupid	Vulnerable	No	Highly unlikely
<i>Orachrysops ariadne</i> Karkloof Cupid	Endangered	No	Highly unlikely
<i>Teriomima zuluana</i> Zulu Yellow Buff	Vulnerable	No	Highly unlikely

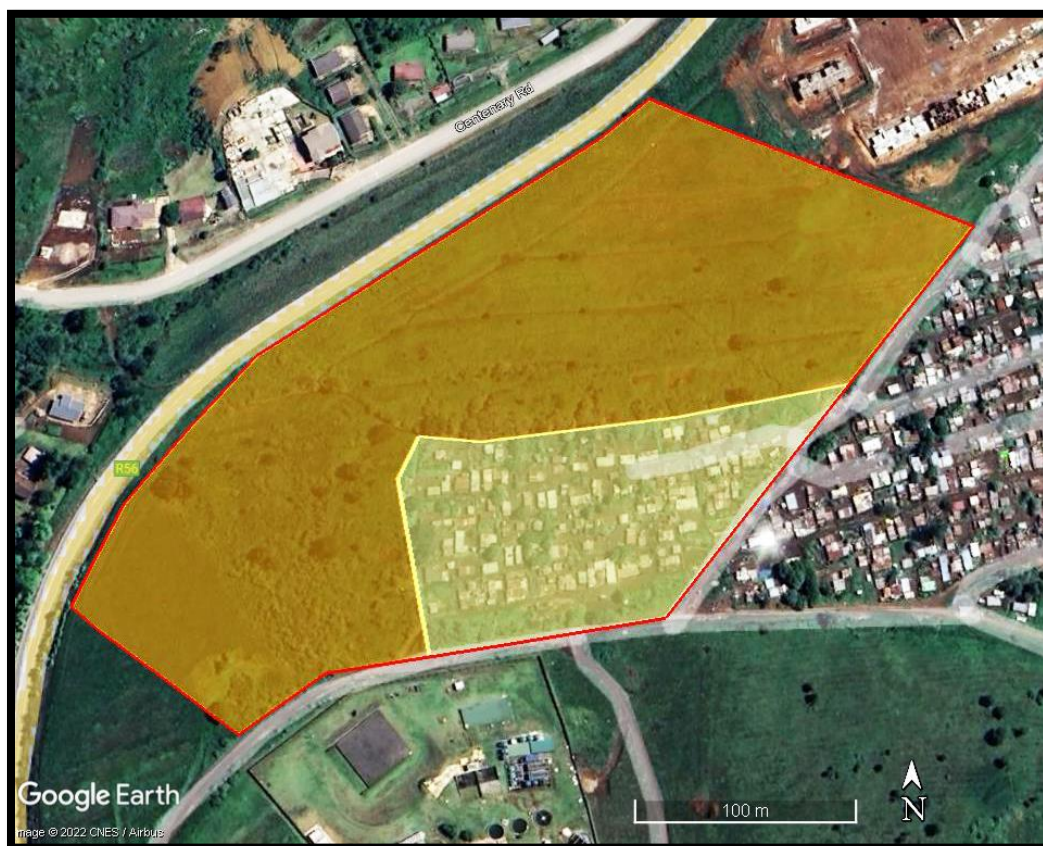
Butterfly species of the KwaZulu-Natal Province that are (Mecenero *et al.*, 2020). No = Butterfly species is unlikely to be a resident at the study area; Yes = Butterfly species is a resident at the study area. Sources of information Henning, Terblanche & Ball (2009), Mecenero *et al.* (2013), Mecenero *et al.* (2020).

Species	Threatened Status	Recorded at site during survey	Residential status at the site: Yes confirmed, Very likely, Likely, Medium possibility, Unlikely, Highly unlikely
<b><i>Abantis bicolor</i></b> Bicoloured Paradise Skipper	Near Threatened	No	Highly unlikely
<b><i>Dingana alaedeus</i></b> Wakkerstroom Widow	Near Threatened	No	Highly unlikely
<b><i>Metisella meninx</i></b> Marsh Sylph	Near Threatened	No	Highly unlikely
<b><i>Ornipholidotos peucetia penningtoni</i></b> Southern Large Glasswing	Near Threatened	No	Highly unlikely

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 are likely to be found at the site.

There is little scope for the partly transformed, modified and visibly disturbed and isolated relatively small patch of grassland to be part of a conservation corridor of particular importance.

Ecological sensitivity at the parts of the site where residential settlements occur, and vegetation has been transformed, is very-low. Ecological sensitivity at the remainder of the site where vegetation is modified and where extensive and visibly dense covers of alien invasive plant species are present, is low



Indications of ecological sensitivity at the site

- Red outline
  - Light yellow outline and shading
  - Orange outline and shading
- Boundaries of the site
  - Very-low Sensitivity
  - Low Sensitivity



**Photograph 8: View of dense cover of alien invasive plant species at the site.**  
 Photo: R.F. Terblanche



**Photograph 9: Flowers and foliage of the alien invasive Solanum mauritianum (bugweed) at the site.**  
 Photo: R.F. Terblanche



**Photograph 10: Alien invasive herb *Oenothera biennis* at the site.**  
Photo: R.F. Terblanche



**Photograph 11: Alien invasive *Canna indica* among other plants at the site.**

Photo: R.F. Terblanche.

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### 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](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

As in the rest of South Africa, there is a housing shortage in the area. In terms of section 9(1) of the National Housing Act (107 of 1997), every municipality must, as part of the municipality's process of integrated development planning (IDP) take all reasonable and necessary steps to ensure that the inhabitants within its area of jurisdiction have access to adequate housing on a progressive basis by setting housing delivery goals, identifying suitable land for housing development and planning, facilitating, initiating and co-coordinating housing development in its area of jurisdiction.

Housing comprises a series of complex interrelationships between people, their needs and values and resources within a political and legal environment. This complexity requires a focused approach to efforts aimed at providing housing. National Government has started to respond by putting the necessary policy and legislative environment in place.

This framework outlines the roles and responsibilities of different spheres of government in relation to housing, as well as dealing with aspects relating to the design and content of housing policy and legislation. In the context of this framework the Local Municipality is required to take all reasonable steps to ensure the provision of adequate housing to its residents.

Various policy directions and legislation exist relating to the role and responsibilities of the different spheres of government to provide and ensure the provision of housing opportunities to affected communities.

Of these, the comprehensive plan for the Development of sustainable Human Settlements based on the Breaking New Ground Principles (BNG) forms the basis on which housing development should be implemented.

The aim is to move beyond the provision of basic shelter towards achieving the broader vision of sustainable human settlements and more efficient towns, cities and regions. The following factors will be taken into consideration in order to achieve the vision:

- Progressive Informal Settlement Eradication: These settlements must be integrated into the broader urban setup so as to overcome spatial, social and economic exclusion. The plans encourage the eradication of informal settlements through in-situ upgrading in desired locations coupled with the relocation of household where development is not possible or desirable.
- Promoting densification and Integration: The aim is to integrate previously excluded groups into the urban area so as to enable them to enjoy the benefits it offers and to create more integrated, functional and environmentally sustainable human settlements, towns and cities.
- Enhancing Spatial Planning: Greater co-ordination and alignment of various planning instruments and economic policies lies at the heart of sustainable human settlements.
- Provision of a mix of housing typologies for different income groups (Subsidised, GAP, Affordable and bonded Housing opportunities).

Enhancing the location of New Housing Projects: The location of past housing projects was said to reinforce apartheid spatial settlement patterns. Spatial restructuring aims to achieve a more decisive Intervention In land markets. The following interventions are envisaged viz. accessing well located state-owned and parastatal land: acquisition of well-located private land for housing development, funding for land acquisition and fiscal incentives

Ubuhlebezwe faces housing challenges in both the rural and urban settings of the municipality. The urban setting involves the growing of informal settlement challenges coupled with the rectification issues dealing with past housing developmental quality standards. There are also issues around the limited availability of renting spaces to house the forever growing working-class resulting in more expensive backyard renting as the main option available. The rural context largely includes robust growth of settlement patterns as well as the rural human shelter made of informal structures which are not applicable to the general housing standards.

Multiple housing projects are underway and future housing projects have been planned for the municipality with a total housing provision of 12 609 units including the integrated residential development program, upgrading of informal settlements, housing assistance in emergency circumstances, community residential units programme and individual subsidy program.

Development within or adjacent to the towns of Ixopo and UMzimkhulu have substantially been adversely impacted due to the lack of well-located land and the large backlog in providing the required bulk and connector services to support such initiatives. These issues have resulted in a backlog in housing provision in the municipality with rising slums and poor housing conditions. As such there is a definite need for housing provision in Ubuhlebezwe.

Ixopo has been identified for significant residential development which could reduce the backlog of housing provision in the municipality and improve the living condition and quality of life of residents. Ixopo is a well-located town and has been identified as a primary node for infrastructural and services expansion (including housing), a provincial priority corridor (linking internal and external nodes) and a regional connector (playing a fundamental role in connecting this municipality with other neighbouring municipalities). This places Ixopo as a prime town for residential development.

Consistent with national priorities, environmental authorities must support *"increased economic growth and promote social inclusion"*, whilst ensuring that such growth is *"ecologically sustainable"*. In the National Spatial Development Perspective (NSDP) it is highlighted that, to achieve the goal of stimulating sustainable economic activities and to create long-term employment opportunities, it is required that spending on economic infrastructure is focused in priority areas with potential for economic development, with development to serve the broader societies' needs equitably

During the construction phase, temporary employment will be created. The increased employment in the area during the construction phase will also result in increased expenditure, which, in addition, will mean that more than just the proposed jobs required for the construction on the site will be created due to economic spin-offs that will result

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## **7.2.2 ARCHAEOLOGY AND CULTURAL SITES**

A Phase 1 HIA for the proposed upgrade of an informal settlement/township area at O.R.Tambo (Ixopo), in Kwazulu-Natal was conducted successfully. The development & study area is located in the Ubuhlebezwe Local Municipality.

The project is conducted on instruction from MXN Development Construction CC in association with the Ubuhlebezwe Local Municipality (Kwazulu Natal). This project is executed by Maxim Planning Solutions (Pty) Ltd as an essential services project to upgrade the existing informal settlement area present on site and to alleviate the plight of the relevant community living in squalid conditions without basic services. The Heritage Impact Assessment services were seen as essential for the formalization process to ultimately allow for the installation of water, sewerage, stormwater and road infrastructure for this settlement area.

Background research indicated that there are a number of cultural heritage (archaeological & historical) sites and features in the larger geographical area within which the study area falls. No sites, features or material of cultural heritage (archaeological and/or historical) origin or significance were identified in the development area during the assessment.

The only site is the Cross on Medal Hill. As a known and significant landmark in Ixopo care should be taken though to not negatively impact on the site even though it is less than 60 years of age.

Although no graves or graveyards were identified in the area during the assessment, it is very likely that there would be such sites in the study area, especially associated with the both the formal and informal settlement here. Care should be taken no to impact on these sites during any development activities.

Although all efforts are made to locate, identify and record all possible cultural heritage sites and features (including archaeological remains) there is always a possibility that some might have been missed as a result of grass cover and other factors. The subterranean nature of these resources (including low stone-packed or unmarked graves) should also be taken into consideration. Should any previously unknown or invisible sites, features or material be uncovered during any development actions then an expert should be contacted to investigate and provide recommendations on the way forward.

**From a Cultural Heritage point of view the proposed O.R.Tambo (Ixopo) upgrade of an informal settlement/township area can continue taking the above recommendations into consideration.**

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### 7.2.3 AESTHETICS

Ubuhlebezwe Local Municipality (KZ5a5) is a Category B municipality located within the Harry Gwala District Municipality (DC43). The main administrative centre of the Municipality is the town of Ixopo, which is located approximately 85km south east of Pietermaritzburg, capital of KwaZulu-Natal, and is strategically located at the intersection of four major provincial routes leading to Pietermaritzburg, the Drakensberg, the Eastern Cape and the South Coast. The town of Ixopo forms the primary development node of the Municipality and has also been selected as the seat of the Harry Gwala District Council. The importance of Ixopo cannot be underestimated in the socio-economic development of the area as a whole. Ixopo plays an important role in terms of the possible location for industry, commerce and other economic activity. It is a major education and health centre and assists in the diffusion of new ideas and technologies to the rural areas. It is also the primary base for the operation of many departments and service providers.

The proposed development is located within the Urban area of Ixopo approximately 700 meters from the CBD (as the crow flies) and towards the south of the Provincial Route (R56) between Pietermaritzburg (approximately 85 km from Pietermaritzburg) and Kokstad (approximately 110 km from Kokstad). Please see Photograph 1. The site is bordered by the Ixopo water treatment plant towards the South, a formal Residential development towards the North and informal settlement towards East. A portion of the site currently lies vacant while almost a third of the site is occupied by the Choc City / Shayamoya informal settlement.

Ecological disturbances at the site include residential settlements where vegetation has been transformed. Extensive informal dumping and roads with ditches where stormwater is channelled, are found at the site. Extensive and visibly dense covers of alien invasive plant species are conspicuous at the site.

Visual Intrusion is defined as the level of compatibility or congruence of the project with the particular qualities of the area, or its 'sense of place'. This is related to the idea of context and maintaining the integrity of the landscape or townscape.

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

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

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

The proposed development will change the scenic resources of the local area from an undeveloped site to a formal residential area. The visual intrusion is considered to be moderate as the proposed development partially fits into the surroundings but will be clearly noticeable.

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

## 8. ENVIRONMENTAL MANAGEMENT OBJECTIVES AND TARGETS

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

ENVIRONMENTAL ASPECTS	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS
<b>DOCUMENTATION AND TRAINING</b>		
The necessary documentation must be available in the site office  Contravention of the EMP, EA and other applicable legislation can result in the halting of construction activities and even shut down of the site	Ensure that all concerned is aware of the EMP and related environmental aspects.  To ensure that the contractor is adhering to the conditions of all relevant legislation and authorisations applicable to the site.	Availability of documents  Contractor to provide method statements. These method statements must be available.  Trained and informed workforce.  The contractor/designated representative must conduct weekly toolbox talks and the ECO must conduct an initial environmental awareness training session prior to construction.
Inadequate knowledge of environmental aspects can result in destruction to sensitive environments and cause excessive degradation to the receiving environment	To ensure that all contractor personnel are adequately trained prior to commencement of construction. To ensure proper conduct of the site personnel.	The registers must be made available for the ECO to review during the audit.
<b>SITE ACCESS &amp; TRAFFIC MANAGEMENT</b>		
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.	No construction activities occurring outside of the construction footprint.  No destruction of sensitive habitats outside of the construction footprint
<b>VEGETATION CLEARING</b>		
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 restricted to the demarcated working area, no vegetation may be cleared outside of the demarcated working area.
<b>TOPSOIL &amp; SUBSOIL MANAGEMENT</b>		
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 is adequately protected from being blown away or eroded by storm water.  Removed subsoil is 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
<b>EXCAVATIONS &amp; EARTHWORKS</b>		
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	Use of machinery is restricted to only that which is strictly required, and the unnecessary or excessive movement/ use of such machinery is kept to a minimum.

ENVIRONMENTAL ASPECTS	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS
	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.	Excavations and earth-moving only take place within the demarcated working area
<b>DANGEROUS AND TOXIC MATERIALS (CHEMICALS)</b>		
Chemical spill as a result of improper handling and storage of chemicals and paint	Clean environment  Safe storage of materials	Safe storage of chemicals See also below for further aspects on this subject  Availability of safety kits to prevent oils/toxic materials spreading in the environment  Proper storage must be provided for chemicals , paint and construction materials needed No spills of chemicals Proper storage provided  Material Safety Data Sheets (MSDSs) must be readily available on site for all chemicals and hazardous substances.  The Contractor must be in possession of an emergency spill kit that is complete and available at all times on site.
<b>STORAGE OF OIL AND FUEL</b>		
Oil and Fuell spillages as a result of improper storage.	Clean environment  Safe storage of fuel and oil and prevention of spills	Bunded areas provided for the storage of oil and fuel.  No spills of oil or fuel  No leakages of oil  The Contractor must be in possession of an emergency spill kit that is complete and available at all times on site
<b>USE OF OIL AND CHEMICALS</b>		
Oil and Fuell spillages as a result of improper handling	No spills of oil	No oil spills from vehicles  No oil or fuel into environment due to cleaning of vehicles or equipment  Refuelling takes place as per method statements.  Drip trays provided, used and cleaned as per method statements.  The Contractor must be in possession of an emergency spill kit that is complete and available at all times on site
<b>STORAGE AND HANDLING OF CEMENT AND CONCRETE</b>		

ENVIRONMENTAL ASPECTS	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS
Environmental degradation as a result of cement and concrete spillages.	To ensure a clean environment.  Minimise the possibility of concrete residue entering into the surrounding environment	No spills of cement No evidence of contaminated soil on the construction site  Cement is stored and handled according to approved method statements.
<b>TOILETS AND ABLUTION FACILITIES</b>		
Clean sanitary environment	Clean and sanitary environment	Toilets for workers in accordance with the instructions in the EMP
<b>WASTE MANAGEMENT</b>		
A clean and waste free environment	Clean environment with waste handled in accordance with the EMP	No waste in the environment
<b>WORKSHOP EQUIPMENT, MAINTENANCE AND STORAGE OF MATERIAL</b>		
Clean and safe work area	Clean and safe work area	Safe and clean work and storage area
<b>FIRES</b>		
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
<b>OTHER ENVIRONMENTAL ASPECTS</b>		
<p><b>Stockpiles</b></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><b>Erosion, sedimentation and storm water</b></p> <p>No erosion and or sedimentation</p> <p><b>Vegetation</b></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"> <li>• Minimise scarring of the soil surface and land features</li> <li>• Minimise disturbance and loss of soil</li> <li>• Minimise construction footprint</li> </ul> <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>
<p><b>Waste management</b></p> <p>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.</p>	<ul style="list-style-type: none"> <li>• 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</li> </ul>	<ul style="list-style-type: none"> <li>• Disposal of rubble and refuse in an appropriate manner with no rubble and refuse lying on site</li> <li>• Sufficient containers available on site</li> </ul>



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

## 9. ENVIRONMENTAL IMPACT MANAGEMENT OUTCOMES

### 9.1 ASSESSMENT CRITERIA

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

### 9.2 ENVIRONMENTAL IMPACT MANAGEMENT OUTCOMES

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

1. A full copy of the signed EA from EDTEA 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 EDTEA in terms of NEMA, granting approval for the development <b>must</b> 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 <b>must</b> 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 <b>must</b> 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	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	
		everyone involved and must also contain an Environmental awareness training manual.			
			ECO's report must be an item on monthly site meeting agenda	No action required	The project manager.
		The ECO must ensure that the contractor provides method statements for the various environmental aspects.	The method statements must be available in the site office	No action required	The Applicant and the contractor must ensure that the method statements are developed and approved by the ECO
<b>SITE ESTABLISHMENT</b>	Impacts on the environment <b>must</b> be minimised during site establishment and the development footprint must be kept to the approved development area.	A Land surveyor must peg the parameters of the development footprint.  Ensure No encroachment on the Buffer zone of the Schoonspruit.	Construction vehicles, machinery and workers must be restricted to only operate within the approved development footprint.	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
			The development footprint must be clearly demarcated and the extent of this area must be communicated to all contractors and sub-contractors.		
			Existing access roads must be utilised to access the site camp(s) and working/ construction areas		

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			Appropriate traffic management strategies must be implemented to ensure the safety of construction vehicles and other road-users. If needed, signage to warn other road users of the presence of construction vehicles should be erected at appropriate locations, where the signage will be clearly visible to potentially affected road users.		will monitor compliance.
VEGETATION CLEARING	Vegetation clearing <b>may not commence</b> 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 <b>may</b> occur.				
STORM AND WASTE WATER MANAGEMENT	At the end of the construction phase the site and its surrounding area <b>must</b> 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	Maintain the storm water structures and infrastructure	The developer must ensure that a storm water management plan is developed.
			All spillage of oil onto concrete surfaces must be controlled by the use of an approved absorbent material and the used absorbent		

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			<p>material disposed of at an appropriate waste disposal facility.</p> <p>No wastewater may run freely into any naturally vegetated areas. Run-off containing high sediment loads must not be released into drainage channels</p> <p>Approval must be obtained from DW&amp;S for any activities that require authorisation in terms of Section 39 of the National Water Act, 1998 (Act No. 36 of 1998).</p> <p>Surface water or storm water must not be allowed to concentrate, or to flow down cut or fill sloped routes without erosion protection measures being in place</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>		The ECO must monitor compliance.

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
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 of the topsoil and subsoil.</p> <p>The ECO will monitor compliance.</p>
			Removed topsoil and subsoil should be stockpiled for the duration of the active construction period, and utilized for the final landscaping and rehabilitation of disturbed areas.		
			<p>The topsoil must be adequately protected from being blown away or eroded by storm water. The topsoil storage area must be located on a level area outside of any surface drainage/ storm-water channels, and at a location where it can be protected from disturbance during construction and where it will not interfere with construction activities.</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.</p>		

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 <b>may</b> occur.		<p>The topsoil berm may be a few meters wide but should ideally not be more than 0.5m high to allow sufficient light and air penetration.</p> <p>Topsoil should be the final layer applied during rehabilitation, after subsoil/ spoil material has been placed and shaped.</p>		
DANGEROUS AND TOXIC MATERIALS	At the end of the construction phase the site and its surrounding area <b>must</b> be free from any chemical, fuel, oil and cement spills that originated as a result of the construction activities.	<b>CHEMICALS</b>			<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>
		The Contractor must provide method statements for the storage and handling of chemicals on site.	All hazardous substances must be stored in suitable containers as defined in the Method Statement;	No Action required	
			Containers must be clearly marked to indicate contents, quantities and safety requirements		
			All storage areas must be bunded. The bunded area must be of sufficient capacity to contain a spill / leak from the stored containers		
			Bunded areas to be suitably lined with a SABS approved liner		
			An Alphabetical Hazardous Chemical Substance (HCS) control sheet must be drawn up and kept up to date on a continuous basis		
All hazardous chemicals that will be used on site must have Material Safety Data Sheets (MSDS);					



ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			<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>		
		<b>FUEL AND OIL</b>			
		The Contractor must provide method statements for the storage and handling of fuel and oil on site.	The Contractor must ensure that diesel and other liquid fuel, oil and hydraulic fluid is stored in appropriate storage tanks or in bowsers	No Action required	<p>The Contractor will be responsible for providing method statements. He will also be responsible for training of staff in this regard.</p> <p>The ECO will monitor compliance.</p>
			Fuel storage tanks must be located in a portion of the construction camp where they do not pose a high risk in terms of water pollution (i.e. they must be located away from water courses)		
			The tanks/ bowsers must be situated on a smooth impermeable surface (concrete) with a permanent bund. The impermeable lining must extend to the crest of the bund and the volume inside the bund must be 110% of the total capacity of all the storage tanks/ bowsers		
			The floor of the bund must be sloped, draining to an oil separator		
			Provision must be made for refuelling at the storage area by protecting the soil with an		

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

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			<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>		
		<b>CONCRETE AND CEMENT</b>			
		<p>The contractors must provide and maintain a <b>method statement</b> for "cement and concrete batching". The method statement must provide information on proposed storage, washing &amp; disposal of cement, packaging, tools and plants</p>	<p>The mixing of concrete must only be done at specifically selected sites on mortar boards or similar structures to contain run-off into soils rocky outcrops, streams and natural vegetation</p> <p>Cleaning of cement mixing and handling equipment must be done using proper cleaning trays</p> <p>All empty containers must be stored in a dedicated area and later removed from the site for appropriate disposal at a licensed facility</p> <p>Any spillage that may occur must be investigated and immediate remedial action must be taken</p>	No Action required	<p>The Contractor will be responsible for providing method statements. He will also be responsible for training of staff in this regard.</p> <p>The ECO will monitor compliance.</p>

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			<p>The 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>		
<b>TOILETS AND ABLUTION FACILITIES</b>	At the end of the construction phase the site and its surrounding area <b>must</b> be free from any sewage that originated as a result of the construction activities.	The contractor must provide method statement for the operation and maintenance of toilets and ablution facilities	The contractor is responsible for providing all sanitary arrangements for his and the sub-contractors team. A minimum of one chemical toilet must be provided per 30 persons and should include male and female toilets.	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>
			Sanitary arrangements must be to the satisfaction of the ECO. The contractor must keep the toilets in a clean, neat and hygienic condition. The contractor must supply toilet paper to all toilets at all times. Toilet paper dispensers must be provided in all toilets		
			The contractor must be responsible for the cleaning, maintenance and servicing of the toilets. The contractor must ensure that no spillage occurs when the toilets are cleaned or emptied.		
			The use of ablution facilities and or mobile toilets must be used at all times and no		

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			<p>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>		
<b>WASTE MANAGEMENT</b>	At the end of the construction phase the site and its surrounding area <b>must</b> be free from any hazardous or general waste pollution that originated as a result of the construction activities.	The contractors must provide and maintain a method statement for "solid waste management". The method statement must provide information on the proposed licensed facility to be utilised and details must be kept of record keeping for auditing purposes	<p>Waste must be separated into recyclable and non-recyclable waste, and must be separated as follows:</p> <ul style="list-style-type: none"> <li>• <b>Hazardous waste:</b> including (but not limited to) old oil, paint, etc.</li> <li>• <b>General waste:</b> including (but not limited to) paper, plastic, glass and construction rubble</li> </ul> <p>Any illegal dumping of waste must not be tolerated, this action will result in a fine and if required further legal action will be taken. This aspect must be closely monitored and reported on; proof of legal dumping must be able to be produced on request.</p> <p>Bins must be clearly marked for ease of management</p> <p>All refuse bins must have a lid secured so that animals cannot gain access</p> <p>Sufficient closed containers must be strategically located around the construction site to handle the amount of litter, wastes,</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>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>		
<b>DUST</b>	Dust prevention measures <b>must</b> be	The contractors must provide and maintain	All forms of dust pollution must be managed in terms of the National Environmental	No Action required	The Contractor will be responsible for

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
	applied to minimise the generation of dust.	a method statement for "dust control". The method statement must provide information on the proposed source of water to be utilised.	<p>Management: Air quality Act, 2004 (Act No 39 of 2004)).</p> <p>Acceptable dust fall rates for residential areas are:</p> <p><b>Dust fall rate (D) (mg/m<sup>2</sup>/day, 30 days average):</b> D&lt;600</p> <p><b>Permitted frequency of exceeding dust fall rate:</b> Two within a year, not sequential months</p>		<p>providing method statements. He will also be responsible for training of staff in this regard.</p> <p>The ECO will monitor compliance.</p>
			Removal of vegetation must be avoided until such time as soil stripping is required and similarly exposed surfaces must be revegetated or stabilised as soon as is practically possible.		
			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>		
<b>NOISE</b>	Noise prevention measures <b>must</b> 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>		
<b>FIRES</b>	Absolutely <b>no</b> 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 <b>only</b> 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		
<b>FAUNA</b>	<b>No</b> hunting of animals will be allowed.	Plan to ensure that all activities on site must comply with the	All construction workers must be informed that the intentional killing of any animal is not permitted as faunal species are a benefit to	No Action required	The Contractor will be responsible for providing method

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
		regulations of the Animal Protection Act, 1962 (Act No. 71 of 1962)	<p>society. Poaching is illegal and it must be a condition of employment that any employee caught poaching will be dismissed. Employees must be trained on how to deal with fauna species as intentional killing will not be 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>statements. He will also be responsible for training of staff in this regard.</p> <p>The ECO will monitor compliance.</p>
<b>HERITAGE</b>	<b>No</b> 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>	No Action required	<p>The developer and applicant.</p> <p>Study to be conducted by a suitable qualified specialist.</p>

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			<p>Should any archaeological artefacts be exposed during site activities, work on the area where the artefacts were found must cease immediately and the ECO must be notified immediately.</p> <p>All work must cease immediately, if any human remains are uncovered. Such material, if exposed, must be reported to the South African Police Services, so that a systematic and professional investigation can be undertaken. Sufficient time must be allowed to remove/collect such material before development recommences</p>		Findings to be monitored by the ECO.
<b>CRIME, SAFETY AND SECURITY</b>	All Contractors and sub-contractors <b>must</b> 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.		

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			<p>Identify fire hazards, demarcate and restrict public access to these areas as well as notify the local authority of any potential threats e.g. large brush stockpiles, fuels etc</p> <p>All unattended open excavations must be adequately fenced or demarcated.</p> <p>Maintain an incidents and complaints register in which all incidents or complaints involving the public are logged.</p> <p>Ensure that the workforce is sensitised to the effects of sexually transmitted diseases, especially HIV AIDS. The Contractor must ensure that information posters on AIDS are displayed in the Contractor Camp area</p> <p>Workers must be instructed not to trespass onto adjacent land. Trespassers will be prosecuted.</p>		

## 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 **Ubhlebezwe Local Municipality**. 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

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
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 required by the contract and with the permission of the PM, ensuring the necessary way-leaves; permissions and permits are in place.	Contractor, PM, ECO	Continuous
	The Contractor must be responsible for the repair and reinstatement of any existing infrastructure that is damaged, or services which are interrupted, at his/her own cost.	Contractor	As required
	The Contractor must adhere to any time limits for the repairs that may be stipulated by the PM in consultation with the Contractor.	Contractor, ECO	As required
7. Environmental incidents	The Contractor must take timeous corrective action to mitigate an incident appropriate to the nature and scale of the incident and must also rehabilitate any residual environmental damage caused by the incident or by the mitigation measures themselves. The Contractor must adhere to any time limits for such corrective actions that may be stipulated by the ECO in consultation with the PM.	ECO, Contractor	Continuous
8. Labour	Local labour must be used wherever possible to stimulate the local economy.	Contractor	Once-off
	The Contractor should use labour intensive construction measures where appropriate, practical and financially feasible.	Contractor	Once-off
	The workforce should be trained to benefit individuals beyond the completion of the project.	Contractor	Once-off
	The Contractor should use local suppliers where possible.	Contractor	Once-off
	The PM must ensure that all staff working on the project must be in possession of a South African Identity Document or a relevant work permit. A register must be kept on site of all staff working on site.	PM	Continuous
	Equal opportunities for employment should be created to ensure that all sectors of society (especially women) have equal access to such opportunities.	Contractor	Continuous
9. Training of staff	The Contractor must ensure that all construction staff receive environmental awareness training concerning, amongst others, the prevention of accidental spillage of hazardous chemicals and oil; pollution of water resources (both surface and groundwater), air pollution and litter control and identification of archaeological artefacts, protection of any animals encountered on site, no-go areas, the use of toilets and basic sanitation, and basic health and safety on site.	Contractor, ECO	Once-off
	It is the Contractor's responsibility to provide the site foreman with environmental training (including explaining the content of the EMPr and any Conditions of Approval) and is to ensure that the foreman has sufficient understanding to pass this information onto the construction staff.	Contractor, ECO	Once-off
	Training must be provided to the staff members in the use of the appropriate fire-fighting equipment.	Contractor, Health and Safety Officer	Once-off
	The Contractor must ensure that all staff operating machinery/construction vehicles are adequately trained to carry out the designated tasks.	Contractor, Health and Safety Officer	Once-off
10. Worker health and safety	A Health and Safety Plan must be developed and implemented by the Contractor for the construction period to ensure worker safety. Should any injury be obtained as a result of work the Contractor must ensure the necessary medical attention is received. The necessary Health and Safety file and incident register must be kept on site at all times.	Contractor, Health and Safety Officer	Continuous
11. Site access & traffic management	Construction vehicles, machinery and workers must be restricted to the designated access roads, and may not drive through undeveloped vegetation outside of the existing access route except where that vegetation falls within the authorised working area (development footprint) at the site.	Contractor ECO	Continuous

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
12. Vegetation clearing	Vegetation clearing may only commence once the working area has been clearly demarcated to the ECO's satisfaction.	Proponent Contractor ECO	Once-off
13. 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
14. 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
15. 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
16. 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
17. Safety	No children on construction site. Safety fence and controlled access should be enforced Safety signs with necessary information displayed	Proponent Contractor ECO	Continuous
18. 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
19. 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"> <li>• Brush packing with cleared vegetation;</li> <li>• Mulch or chip packing;</li> <li>• Planting of vegetation; and</li> <li>• Hydro-seeding / hand sowing.</li> </ul>	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
20. 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
21. 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
22. 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
23. 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
24. 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
25. 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
26. 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
27. 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
28. 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
29. 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	
30.	Personal Equipment	Protective	Personal Protective Equipment (PPE) must be made available to all construction staff and must be compulsory. Hard hats and safety shoes must be worn at all times and other PPE worn where necessary i.e. dust masks, ear plugs etc.	Contractor, ECO, Health and Safety Officer	Monthly
			No person is to enter the portion of the site where construction activities are being undertaken without the necessary PPE.	Contractor, ECO, Health and Safety Officer	Monthly
			SABS Standards and specifications governing dangerous processes such as welding must be strictly applied, with a view to proper protection of the public and workers.	Contractor, ECO, Health and Safety Officer	As required
31.	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 **Ubuhlebezwe Local Municipality** 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.

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### 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.