

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 formalization and operation of the commencement of the clearance of 102.3852 ha of indigenous vegetation in order to formalise a township, currently known as the informal settlements of Goutrou and Hillside, situated on a Portion of the Remaining Extent of Erf 1, Hopetown, within the Thembelihle Local Municipality, Northern-Cape 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 formalization (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 formalization and operation of the commencement of the clearance of 102.3852 ha of indigenous vegetation in order to formalise a township, currently known as the informal settlements of Goutrou and Hillside, situated on a Portion of the Remaining Extent of Erf 1, Hopetown, within the Thembelihle Local Municipality, Northern-Cape 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 Town and Regional Planner
- The Civil Engineer
- A SAHRA Specialist.
- A Ecological specialist
- Registered Environmental Assessment Practitioner (EAP)

They were responsible for the following actions:

- A Geotechnical Engineer had to determine whether the Geology and Soils of the site is suitable for the proposed development.
- A Town and Regional Planner designed the proposed development in such a way that the layout of the proposed development, takes into account the measures described by the Civil Engineer and that the layout satisfies the needs of future occupiers of the site
- The Civil Engineer had to determine the capability of existing infrastructure to be linked to proposed development and readily available bulk services. He also designed the proposed infrastructure.
- SAHRA Specialist determined the possible impact of the development on Archaeological and cultural features.
- The Ecological specialist determined the impact of the proposed development on the Fauna and Flora of the area
- The EAP must assess all possible environmental issues that may affect the proposed project and ensure that all interested and affected parties are notified in order to assist him in identifying possible impacts. He must also give mitigation measures where applicable.
- It will be essential to plan for the appointment of an Environmental Control Officer (ECO) who will be responsible to ensure that all aspects regarding the environmental issues are implemented and monitored. The ECO will also be responsible for maintaining a database of all records pertaining to the environment for the study area.
- The surveyor ensured that the cadastral information is accurate, up to date and properly mapped. The contours of the area are accurately plotted.

2. Contents of the Environmental Management Programme

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

1. (1) An EMPr must comply with section 24N of the Act and include-
- (a) details of
 - (i) the EAP who prepared the EMPr; and
 - (ii) the expertise of that EAP to prepare an EMPr, including a curriculum vitae;
 - (b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;
 - (c) a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers;
 - (d) a description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including-
 - (i) planning and design;
 - (ii) pre-construction activities;
 - (iii) construction activities;
 - (iv) rehabilitation of the environment after construction and where applicable post closure;
 - and
 - (v) where relevant, operation activities;
 - (f) a description of proposed impact management actions, identifying the manner in which the impact management outcomes and outcomes contemplated in paragraphs (d) will be achieved, and must, where applicable, include actions to –
 - (i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;
 - (ii) comply with any prescribed environmental management standards or practices;
 - (iii) comply with any applicable provisions of the Act regarding closure, where applicable; and
 - (iv) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;
 - (g) the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);
 - (h) the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);
 - (i) an indication of the persons who will be responsible for the implementation of the impact management actions;

- (j) the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;
- (k) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);
- (l) a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;
- (m) an environmental awareness plan describing the manner in which-
 - (i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and
 - (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment; and
- (n) any specific information that may be required by the competent authority.

3. Details of Environmental Assessment Practitioner

Environmental Assessment Practitioner (EAP):¹	AB Enviro Consult CC		
Contact person:	Mrs. JE du Plooy		
Postal address:	7 Louis Leipoldt Street		
Postal code:	2531	Cell:	071 202 4027
Telephone:	018 294 5005	Fax:	018 293 0671
E-mail:	jp@abenviro.co.za		
EAP Qualifications:	BA; HED; B.A.(Honns) <i>Cum Laude</i> ; M.E.M		
EAP Registrations/Associations"	Registered Environmental Assessment Practitioner 2019/1573		

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
- **Mrs J.E. du Plooy** is a consultant since 2001

PERSONAL PARTICULARS AND CAREER HISTORY OF PROF DE VILLIERS

Name : ABRAHAM BAREND (BRAAM) DE VILLIERS

Date of birth : 1944/01/26

Telephone : (018) 294-5005

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Electronic mail : brama@abenviro.co.za

Address : 7 LOUIS LEIPOLDT STREET

POTCHEFSTROOM

2531

Lecturer & Professor – Potchefstroom University 1969- 2004

ACADEMIC AND PROFESSIONAL QUALIFICATIONS

Post–Matric Qualifications

<u>YEAR</u>	<u>Qualification</u>	<u>Institution</u>	<u>Field of Study</u>
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

PROFESSIONAL QUALIFICATIONS AND REGISTRATIONS

<u>YEAR</u>	<u>Qualification/ Registration</u>	<u>Institution</u>	<u>Field of Study</u>
1986	Professional Natural Scientist	S.A. Council Scientists	Environmental Science
1994	Quality Auditor	ESKOM	Auditing
1998	Personnel & Verifying Auditor	SAATCA	Environmental Auditing
2006-2018	Environmental Assessment Practitioner	Interim Certification Board EAPSA	Environmental Science

MEMBERSHIP AND PARTICIPATION IN SOCIETIES, COUNCILS, ETC.

Name of professional societies	YEAR	Capacity
S.A. Geographical Society.	1967-1996	Board Member
Society for Geography	1968-2004	Member
SAGS Western Transvaal	1985-1989 1987-1989 1996	Chairman
Africa Geographical Association	1993-1995	Vice-President.
Society for the Vaal River Catchment	1980-1999	Member
S.A. Society for Photogrammetry, Remote Cartography	1984-1996	Member
Dendrological Society	1986-2005	Member
Birdlife South Africa	2003-present	Member

British Geomorphological Research Group	1985-1997	Member
Int Com on Water Resource Systems	1985-1997	Member
Int Com on Continental Erosion	1986-1990	Member
Int Com on Remote Sensing and Data Transmiss	1986-1991	Member
Society for S.A. Geographers	1995-2005	Member
SA Photogrammetrical and Geo. Info.	1995-2003	Member
S.A. Association of Geomorphologists	1994-1999	Board Member and member
SADC Mine Dump Study Group	1996-2005	Member

***Chairman of the Committee for Interested and Affected Parties (CIP) (2004-2008)** for International Accreditation by the influential accrediting body of **Price, Waterhouse Coopers- International Environmental Auditors in Southern Africa.**

Member of Price Waterhouse Coopers CIP (2004-2010)

ACADEMIC courses taught AT POST-MATRIC LEVEL

- 1.1 The Geography of Economic Activities and Regional Geography (3rd year and honours students)
- 1.2 Weather and Climate (1st, 2nd, and 3rd year students)
- 1.3 Geomorphology (1st year up to PhD level)
- 1.4 Remote Sensing and the Environment (3rd year and Honours)
- 1.5 Quantitative Geography (3rd year up to Masters Level)
- 1.6 Environmental Management (2nd year, up to PhD level)
- 1.7 Environmental Analysis (3rd year and up to Masters Level)
- 1.8 Geography of Soil (3rd year and Honours)
- 1.9 Cartography (1st year to Honours)
- 1.10 As professor, 26 Masters & 4 PhD D students completed their studies in environmentally related subjects under his tutor- and co-tutorship.

INVOLVEMENT IN COURSES AND WORKSHOPS

ENVIRONMENTAL COURSES: Partially responsible for course development and taught various courses for environmental officers employed by the North West Province over a period of 3 years (1998-2001). These courses were aimed at improving their knowledge of the environment as well as their understanding of the environmental interactions specifically related to the North West province.

STATE OF THE ENVIRONMENT REPORT (SOE) Involved in the first SOE prepared by the North West Province and was responsible for most of the physical geographical aspects (1999).

ENVIRONMENTAL PROJECTS

The following projects are typical examples, of such projects which he co-ordinated and managed:

Mooi River Catchment studies: This was a study on the impacts of the mining activities on the quality and quantity of water in the Mooi River catchments and was done for the North West Province. He co-ordinated and managed this project. The team consisted of a PhD student as well as two teams of local and international students; one responsible for the biophysical variables, and the other for socio-cultural aspects.

SADC mine dumps study group: Acted as co-ordinator for the formulation of tools to assess the effects of mine dumps on the environment in the SADC region. One group was involved in the Zimbabwean copper belt region, and the other in the Tanzanian gold mining area. The studies were undertaken for the Carl Duisburg Gesellschaft (Germany). The research team consisted of geographers, ecologists and mining experts. From this study, a pilot program, the “South African Environmental Management System” (SEMS) developed, which was applied successfully by a team of researchers in a pilot study in the Carletonville region.

SADC development of training modules for environmental studies using GIS: Member of the three-person team who developed these training modules. It was applied at the Copper belt University, the University of Dar Es Salaam as well as at the Potchefstroom University as an introduction to the integration of environmental data (both biophysical and socio-economic) for the interpretation of geographical regions.

Environmental degradation - the result of indiscriminate location of slime dams in the SADC Region: Co-ordinated this study in the Far West Rand Area; conducted case studies in Zambia and South Africa. The team consisted of researchers from the Netherlands, Germany, Zambia and Tanzania.

Land use changes in the North West Province: An Environmental Management Support System for SOE North-West University Team leader. This project was undertaken for DACE (NWP) and various students participated – each involved in a specific aspect of the environment. This data was co-ordinated and eventually incorporated into the SOE report.

RESEARCH PUBLICATIONS AND CONFERENCES

He published 11 environmentally related articles in peer-reviewed magazines, and appeared professionally at 30 conferences with a direct bearing on environmental work.

ACADEMIC AND PROFESSIONAL QUALIFICATIONS Mr J.P. de Villiers

<u>YEAR</u>	<u>Qualification</u>	<u>Institution</u>	<u>Field of Study</u>
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

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

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	Master's degree in Management	PU FOR CHE	Environmental Management
2001	Aquabase Intro	Aquabase	Hydrology
2001	Geomedia Professional	Intertech	GIS
2001	Map Info	Spatial Technology	GIS

PROFESSIONAL QUALIFICATIONS AND REGISTRATIONS

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

Experience of the consultancy

Over a period of 25 years (1996-2021) this consultancy has successfully applied for, and obtained positive ROD's and EA's for more than 375 projects. Environmental Control Officer's duties are also performed on various projects.

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

The consultancy is qualified to undertake professional studies in waste management and is still involved in the development of waste disposal- (solid and liquid effluent), and emission studies. These studies are conducted both academically and practically. This work relates to mine waste, domestic waste and effluent as well as to the monitoring of waste disposal. Environmental audits in this respect are undertaken on a regular basis

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5. DESCRIPTION OF THE ACTIVITY

AB Enviro Consult was appointed by the Thembelihle Local Municipality in association with the Department of Co-operative Governance, Human Settlements and Traditional Affairs of the Northern Cape (COGHSTA) to apply for Authorization for the “Proposed” Establishment of a Township on the site. A site inspection held on 23 November 2019 revealed that construction activities on site has already commenced and that the Applicant will have to apply for the rectification of unlawful commencement or continuation of a listed activity in terms of Section 24G of the National Environmental Management Act, 1998 (Act No. 107 of 1998) as amended.

Apart from the Informal Settlement that has taken place on site, other activities commenced with is mostly related to service provision in the form of VIP toilets, roads, standpipes and electricity. Stand numbers has also been allocated, indicating a planned formalization process. The Applicant was not aware that they required Environmental Authorization before starting with provision of essential services in the area.

The intension of this application is thus to legalise the commencement of the clearance of 102.3852 ha of indigenous vegetation in order to formalise a township, situated on a Portion of the Remaining Extent of Erf 1, Hopetown, within the Thembelihle Local Municipality, Northern-Cape Province.

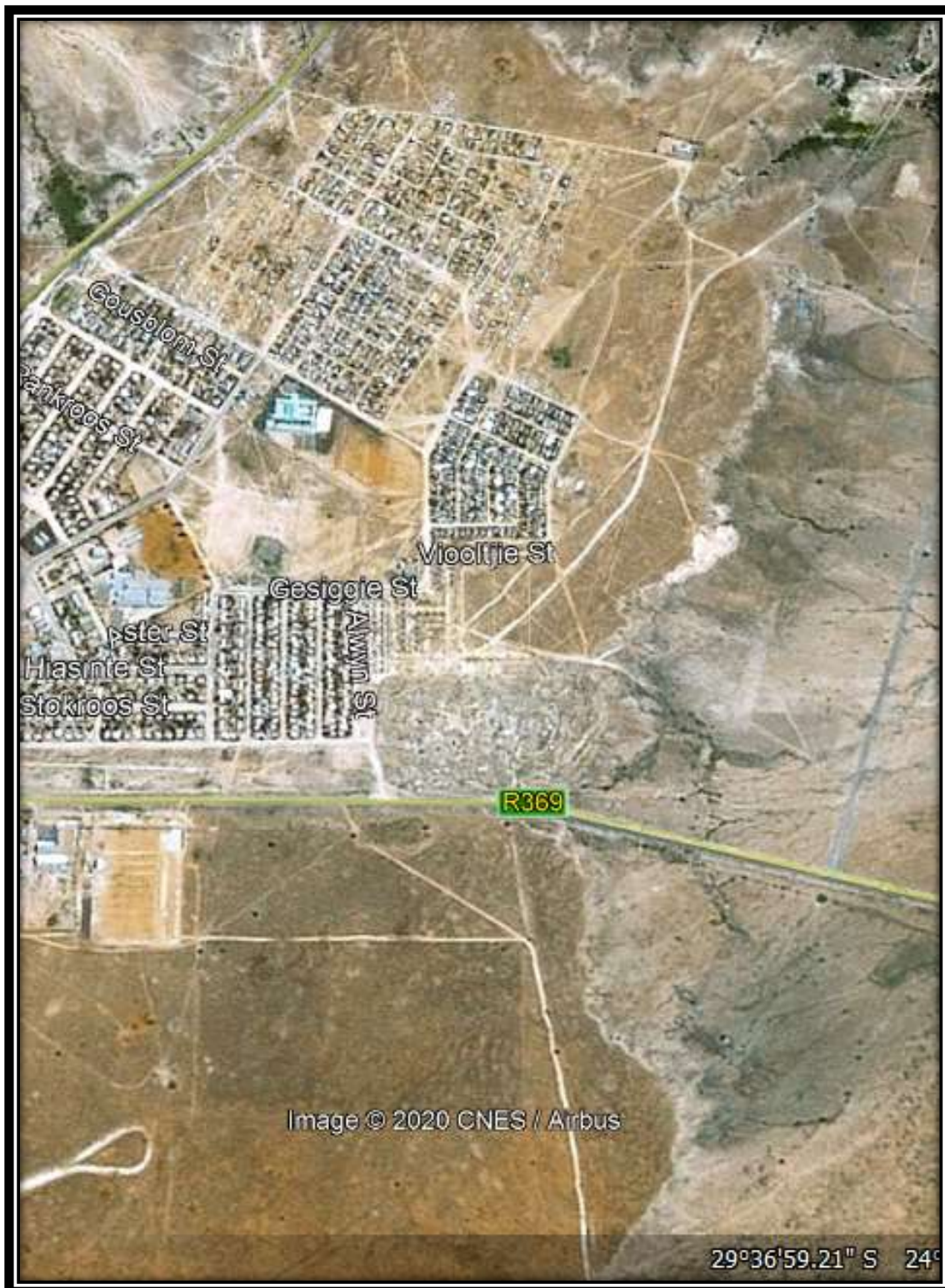
Informal settlement has already taken place on site, as such the need for housing in the area is highlighted. As in the rest of South Africa, there is a housing shortage in the area. This is undesirable as Informal settlements consist of non-conventional housing built without complying with legal building procedures. Broadly, these crude dwellings mostly lack proper services, such as water supply, sanitation, drainage, waste disposal and proper road access. There is also a bond between poor housing and environmental conditions in informal settlements which also reflects poverty.

Linking basic services such as water to health is viewed as a false separation as these services are ‘intimately related to housing’. It becomes a housing issue if children playing outside the house contract diarrhea via ingesting pathogens from fecal matter which contaminates the land on which they play. Otherwise, it is the house which provides for shelter against injury, weather and disease. Improving the surroundings of the house is to limit severe health risks existing within poor quality housing.

The proposed development is to formalize a township and to provide the services associated with a town to people in the area. It was envisioned to develop the proposed town as early as 2014. A business plan for the two development sites have been prepared in 2014 but was never submitted to COGHSTA. It is evident that from Google Earth Images of the area of 2013, the area has seen an influx of informal settlements. The occurrence of informal housing in the Municipality can be linked to an increase in urban population and the lack of properly planned sites with infrastructure. The formalization of the town is highly desirable as it will eliminate the negatives associated with informal housing as described above

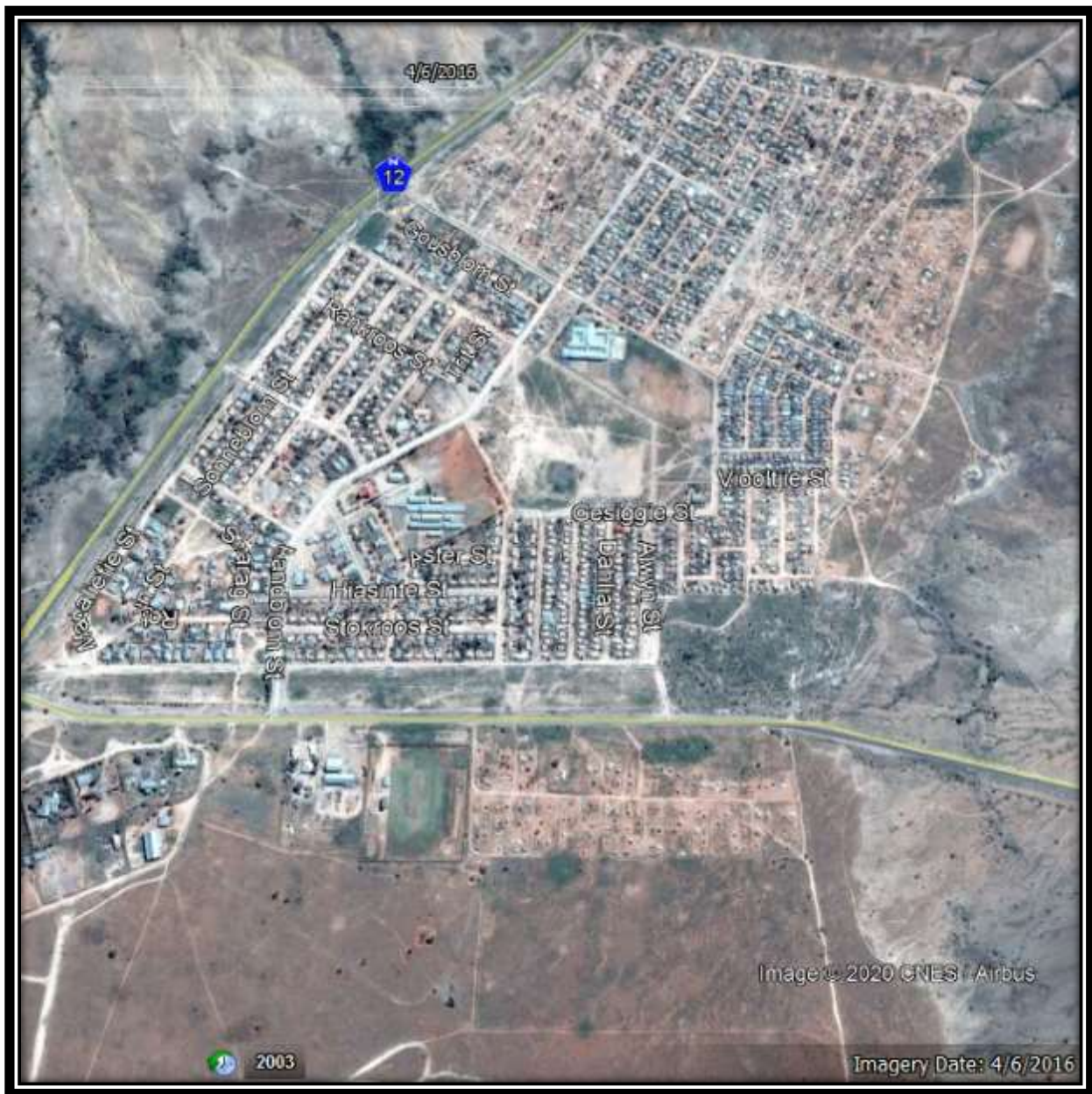
What has been completed/ commenced with:

Satellite imagery shows the progression of informal settlement on site. The 2006 Google Earth image shows no signs of informal settlement. The 2013 Google Earth image shows settlement starting to take place at Goutrou. The first signs of settlement at Hillside can be seen on the 2016 Google Earth image while the 2018 Google Earth image (The latest available image) is an indication of the current extent of informal settlement on site.



The site: Pre- Informal settlement 2006





Informal Settlement at Hillside can be seen on this 4/6/2016 Google Earth image.



12/5/2018 Google Earth image indicates the current extent of informal settlement on site

Apart from the Informal Settlement that has taken place on site, other activities commenced with is mostly related to service provision in the form of VIP toilets (Photograph 1), roads (Photograph 2), standpipes and

electricity (Photograph 2). Stand numbers has also been allocated, indicating a planned formalization process. See Photograph 3.

The Applicant was not aware that they required Environmental Authorization before starting with provision of essential services in the area.



Photograph 1: VIP toilets installed on site



Photograph 2: Graded and planned roads found on site. This photograph also illustrates the electricity infrastructure that has already been installed.



Photograph 3: Stand numbers has been allocated.

Large parts of vegetation at the site have been transformed or modified. Remaining vegetation is mainly karroid with few individual trees. Exotic trees occur at informal residential areas. The aggressive alien invasive tree *Prosopis glandulosa* is found at various places at the site. Indigenous trees include shrub-height *Diospyros lycioides* subsp. *lycioides*, *Vachellia tortilis*, *Ziziphus mucronata* and *Senegalia mellifera* subsp. *detinens*.

Informal developments had ecological impacts at the site. Loss of natural habitat with indigenous vegetation took place owing to informal developments. While it cannot be categorically stated that no threatened, near-threatened plant species were found at the site prior to the informal development, there are no distinct indicators that such species would have been at the site.

What still has to be completed?

The application deals with the formalization of this Township. This will include service provision and will involve re-layout of the Township. The layout plan will also address the issue of storm water. Figure 2 below is a copy of the proposed re-layout plan. The proposed new Township will consist of the following land uses.

Land use	Number of stands
Residential	1 500
Business	3
Church	3
Crèche	5
Primary School	1
Municipal	1
Parks	8

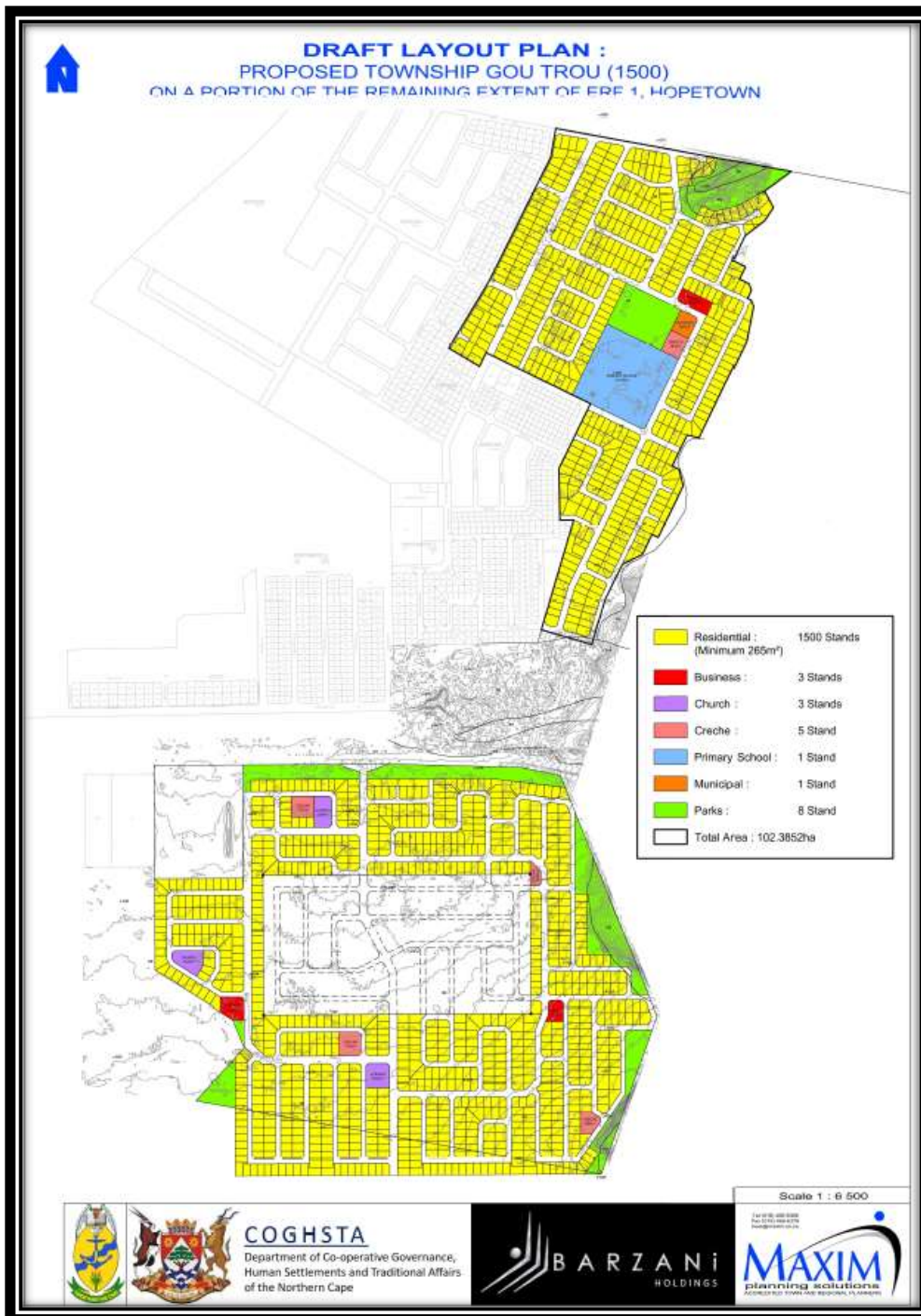


Figure 2: Proposed Re-Layout Plan.

BULK SERVICES

The provision of basic services is essential for the people living in this informal settlement. Services will be provided for by the Local Municipality and will connect to Municipal infrastructure.

Bulk water supply

Evaluation of capacity of bulk infrastructure:

The Civil Services Report's engineer came to the conclusion that the current Steynville reservoir does not contain sufficient capacity to serve the addition of a further 7750 people (1409 erven at 5.5 people/erf), with a resultant negative deficit when the additional populations is applied to the reserve capacity.

The following must be noted:

- The existing 150mmØ bulk water supply line between the existing Water Purification Works and Steynville Reservoir is currently sufficient but needs to be upgraded to accommodate the proposed development.
- In the case of the reservoir the capacity available for domestic use, as a result of the reserved volume of water for fire demand, is insufficient to serve the current domestic demand within a single day.

It is recommended to replace the existing bulk supply line from the water treatment works to the Steynville reservoir. It is proposed that a new feeder main be constructed to serve the population of Steynville. The new bulk main will be sized to serve the total domestic demand for the entire existing Steynville, Goutrou Area 1 (548 residential erven) and Goutrou Area 2 (952 residential erven).

The required pipe diameter is minimum 193mm Ø, however, considering the standard pipe diameters for uPVC pipes, the most suitable diameter will be a 200mmØ uPVC Class 9 pipe.

The Engineer came to the conclusion that the Concrete Reservoir capacity is insufficient to serve the additional proposed erven. Thus the necessity exists to increase the available storage capacity. It is recommended that a new reservoir to serve the proposed development be constructed in position at the site of the existing reservoir. The capacity of the new reservoir will be 48 hours of the AADD of entire population of the greater Steynville.

Additionally a fixed reserve capacity for fire demand must be provided based on the fire risk category for the total development served (i.e. existing plus proposed) To this end the fire risk category must be defined with relation to the development composition and definitions as set out in the Red Book.

This leads to the conclusion that the capacity for the new reservoir is proposed to be 2Ml. It is also clear from the elevation difference between the height of Elevated Storage Tank and the highest point of the proposed development of approximately 25m (2.5 bar), would lead to the fact that an additional elevated tower will not be required. Provision should also be made for a backup generator to provide power to the booster pump station providing water to the elevated storage tanks feeding the greater Steynville, to aid in the event of power disruptions.

A new Bulk Main to Proposed Development should be constructed to serve the proposed development. The new bulk main will be sized to serve the total domestic demand for Goutrou Area 1 (548 residential erven) and Goutrou Area 2 (952 residential erven). The required pipe diameter is minimum 160mm Ø, however, considering the standard pipe diameters for uPVC pipes, the most suitable diameter will be a 200mmØ uPVC Class 9 pipe.

The Goutrou area will require a pipe diameter is minimum 209mm Ø, however, considering the standard pipe diameters for uPVC pipes, the most suitable diameter will be a 200mmØ to 250mmØ pipe. In light of the above it is recommended that the proposed bulk main to the proposed development will be a 250 mm Ø uPVC Class 9 main. For the Goutrou Development it is suggested that the required pipe diameter is minimum 263mm Ø, however, considering the standard pipe diameters for uPVC pipes, the most suitable diameter will be a 315mmØ uPVC Class 9 pipe.



Proposed Bulk Water Infrastructure

Summary of Recommendations

- New 200mmØ Bulk Water Supply Line to Steynville.
- New 2Ml concrete reservoir at site of existing reservoir.
- New 315mmØ bulk water main approximately 760m in length.
- New 250mmØ bulk water main feeding Area 2 from the proposed 315mmØ above, approximately 180m in length.
- New 200mmØ bulk water main feeding Area 1 from the proposed 315mmØ above, approximately 1050m in length.

Sanitation

Goutrou Area: The proposed development site is located directly adjacent to Steynville which is fully serviced with flush toilets, and therefore in close proximity to existing services. The bulk capacity is expected to be sufficient to accommodate the additional inflow.

Hillside Area: VIP toilets have been installed for the informal dwellings. The existing oxidation ponds would be able to accommodate additional inflow.

Handling of effluent

The following proposal must be incorporated to bring the proposed Steynville Outfall Sewer Main to a standard that will accommodate the new infrastructure.

Based on the technical report compiled by Worley Parsons in April 2020, it is proposed that a new outfall line be constructed and discharge the sewerage to existing oxidation ponds.

According to the Civil Services Report; taking into consideration the estimated peak wet weather flow of 55.65ℓ/s and a design life of twenty years (20), it is envisaging that a new 315mm diameter uPVC line be constructed. The increased conduit size will avoid surcharging within the sewer and allow energy line to stay within the conduit. The length of the considered pipeline is approximately 2120m. The exact route of the pipeline should be considered and agreed during final design stage.

It will also be imperative to look into the specifications of the existing Rising Main. From the results of an analysis of data it became clear that the existing Rising Main have sufficient capacity to serve the new demands.

The Bulk Sewer Pump Station accommodates the sewer from the entire Hopetown. The total effluent generated amounts to a combined Peak Wet Weather Flow (PWWF) of 1468.464m³/day (16.996ℓ/s).

The proposed Goutrou Sewer Pump Station will be designed to accommodate an inflow of 18ℓ/s. The Pump Station will be approximately 5.5m deep and be equipped with a dry sump installed sewer pump set complete. It is concluded by the Engineer that it should be sufficient in capacity to meet the needs of the proposed development. The pump stations at Vergenoeg and Tambo Square will also need refurbishment. According to the Civil Engineer's report, the 315 mmØ rising main and the WTW has sufficient capacity to serve the addition of a further 9763 people (1775 erven at 5.5 people/erv), with a residual capacity of 20449 and 14426 people for the bulk pipeline and WTW respectively.

Storm Water

The traditional design of storm water drainage systems has been to collect and convey storm water runoff as rapidly as possible to a suitable location where it can be discharged. We are also more conscious of the quality of the environment and the impact that uncontrolled increases in runoff can have on landowners.

The objective of a storm water management plan should be to manage the storm water resources of the collective watersheds to:

- Prevent flood damage.
- Preserve the natural and beneficial functions of the natural drainage system.
- Preserve and enhance storm water quality.

The collection and concentration of storm water will be kept to an absolute minimum so as not to impact negatively on any natural watercourse.

Currently the greater Steynville has no existing formal storm water infrastructure, with all storm water draining on the surface within the existing roads infrastructure toward the natural watercourses.

Goutrou:

As discussed previously in the report Goutrou has a watershed running across the development. Approximately half of the proposed development gravitates in a northerly direction towards the Orange River at approximately 1.3%, while the other half of the site drains in a south easterly direction at approximately 1%.

Storm water drainage will be accommodated above the surface within the road reserves to natural water courses surrounding the proposed development. No provision will be made for Bulk Storm Water infrastructure however, storm water should be taken into account when designing the internal services on the proposed project.

Hillside:

The abovementioned area has a 1% slope from the south in the direction of the R369 Provincial Road to the north. Storm Water will be accommodated on the surface within the road reserves and gravitate towards the R369. Therefore, no Bulk Storm Water infrastructure will be required for this portion of the development,

however, storm water should be taken into account when designing the internal services on the proposed project.

Waste removal

A new dumping site has been constructed towards the south of Hopetown relieving pressure on the existing one in the middle of Town.

Electricity

According to the Electrical Services report: Hopetown is currently supplied from their Municipal Main Intake 22/11kV "Ster" Substation which is supplied from the Eskom "Osborne-Waterford" 22kV feeder. The Goutrou development is already serviced and is supplied from the Municipal "Ster" Substation via an 11kV overhead "Hare" line which has adequate capacity for the Goutrou South (Hillside) development.

The bulk supply limitations on the Municipal and upstream Eskom network are summarised as follows:

- a) The Notified Maximum Demand (NMD) at the Municipal Intake 22/11kV "Ster" Substation is 1,8MVA and is fully utilized. Hence, the NMD must be increased as per the load estimate requirements.
- b) The upstream Eskom "Osborne-Waterford" 22kV feeder which supply the Municipal "Ster" Substation has 2MVA spare capacity and could accommodate approximately 800 low-income erven. The installation of a Voltage Regulator on this Eskom feeder will accommodate the proposed development in Goutrou South (Hillside).

Roads

The Traffic Impact Assessment investigated the expected transport related impacts of the proposed Goutrou Township development with 1 500 Erven. The study investigated the worst case potential impact of the Township on the external road network.

SURROUNDING ROAD NETWORK:

N12: The N12 is a National Class 1 road. Access to the northern part of the site may be taken via Jakaranda Street which links with the N12.



R369: The R369 is a Class 2 provincial road. Access to the northern part of the site will be off Aandblom Street linking with the R369 and for the southern part of the site via a new road linking with the R369.



Based on the TIA site observations, the existing and base traffic volumes shown in the figures, as well as the capacity analysis, it is concluded that the proposed development will have little impact on the external road network.

The TIA proposed and concluded:

- ***Signalisation of the intersection of the N12, Widd Road and R369 when warranted.***
- ***It is recommended that provision is made for sidewalks along the school site frontages.***
- ***It is recommended that provision is made for traffic calming along the school site roads.***

6. DESCRIPTION OF THE PROPERTY

The development is located on a portion of the remaining extent of Erf 1, Hopetown and consist of two informal settlements currently known as Goutrou and Hillside. The Goutrou informal settlement area is located on a portion of the Remainder of Erf 1, Hopetown and the Hillside informal settlement area on Erf 1492. Erf 1492 is registered at the Surveyor- General, but not at the Registrar of Deed, thus the two mentioned erven will fall under the original title deed of the Remainder of Erf 1, Hopetown.

The above-mentioned delineated area includes Erf 624, Hopetown (comprising 15,4176 hectares) which is currently privately owned. We have included this erf in the assessment as the Applicant will be approaching the current owner to establish whether this property can be transferred back to the Thembelihle Local Municipality. The inclusion of this area into the assessment is crucial to ensure proper integrated planning of this entire area, should development be undertaken on this specific property in future.

The Goutrou informal settlement is located towards the east of the existing Steynville residential area and towards the north of the R369 road while the Hillside informal settlement is located towards the south of this Township and the R369. The R369 that goes to the Van der Kloof Dam, is the boundary between these two areas. See Figure 1 for a copy of the Locality Map.

The site is located in an area that falls under the jurisdiction of the Thembelihle Local Municipality and the Pixley ka Sem District Municipality, Northern-Cape Province.

The coordinates of the site are:

The Goutrou informal settlement

Latitude: 29°36'57.54" South

Longitude: 24°06'38.22" East

The Hillside informal settlement

Latitude: 29°37'26.06" South

Longitude: 24°06'20.51" East

The Surveyor-general 21 digit site reference number is:

C	0	3	3	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0
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Street address:	Access to the northern part of the site will be off Aandblom Street linking with the southern part of the site via a new road linking with the R369
Magisterial District or Town:	Thembelihle Local Municipality and the Pixley ka Sem District Municipality.

The largest part of the study area has been extensively disturbed and developed through informal residential settlement. Some areas has been heavily disturbed through quarrying and trenching, while informal dumping of residential refuse and building rubble also occurs throughout the area.



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

7.1 BIO-PHYSICAL ASPECTS

7.1.1 GEOLOGY AND SOIL

According to the Geo-Technical report that was compiled for the site, the site is underlain by shale and sandstone of the Ecca Group, Karoo Supergroup, but is locally covered by recent aeolian sand and calcrete gravel of the Kalahari Formation. Some severe problems are foreseen regarding the excavatability to 1,0m depth on site, and shallow rock, core stones and rock outcrop or hard pan calcrete were identified almost across the site.

Zoning of the site revealed zones with minor constraints regarding the **compressibility, collapse potential** and the **expansive potential** of the soil.

The following zones were identified on the site:

Normal Development with risk:

Site Class CR/1A3F:

This zone represents the majority of the area and comprises of a relative thin top layer sand less than 0,75m in thickness of slightly collapsible and compressible or low expansive soil underlain by a competent pebble marker or calcrete, with estimated total movement of less than 7,5mm measured at surface with the risk of shallow rock, core stones and hard pan calcrete rock outcrop adding a **R site class designation** to

the zone with **problems relating to restricted excavation to less than 1,0m**. Development on solid rock calcrete or calcrete rock outcrop known as hard pan calcrete and will have an inflated cost where special pneumatic tools and blasting will be required for the installation of services. Normal foundation techniques will be adequate to enable proper development, with proper compaction within standard strip foundations and drainage provision that will be required. It is classified as HCR in terms of the SAIEG & NHBRC guidelines (1995) or the SAICE Code of practice (1995), and 1A3F according to the classification for urban development (Partridge, Wood & Brink)(1993).

Suitable for development with precaution

Site Class PQ: Areas where small quarries or filling or dumping of spoil were identified must be rehabilitated before any construction can be allowed, and backfilling with an engineer's material may improve the developability of these zones, but these operations will dramatically increase the development cost in this zone.

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

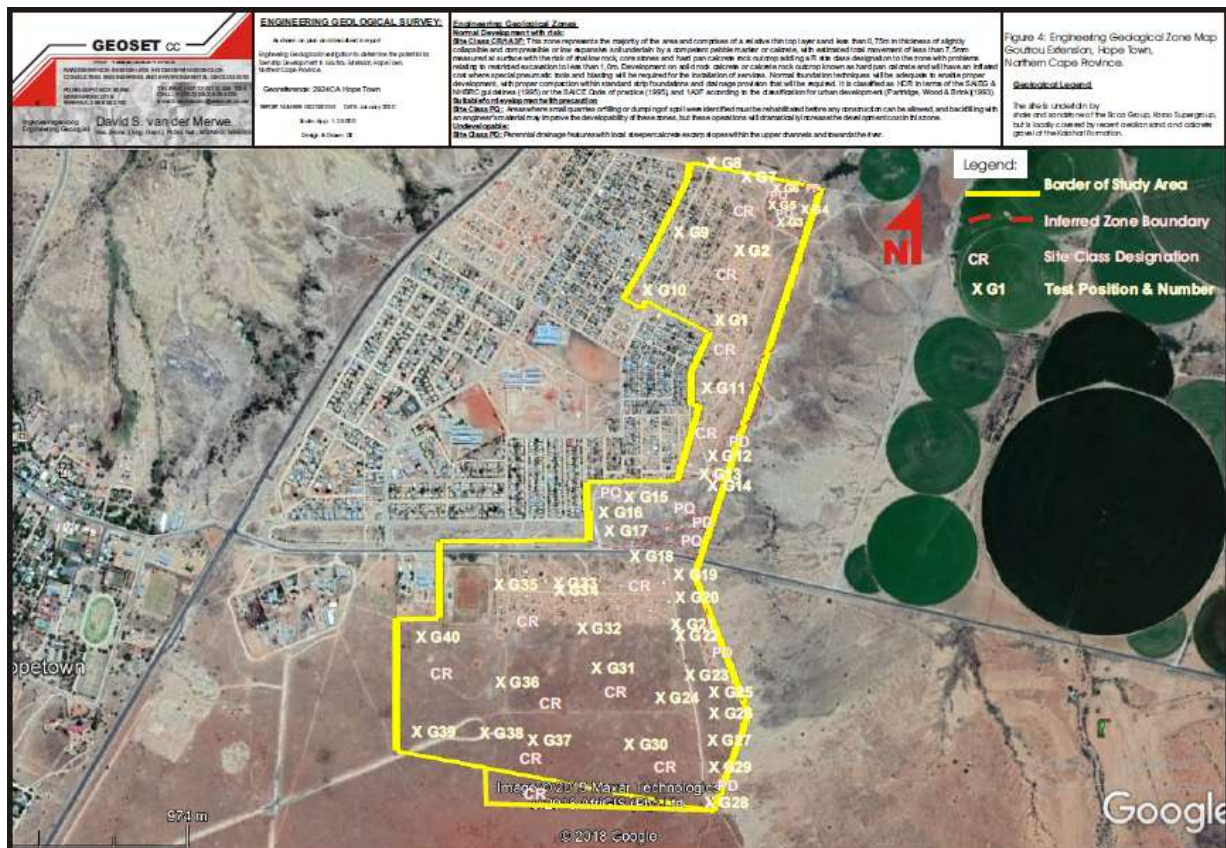


Figure 3: Engineering Geological Zone Map

7.1.2 TOPOGRAPHY

The topography of the study area is in general flat and open, with no real rocky outcrops or ridges occurring although there are some higher elevated sections. The site is located on a northern slope towards the Orange River from 1085 to 1104 masl.

An old quarry is located towards the south of Goutrou. Most of this quarry has been filled with building rubble and informal dumping.

A detailed site survey has been carried out to establish levels. The Engineering report and the Layout plan will address issues regarding storm water. As the proposed development will be in close proximity to residential areas, safety of children and people need to be taken into consideration during the construction phase.

7.1.3 CLIMATE

The region is characterized by summer rainfall with thunderstorms, with annual low rainfall figures of 322 mm for Hopetown recorded at the closest weather stations to the site. Winters are dry with frost common. The warmest months are normally December and January and the coldest months are June and July.

Extreme climatic events may have an influence on the project during the construction and operational phase and will have to be taken into consideration.

Climate Change

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

Water availability and demand has been calculated by the consulting Civil Engineers, to enable a sustainable waterborne sewage system as well as potable water supply for both the existing and future developments in the area.

7.1.4 SURFACE DRAINAGE

The site is located on a shallow slope towards the Orange River located approximately 1 500 meters north of the site. Plate flow is the dominant drainage pattern on site, and no prominent drainage channel intersects the site. Drainage occurs in a northern eastern direction on site, and then in a northern direction towards and into the Orange River.

Special care must be taken to ensure adequate surface drainage to prevent the accumulation of water next to structures. Storm water diversion measures such as ponding pools are recommended to control peak flows during thunderstorms. All embankments must be adequately compacted and planted with grass to stop any excessive erosion and scouring of the landscape.

7.1.5 GROUND WATER

The permanent or perched water table on site is deeper than 1,5m below ground surface. Although no seepage or the presence of perennial fluctuations of ground water were not encountered on site, the Engineering Geological report expects that a seasonal perched water table may exist. A calcified 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.

7.1.6 FLORA

To serve as local context for the landscape and vegetation at the site an outline of the Kimberley Thornveld (SVk 4) and Northern Upper Karoo (NKu 3) from Mucina and Rutherford (2006) follows.

SVk 4 Kimberley Thornveld

Distribution: In South Africa the Kimberley Thornveld is found in the North West, Free State and Northern Cape Provinces. Kimberley Thornveld is present in most of the Kimberley, Hartswater, Bloemhof and Hoopstad Districts as well as substantial parts of the Warrenton, Christiana, Taung, Boshof and to some extent the Barkly West Districts. The distribution also includes pediment areas in the Herbert and Jacobsdal Districts (Mucina & Rutherford 2006).

Vegetation and landscape features: Plains often slightly irregular with well-developed tree layer of *Acacia erioloba*, *Acacia tortilis*, *Acacia karroo* and *Boscia albitrunca* and well-developed shrub layer with occasional dense stands of *Tarchonanthus camphoratus* and *Acacia mellifera*. Grass layer open with much uncovered soil (Mucina & Rutherford 2006).

Geology and soils: Andesitic lavas of the Allanridge formation in the north and west and fine-grained sediments of the Karoo Supergroup in the south and east. Deep sandy (0.6 – 1.2 m) to loamy soils of the Hutton soil form are present on slightly undulating sandy plains (Mucina & Rutherford).

Climate: Climate is characterized by summer and autumn rainfall and very dry winters. Mean annual precipitation from about 300 mm in the southwest to about 500 mm in the northeast. Frost frequent in winter (Mucina & Rutherford 2006).

Important taxa of the Kimberley Thornveld listed by Mucina & Rutherford (2006): Tall Tree: *Acacia erioloba*. Small Trees: *Acacia karroo*, *Acacia mellifera* subsp. *detinens*, *Acacia tortilis* subsp. *heteracantha*, *Searsia lancea*. Tall Shrubs: *Tarchonanthus camphoratus*, *Diospyros pallens*, *Ehretia rigida*, *Euclea crispa* subsp. *ovata*, *Grewia flava*, *Lycium arenicola*, *Lycium hirsutum*, *Searsia tridactyla*. Low Shrubs: *Acacia hebeclada* subsp. *hebeclada*, *Anthospermum rigidum* subsp. *pumilum*, *Helichrysum zeyheri*, *Hermannia comosa*, *Lycium pilifolium*, *Melolobium microphyllum*, *Pavonia burchellii*, *Peliostomum leucorrhizum*, *Plinthus sericeus*, *Wahlenbergia nodosa*. Succulent Shrubs: *Aloe hereroensis* var. *hereroensis*, *Lycium cinereum*. Graminoids: *Eragrostis lehmanniana*, *Aristida canescens*, *Aristida congesta*, *Aristida mollissima* subsp. *argentea*, *Cymbopogon pospischilii*, *Digitaria argyrograptia*, *Digitaria eriantha* subsp. *eriantha*, *Heteropogon contortus*, *Themeda triandra*. Herbs: *Barleria macrostegia*, *Dicoma schinzii*, *Harpagophytum procumbens* subsp. *procumbens*, *Helichrysum cerastioides*, *Hermbstaedtia odorata*, *Hibiscus marlothianus*, *Jamesbrittenia aurantiaca*, *Lippia scaberrima*, *Osteospermum muricatum*, *Vahlia capensis* subsp. *vulgaris*. Succulent Herbs: *Aloe grandidentata*, *Piранthus decipiens*.

Northern Upper Karoo (NKu 3)

Distribution: Northern Upper Karoo is found in South Africa in the Northern Cape and Free State Provinces. Northern Upper Karoo occurs at the northern regions of the Upper Karoo plateau and ranges

from Prieska, Vosburg and Carnarvon in the west to Phillipstown, Petrusville and Petrusburg in the east. Northern Upper Karoo is bordered in the north by Niekerkshoop, Douglas and Petrusburg and in the south by Carnarvon, Pampoenpoort and De Aar. A few patches occur in Griqualand West. Altitude varies mostly from 1000 – 1500 m (Mucina & Rutherford, 2006).

Vegetation and landscape features: Shrubland dominated by dwarf karoo shrubs, grasses and *Acacia mellifera* subsp. *detinens* and some other low trees (especially on sandy soils in the northern parts and vicinity of the Orange River). Flat to gently sloping, with isolated hills of Upper Karoo Hardeveld in the south and Vaalbos Rocky Shrubland in the northeast and with many interspersed pans (Mucina & Rutherford 2006).

Geology and soils: Shales of the Volksrust Formation and to a lesser extent the Prince Albert Formation (both of the Ecca Group) as well as Dwyka Group diamictites from the underlying geology. Jurassic Karoo Dolerite sills and sheets support this vegetation complex in places. Wide stretches of land are covered by superficial deposits including calcretes of the Kalahari Group. Soils are variable from the shallow to deep, red-yellow, apedal, freely drained soils to very shallow Glenrosa and Mispah forms. Mainly Ae, Ag and Fc land types (Mucina & Rutherford, 2006).

Climate: Rainfall peaks in autumn (March). Mean annual precipitation (MAP) ranges from about 190 mm in the west to 400 mm in the northeast (Mucina & Rutherford, 2006).

Important taxa of the Northern Upper Karoo listed by Mucina & Rutherford (2006): Small Trees: *Acacia mellifera* subsp. *detinens*, *Boscia albitrunca*. Tall Shrubs: *Lycium cinereum*, *Lycium horridum*, *Lycium oxycarpum*, *Lycium schizocalyx*, *Rhigozum trichotomum*. Low Shrubs: *Chrysocoma ciliata*, *Gnidia polycephala*, *Pentzia calcarea*, *Pentzia globosa*, *Pentzia incana*, *Pentzia spinescens*, *Rosenia humilis*, *Amphiglossa triflora*, *Aptosimum marlothii*, *Aptosimum spinescens*, *Asparagus glaucus*, *Barleria rigida*, *Berkheya annectens*, *Eriocephalus ericoides* subsp. *ericoides*, *Eriocephalus glandulosus*, *Eriocephalus spinescens*, *Euryops asparagoides*, *Felicia muricata*, *Helichrysum lucilioides*, *Hermannia spinosa*, *Leucas capensis*, *Limeum aethiopicum*, *Melolobium candicans*, *Microloma armatum*, *Osteospermum leptolobum*, *Osteospermum spinescens*, *Pegolettia retrofracta*, *Pentzia lanata*, *Phyllanthus maderaspatensis*, *Plinthus karooicus*, *Pteronia glauca*, *Pteronia sordida*, *Selago geniculata*, *Selago saxatilis*, *Tetragonia arbuscula*, *Zygophyllum lichtensteinianum*. Succulent Shrubs: *Hertia pallens*, *Salsola calluna*, *Salsola glabrescens*, *Salsola rabieana*, *Salsola tuberculata*, *Zygophyllum flexuosum*. Semiparasitic Shrub: *Thesium hystrix*. Herbs: *Chamaesyce inaequilatera*, *Convolvulus sagittatus*, *Dicoma capensis*, *Gazania krebsiana*, *Hermannia comosa*, *Indigofera alternans*, *Lessertia pauciflora*, *Radyera urens*, *Sesamum capense*, *Sutera pinnatifida*, *Tribulus terrestris*, *Vahlia capensis*. Succulent Herb: *Psilocaulon coriarium*. Geophytic Herb: *Moraea pallida*. Graminoids: *Aristida adscensionis*, *Aristida congesta*, *Aristida diffusa*, *Enneapogon desvauxii*, *Eragrostis lehmanniana*, *Eragrostis obtusa*, *Eragrostis truncata*, *Sporobolus fimbriatus*, *Stipagrostis obtusa*, *Eragrostis bicolor*, *Eragrostis parosa*, *Fingerhuthia africana*, *Heteropogon contortus*, *Stipagrostis ciliata*, *Themeda triandra*, *Tragus berteronianus*, *Tragus koelerioides*, *Tragus racemosa*.

Note: Though some plant species of the above listed vegetation types are present at the site, not necessarily all of the plant species listed above are present at the site.

Large parts of vegetation at the site have been transformed or modified. Remaining vegetation is mainly karroid with few individual trees. Exotic trees occur at informal residential areas. The aggressive alien invasive tree *Prosopis glandulosa* is found at various places at the site. See Photograph 6. Indigenous trees include shrub-height *Diospyros lycioides* subsp. *lycioides*, *Vachellia tortilis*, *Ziziphus mucronata* and *Senegalia mellifera* subsp. *detinens*.



Photograph 6: Small tree in picture is aggressive alien invasive species *Prosopis glandulosa* (Mesquite), at the site.

Photo: R.F. Terblanche

The tall shrub *Rhigozum trichotomum* is found in dense clumps at some places at the site. Other tall shrubs include *Lycium cinereum* and *Lycium horridum*. The succulent shrub *Hertia pallens* is widespread at remaining vegetation at the site. occurs Low shrubs are visibly frequent at remaining vegetation at the site and include *Aptosimum marlothii*, *Pentzia globosa*, *Chrysocoma ciliata*, *Gnidia polycephala*, *Melolobium candicans*, *Plinthus karoocicus*, *Pteronia glauca*, *Selago geniculata* and *Zygophyllum* species. Herbaceous plant species include *Gazania krebsiana*, *Chamaesyce inaequilatera*, *Hermannia comosa*, *Indigofera alternans*, *Sesamum capense* and *Tribulus terrestris*. Indigenous grass species at the site include *Eragrostis lehmanniana*, *Eragrostis echinocloidea*, *Aristida congesta*, *Tragus berteronianus* and *Enneapogon desvauxii*.

Some of the alien invasive weed species at hirtherto bare ground or ecologically disturbed areas at the site are *Salsola kali*, *Argemone ochroleuca*, *Schkuhria pinnata*, *Xanthium spinosum*, *Chenopodium album*, *Alternanthera pungens* and *Datura ferox*.

Scope for the site to be part of a corridor of particular conservation concern is small. The Habitat Specialist has compiled the following sensitivity map.

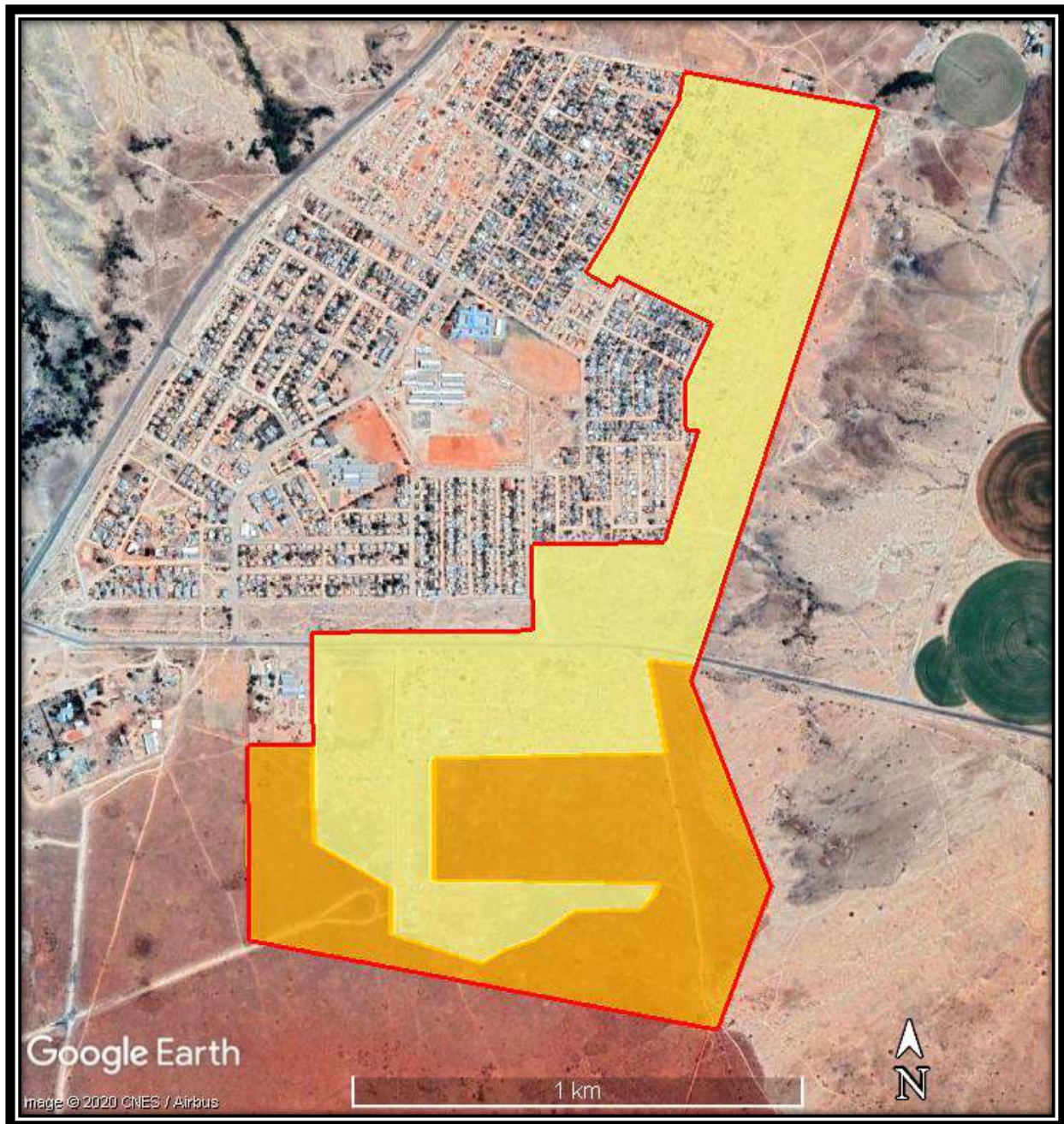


Figure 4: Sensitivity map.

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

Ecological sensitivity at most of the is currently low. Ecological sensitivity at vegetation that remains at the site is medium. In the recent past before informal settlements were constructed the ecological sensitivity of the entire site, based on habitat at and in the vicinity of the site, was probably medium.

7.1.7 FAUNA

The fauna of the area is highly disturbed by the people living in the adjoining suburbs. The likelihood of the presence of larger mammals is doubtful. No listed species were identified during the fieldwork phase.

VERTEBRATES

Mammals

Since the site falls outside reserves, threatened species such as the black rhinoceros (*Diceros bicornis*) and the African wild dog (*Lycaon pictus*) are obviously not present. No smaller mammals of particular high conservation significance are likely to be found on the site as well.

Birds

With bird species which often have a large distributional range, their presence does not imply that they are particularly dependent on a site as breeding location. Therefore the emphasis in the right hand columns of. Literature sources that were mainly consulted are Barnes (2000), Hockey, Dean & Ryan, P.G. (2005) and Chittenden (2007). No threat to any threatened bird species or any bird species of particular conservation importance are foreseen.

Reptiles

The Atlas and Red List of Reptiles of South Africa, Lesotho and South Africa (Bates, Branch, Bauer, Burger, Marais, Alexander & de Villiers, 2014) has been used as the main source to compile the list for assessment.

There appears to be no threat to any reptile species of particular high conservation importance if the site is developed.

Amphibians

There is no suitable habitat for *Pyxicephalus adspersus* (Giant Bullfrog) at the site. There appears to be no threat to any amphibian species of particular high conservation importance if the site is developed.

INVERTEBRATES

Butterflies

Studies relating to the vegetation and habitat of threatened butterfly species in South Africa showed that ecosystems with a unique combination of features are selected by these often localised threatened butterfly species (Deutschländer and Bredenkamp 1999; Edge 2002, 2005; Terblanche, Morgenthal & Cilliers 2003; Lubke, Hoare, Victor & Ketelaar 2003; Edge, Cilliers & Terblanche, 2008). Threatened butterfly species in South Africa can then be regarded as bio-indicators of rare ecosystems.

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

Assessment of threatened butterfly species

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

The proposed global red list status for *Aloeides dentatis dentatis* according to the most recent IUCN criteria and categories is Endangered (Mecenero *et al.*, 2013). *Aloeides dentatis dentatis* colonies are found where one of its host plants *Hermannia depressa* or *Lotononis eriantha* is present. Larval ant association is with *Lepisiota capensis* (S.F. Henning 1983; S.F. Henning & G.A. Henning 1989). The habitat requirements of *Aloeides dentatis dentatis* are complex and not fully understood yet. See

Deutschländer and Bredenkamp (1999) for the description of the vegetation and habitat characteristics of one locality of *Aloeides dentatis* subsp. *dentatis* at Ruimsig, Roodepoort, Gauteng Province. There is not an ideal habitat of *Aloeides dentatis* subsp. *dentatis* on the site and it is unlikely that the butterfly is present at the site.

***Anthene lindae* (Kalahari Hairtail)**

Small but distinct butterfly species discovered by R.F. Terblanche in 1990 at the present Witsand Nature Reserve in the Northern Cape. Recent red listing and extinction risk assessments list *Anthene lindae* as Vulnerable (Henning, Terblanche & Ball, 2009; Mecenero *et al.*, 2013). The butterfly is intimately associated with *Acacia erioloba* which may prove to be the larval food plant (Terblanche, 1994; Jessnitz pers. comm). However, all the localities for this butterfly species have been found on what appears to be a unique catchment area and basins with particular high water tables on the western side of the Langberg mountain chain, Northern Cape Province (Terblanche & Taylor, 2000). According to Henning *et al.* (2009) *Anthene lindae* has up to date only been found at an ecotone between Gordonias Plains Shrubland and Olifantshoek Plains Thornveld (Mucina & Rutherford, 2006). *Anthene lindae* is not found everywhere where *Vachellia erioloba* is present (Terblanche In prep.) and based on the present knowledge and surveys, presence of the butterfly at the site is unlikely.

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

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

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

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

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

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

Conclusion on threatened butterfly species

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

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

Colotis celimene amina (Lilac tip)

Colotis celimene amina is listed as Rare (Low density) by Mecenero et al. (2013). In South Africa *Colotis celimene amina* is present from Pietermaritzburg in the south and northwards into parts of Kwa-Zulu Natal, Gauteng, Limpopo, Mpumalanga and the North West Provinces (Mecenero et al. In press.). Reasons for its rarity are poorly understood. It is highly unlikely that *Colotis celimene amina* would be present at the site.

Lepidochrysops procera (Savanna Blue)

Lepidochrysops procera is listed as Rare (Habitat specialist) by Mecenero et al. (2013). *Lepidochrysops procera* is endemic to South Africa and found in Gauteng, KwaZulu-Natal, Mpumalanga and North West (Mecenero et al., 2013). Owing to a lack of habitat requirements and ideal habitat the presence of the taxon at the site is highly unlikely.

Metisella meninx (Marsh Sylph)

Henning and Henning (1989) in the first South African Red Data Book of Butterflies, listed *Metisella meninx* as threatened under the former IUCN category Indeterminate. Even earlier in the 20th century Swanepoel (1953) raised concern about vanishing wetlands leading to habitat loss and loss of populations of *Metisella meninx*. According to the second South African Red Data Book of butterflies (Henning, Terblanche & Ball, 2009) the proposed global red list status of *Metisella meninx* has been Vulnerable. During a recent large scale atlassing project the Conservation Assessment of Butterflies of South Africa, Lesotho and Swaziland: Red List and Atlas (Mecenero et al., 2013) it was found that more *Metisella meninx* populations are present than thought before. Based on this valid new information, the conservation status of *Metisella meninx* is now regarded as Rare (Habitat specialist) (Mecenero et al., 2013). Though *Metisella meninx* is more widespread and less threatened than perceived before, it should be regarded as a localised rare habitat specialist of conservation priority, which is dependent on wetlands with suitable patches of grass at wetlands (Terblanche In prep.). Another important factor to keep in mind for the conservation of *Metisella meninx* is that based on very recent discoveries of new taxa in the group the present *Metisella meninx* is species complex consisting of at least three taxa (Terblanche In prep., Terblanche & Henning In prep.). The ideal habitat of *Metisella meninx* is treeless marshy areas where *Leersia hexandra* (rice grass) is abundant (Terblanche In prep.). The larval host plant of *Metisella meninx* is wild rice grass, *Leersia hexandra* (G.A. Henning & Roos, 2001). Owing to a lack of habitat requirements and ideal habitat the presence of the taxon at the site is highly unlikely.

Platylesches dolomitica (Hilltop Hopper)

Platylesches dolomitica is listed as Rare (Low density) by Mecenero et al. (2013). Historically the conservation status of *Platylesches dolomitica* was proposed to be Vulnerable (Henning, Terblanche & Ball 2009). However this butterfly which is easily overlooked and has a wider distribution than perceived before. *Platylesches dolomitica* has a patchy distribution and is found on rocky ledges where *Parinari capensis* occurs, between 1300 m and 1800m (Mecenero et al. 2013, Dobson Pers comm.). Owing to a lack of habitat requirements and ideal habitat the presence of the taxon at the site is highly unlikely.

7.1.8. AIR QUALITY

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

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

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

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

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

Ranking the significance of different sources of pollution on the basis of the total emissions for which each source is responsible would, for example, place industrial emissions above household fuel-burning. If the aim is to reduce impacts on human health, however, then household fuel-burning would need to be targeted as a top priority (Scorgie et al., 2004d).

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

Approaches adopted or considered for future implementation have included: regulation (for example, the use of Atmospheric Emission Licences for Listed Activities); market instruments (such as atmospheric user-charges and pollution taxes); the potential for voluntary agreements, education and awareness raising; and emissions trading. International experience shows that adopting a mix of instruments and

interventions is more effective than using a single instrument to improve air quality across various types of source. Although direct regulation remains important in controlling industrial sources, there is evidence that specifying emission limits is more effective than specifying the use of particular technologies, so as to give companies flexibility in selecting the method of achieving success that suits them best. This approach is advocated as being more cost-effective and more likely to stimulate technological advances in pollution control methods and production processes.

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

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

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

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

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

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

7.1.9 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.

7.1.10 ARCHAEOLOGY AND CULTURAL SITES

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

Two sites with relatively small scatters of Stone Age material were identified and recorded during the assessment. The 2nd site is located close to an old quarry/erosion donga site on the south-eastern edge of the area.

In isolation the sites and material recorded are not of high significance as the scatters of Stone Age material is not dense and not in situ. However the possibility of some in situ deposits and sites do exist and the following is therefore recommended:

- That if any in situ deposits of archaeological material is exposed during development activities then an archaeologist should be called in to investigate and recommend on the way forward.
- The graveyard site (Site 3) is located outside of the study and development area and is of recent age and origin. The site is very large with an unknown number of graves located on it. Care should be taken to not impact on the site and graves in it in any way during future development actions.

From a cultural heritage point of view the proposed Development can therefore continue, taking cognizance of the above recommendations.

7.2 SOCIOLOGICAL AND ECONOMIC ISSUES

7.2.1 SOCIAL AMENITIES

Informal settlement has already taken place on site, as such the need for housing in the area is highlighted. As in the rest of South Africa, there is a housing shortage in the area. This is undesirable as Informal settlements consist of non-conventional housing built without complying with legal building procedures. Broadly, these crude dwellings mostly lack proper indoor infrastructure, such as water supply, sanitation, drainage, waste disposal and proper road access. There is also a bond between poor housing and environmental conditions in informal settlements which also reflects poverty.

Linking basic services such as water to health is viewed as a false separation as these services are 'intimately related to housing'. It becomes a housing issue if children playing outside the house contract diarrhea via ingesting pathogens from fecal matter which contaminates the land on which they play. Otherwise, it is the house which provides for shelter against injury, weather and disease. Improving the surroundings of the house is to limit severe health risks existing within poor quality housing.

The proposed development is to formalize a township and to provide the services associated with a town to people in the area. It was envisioned to develop the proposed town as early as 2014. A business plan for the two development sites have been prepared in 2014 but was never submitted to COGHSTA. It is evident that from 2013 the area has seen an influx of informal settlements. The occurrence of informal housing in the Municipality can be linked to an increase in urban population and the lack of properly planned sites with infrastructure. The formalization of the town is highly desirable as it will eliminate the negatives associated with informal housing as described above.

The preparation, submission and approval of the business plan to COGHSTA should be seen against the following background that highlights the need and desirability of the development:

- A constant increasing demand for affordable housing within the municipal area;
- The impact of the housing demand on municipal services and land needed therefore;
- The implementation of a well-structured and designed town planning and survey procedure;

- The poor financial and institutional capacity of the Local Authority to proceed with such planning and survey exercises;
- Conducting of a properly structured public participation process; and
- The shortage of funding and budget constraints within the municipal budget to drive such a process and the payment, therefore

Housing Needs

There is no formal updated housing waiting list available at the municipality. Some existing data has however been identified to assist in this regard.

The housing backlog for Hopetown is **1202 housing units**, with a housing supply of zero, according to the Pixley ka Seme District Municipality: Human Settlement Sector Plan and the Thembelihle IDP 2015/2016, this number may be outdated as there seems to be no updated figure in regard to housing backlog in the Municipality.

The above mentioned statistics should be viewed against the fact that the driving factor behind the increased need for housing in Thembelihle Local Municipality is the in-migration of rural households into the urban centres of the municipality, in seek of improved economic opportunities, access to better facilities and improved services.

The proposed development will:

- Provide services associated with the formalization of a town to future occupiers as well as the residents of the neighboring areas.
- During the construction phase of the proposed development, employment opportunities will be created and thus decrease the unemployment rate of the area.
- During the operational phase of the proposed development, additional employment opportunities will be created.
- The tax base of the Thembelihle Local Municipality will be broadened.

7.2.2 AESTHETICS

The topography of the study area is in general flat and open, with no real rocky outcrops or ridges occurring although there are some higher elevated sections. Vegetation cover was not dense (grass cover) while tree cover is very limited. The largest part of the study area has been extensively disturbed and developed through informal and more formal residential settlement. Some areas has been heavily disturbed through quarrying and trenching, while informal dumping of residential refuse and building rubble also occurs throughout the area.

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 informal residential area site to a formal residential area. The visual intrusion is considered to be low as the proposed development will have minimal change and blends in well with the surroundings.

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.

Aesthetics have very little influence as the area is already highly disturbed. The project on the other hand will have a huge impact on the Aesthetics of the area as the informal settlement will be formalized and services will be provided.

8. ENVIRONMENTAL MANAGEMENT OBJECTIVES AND TARGETS

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

ENVIRONMENTAL ASPECTS	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS
DOCUMENTATION AND TRAINING		
The necessary documentation must be available in the site office	Ensure that all concerned is aware of the EMPr and related environmental aspects	Availability of documents Trained and informed workforce.
SITE ACCESS & TRAFFIC MANAGEMENT		
Access roads may increase the construction footprints	Construction vehicles, machinery and workers must be restricted to the designated access roads, and may not drive through undeveloped vegetation outside of the existing access route except where that vegetation falls within the authorised working area (development footprint) at the site.	Minimizing eradication of vegetation.
VEGETATION CLEARING		
Vegetation will be cleared from within the footprint of the working area, before earthmoving and construction activities commence.	Vegetation clearing may only commence once the working area has been clearly demarcated to the ECO's satisfaction.	Land clearing must be restricted to the demarcated working area, and no vegetation may be cleared outside of the demarcated working area.
TOPSOIL & SUBSOIL MANAGEMENT		
Topsoil (where present) will be removed from any area where physical disturbance of the surface will occur.	Removed topsoil and subsoil should be stockpiled for the duration of the active construction period, and utilized for the final landscaping and rehabilitation of disturbed areas on site	The topsoil must be adequately protected from being blown away or eroded by storm water. Removed subsoil should be stockpiled separately from topsoil. Topsoil should be the final layer applied during rehabilitation, after subsoil/ spoil material has been placed and shaped on the site
EXCAVATIONS & EARTHWORKS		
It will be necessary to employ heavy machinery (excavators, back-actors, bulldozers, dump trucks etc.) for the earthmoving required	Use of heavy machinery can substantially increase the likelihood, intensity and significance of potential negative	Use of machinery should be restricted to only that which is strictly required, and the unnecessary or excessive

ENVIRONMENTAL ASPECTS	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS
	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.	movement/ use of such machinery must be kept to a minimum. Machinery must enter and exit the site via the indicated access roads, and may not enter/ exit the river channel at any other location. Excavations and earth-moving may only take place within the demarcated working area
DANGEROUS AND TOXIC MATERIALS (CHEMICALS)		
Safe storage of chemicals See also below for further aspects on this subject Availability of safety kits to prevent oils/toxic materials spreading in the environment Proper storage must be provided for chemicals , paint and construction materials needed	Clean environment Safe storage of materials	No spills of chemicals Proper storage provided
STORAGE OF OIL AND FUEL		
Safe handling of fuel and oil and prevention of spills.	Clean environment	No spills of oil or fuel No leakages of oil
USE OF OIL AND CHEMICALS		
Drip trays must be provided for vehicles in storage yard Wash bay and oil trap to be provided	No spills of oil Cleaning area for vehicles	No oil spills from vehicles No oil or fuel into environment due to cleaning of vehicles or equipment
STORAGE OF CEMENT		
Safe handling of cement	Clean environment	No spills of cement
STORAGE OF EQUIPMENT AND MATERIALS		
Safe and proper storage of equipment and material	Safe and proper storage of equipment and material	Neat, clean and ordered storage of material
CONCRETE		
The contractors must provide information on proposed handling of concrete.	Minimise the possibility of concrete residue entering into the surrounding environment	No evidence of contaminated soil on the construction site
TOILETS AND ABLUTION FACILITIES		
Clean sanitary environment	Clean and sanitary environment	Toilets for workers in accordance with the instructions in the EMP
WASTE MANAGEMENT		
A clean and waste free environment	Clean environment with waste handled in accordance with the EMP	No waste in the environment
WORKSHOP EQUIPMENT, MAINTENANCE AND STORAGE OF MATERIAL		
Clean and safe work area	Clean and safe work area	Safe and clean work and storage area
FIRES		
No burning of waste and or fires originating from the construction area	No burning of waste and or fires originating from the construction area	No fire incidents
OTHER ENVIRONMENTAL ASPECTS		
Stockpiles		

ENVIRONMENTAL ASPECTS	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS
<p>All stockpiled material must be easily accessible without any environmental damage to adjacent grasslands/farmlands.</p> <p>All temporarily stockpiled material must be stockpiled in such a way that the spread of materials are minimised.</p> <p>The stockpiles may only be placed within the demarcated areas - the location of which must be approved by the ER or ECO.</p> <p>Stockpiled material at batching plant must be contained to prevent the spread of gravel in the area.</p> <p>Erosion, sedimentation and storm water</p> <p>No erosion and or sedimentation</p> <p>Vegetation</p> <p>The contractor must avoid vegetated areas that will not be cleared.</p>	<p>Properly constructed and well maintained stockpiles</p> <ul style="list-style-type: none"> Minimise scarring of the soil surface and land features Minimise disturbance and loss of soil Minimise construction footprint <p>Minimise impacts on vegetation</p>	<p>No erosion or spread of material from stockpiles</p> <p>Gravel stockpiles must be properly managed</p> <p>No erosion or sedimentation.</p> <p>Limit impact on vegetation</p>
<p>Waste management</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"> Sustainable management of waste; to keep the site neat and tidy. This will control potential influx of vermin and flies thereby minimising the potential of diseases on site and the surrounding environment. It will also minimise the potential to pollute soils, water resources and natural habitats 	<ul style="list-style-type: none"> Disposal of rubble and refuse in an appropriate manner with no rubble and refuse lying on site Sufficient containers available on site
<p>Dust</p> <p>Dust production must be controlled by regular watering of roads and works area, should the need arise.</p>	<p>Reduce dust fall out</p>	<p>No visible signs of dust</p>
<p>SAFETY</p>	<p>Children's access to construction site controlled,</p> <p>Access to construction camp controlled</p> <p>Safety aspects considered</p>	<p>No children on construction site</p> <p>Safety fence and controlled access available</p> <p>Safety signs with necessary information displayed</p>

9. ENVIRONMENTAL IMPACT MANAGEMENT OUTCOMES

9.1 ASSESSMENT CRITERIA

Impacts were rated using the following methodology

Nature of the potential impact		Description of the effect, and the affected aspect of the environment
Duration (time scale)	Short term	Up to 5 years
	Medium term	6 – 15 years
	Long term	More than 15 years
Extent (area)	Local	Confined to study area and its immediate surroundings
	Regional	Region (cadastral, catchment, topographic)
	National	Nationally (The country)
	International	Neighboring countries and the rest of the world.
Magnitude (Intensity)	Low	Site-specific and wider natural and/or social functions and processes are negligibly altered. ((A low intensity impact will not affect the natural, cultural, or social functions of the environment).
	Medium	Site-specific and wider natural and/or social functions and processes continue albeit in a modified way. (Medium scale impact will alter the different functions slightly).
	High	Site-specific and wider natural and/or social functions and processes are severely altered. (A High intensity impact will influence these functions to such an extent that it will temporarily or permanently cease to exist).
Probability	Improbable	Possibility of occurrence is very low. (Such an impact will have a very slight possibility to materialise, because of design or experience).
	Possible	There is a possibility that the impact will occur
	Probable	It is most likely that the impact will occur
	Definite	The impact will definitely occur
Significance	Insignificant	Impact is negligible and will not have an influence on the decision regarding the proposed activity (No mitigation is necessary)
	Very Low	Impact is very small and should not have any meaningful influence on the decision regarding the proposed activity (No mitigation is necessary)
	Low	The impact may not have a meaningful influence on the decision regarding the proposed activity (No mitigation is necessary)
	Medium	The impact should influence the decision regarding the proposed activity (The project can only be carried through if certain mitigatory steps are taken)
	High	The impact will influence the decision regarding the proposed activity
	Very High	The proposed activity should only be approved under special circumstances
Reversibility	Low	There is little chance of correcting the adverse impact

Nature of the potential impact		Description of the effect, and the affected aspect of the environment
Risk	Medium	There is a moderate chance of correcting the adverse impact
	High	There is a high chance in correcting the adverse impact
	Low	Assessing a risk involves an analysis of the consequences and likelihood of a hazard being realized. In decision-making, low-consequence / low-probability risks (green) are typically perceived as acceptable and therefore only require monitoring.
	Medium	Other risks (amber) may require structured risk assessment to better understand the features that contribute most to the risk. These features may be candidates for management
	High	High-consequence / high-probability risks (red) are perceived as unacceptable and a strategy is required to manage the risk.

Attributes associated with the alternatives were assessed and is outlined below:

Geographical attributes

The Geographical attributes of an area relates to the characteristics of a particular region, area or place. It influences the determination of site alternatives as it relates to the location of a site in relation to relevant features in the area.

Physical attributes

Physical attributes of an area relates to the processes and patterns in the natural environment. For the purpose of this assessment, the following processes and patterns have been investigated. Geology, soil, topography and landforms, climate and meteorology, surface water and ground water.

Biological attributes

Biological attributes for the purpose of this study includes the distribution of species and ecosystems in geographic space and through geological time. Organisms and biological communities often vary in a regular fashion along geographic gradients of latitude, elevation, isolation and habitat area. The two main branches assessed will be: Phytogeography is the branch of biogeography that studies the distribution of plants.

Zoogeography is the branch that studies distribution of animals.

Social attributes

Social attributes is closely related to social theory in general and sociology in particular, dealing with the relation of social phenomena and its spatial components.

Economic attributes

Economic attributes includes the location, distribution and spatial organization of economic activities and also takes into account social, cultural, and institutional factors in the spatial economy of the development.

Heritage attributes

The broad generic term Cultural Heritage Resources refers to any physical and spiritual property associated with past and present human use or occupation of the environment, cultural activities and history. The term includes sites, structures, places, natural features and material of paleontological, archaeological, historical, aesthetic, scientific, architectural, religious, symbolic or traditional importance to specific individuals or groups, traditional systems of cultural practice, belief or social interaction.

Cultural attributes

Cultural attributes relates to the specific characteristics such as language, religion, ethnic and racial identity, and cultural history & traditions of people. These attributes influences family life, education, economic and political structures, and, of course, business practices.

It should be noted that the above mentioned attributes do not occur in isolation and it is not uncommon for an identified impact to overlap with two or more of these attributes. Also note, not all risks require comprehensive

and detailed assessment. Solid problem formulation should allow decision-makers to evaluate the extent of subsequent analysis required. The level of effort put into assessing each risk should be proportionate to its significance and priority in relation to other risks, as well as its complexity, by reference to the likely impacts. Consideration should be given to stakeholders' perceptions of the nature of the risk.

9.2 ENVIRONMENTAL IMPACT MANAGEMENT OUTCOMES

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

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

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 complete copy of the signed EA in terms of NEMA, granting approval for the development must be available on site	Obtain the Environmental Authorization and plan to have a copy of the signed EA on site.	Ensure that a signed copy of the EA is available in the site office	No action required	The Applicant, assisted by the EAP to be monitored by the ECO
	A copy of the EMPr as well as any amendments thereof must be available on site	Ensure that a site specific EMPr is compiled and approved and plan to have a copy of the approved document on site	Ensure that a copy of the approved EMPr is available in the site office	No action required	The Applicant, assisted by the EAP to be monitored by the ECO
	A suitably qualified ECO must be appointed.	Prior to the start of construction activities, an ECO must be appointed to ensure that an Environmental Control document is compiled. This document must	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	
		explain the roles and responsibilities of everyone involved and must also contain an Environmental awareness training manual.			
			ECO's report must be an item on monthly site meeting agenda	No action required	The project manager.
		The ECO must ensure that the contractor provides method statements for the various environmental aspects.	The method statements must be available in the site office	No action required	The Applicant and the contractor must ensure that the method statements are developed and approved by the ECO
SITE ESTABLISHMENT	Impacts on the environment must be minimised during site establishment and the development footprint must be kept to the	A Land surveyor must peg the parameters of the development footprint.	Construction vehicles, machinery and workers must be restricted to only operate within the approved development footprint.	No action required	The developer must ensure that a Land surveyor pegs the parameters of the development footprint and that
			The development footprint must be clearly demarcated and the extent of this area must be communicated to all contractors and sub-contractors.		

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
	approved development area.		Existing access roads must be utilised to access the site camp(s) and working/ construction areas Appropriate traffic management strategies must be implemented to ensure the safety of construction vehicles and other road-users. 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.		all concerned are trained in this regard. The ECO will monitor compliance.
VEGETATION CLEARING	Vegetation clearing may not commence until such time as the development footprint has been clearly defined.	A Land surveyor must peg the parameters of the development footprint.	Land clearing must be restricted to the demarcated working area, and no vegetation may be cleared outside of the demarcated working area.	The scope for the degraded and isolated site to be a corridor of particular conservation importance is small. Cultivation of indigenous plant species at the site is essential and will enhance urban conservation corridors.	The developer must ensure that a Land surveyor pegs the parameters of the development footprint and that all concerned are trained in this regard. The ECO will monitor compliance.
	No clearance of vegetation outside of the development footprint may occur.			Continued monitoring and eradication of alien	

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
				invasive plant species are imperative. It is in particular declared alien invasive species such as Prosopis glandulosa (Mesquite) that should not be allowed to establish	
STORM AND WASTE WATER MANAGEMENT	At the end of the construction phase the site and its surrounding area must be free from any pollution that originated as a result of the construction activities.	The developer must compile a storm water management plan.	All spillage of oil onto concrete surfaces must be controlled by the use of an approved absorbent material and the used absorbent material disposed of at an appropriate waste disposal facility.	No action required	The developer must ensure that a storm water management plan is developed. The ECO must monitor compliance.
			Natural storm water runoff not contaminated by construction activities can be discharged directly into the natural environment.		
			No wastewater may run freely into any naturally vegetated areas. Run-off containing high sediment loads must not be released into natural environment.		
			Approval must be obtained from DW&S for any activities that require authorisation in terms of Section 39 of the National Water Act, 1998 (Act No. 36 of 1998).		

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			<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> <p>Land clearing must be restricted to the demarcated working area, and no disturbance of topsoil & subsoil outside of the demarcated working area will be allowed.</p>		

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.	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.	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>
			The topsoil must be adequately protected from being blown away or eroded by storm water. The topsoil storage area must be located on a level area outside of any surface drainage/ storm-water channels, and at a location where it can be protected from disturbance during construction and where it will not interfere with construction activities.		
			Removed subsoil should be stockpiled separately from topsoil. Handling of topsoil should be minimized as much as possible, and the location of the 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		

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			only, once to strip and stockpile, and once to replace, level, shape and scarify. The topsoil berm may be a few meters wide but should ideally not be more than 0.5m high to allow sufficient light and air penetration.		
	Topsoil should be the final layer applied during rehabilitation, after subsoil/ spoil material has been placed and shaped.				
	The Contractor will be responsible for providing method statements. He will also be responsible for training of staff in this regard.				
	No disturbance of topsoil & subsoil outside of the development footprint may occur.				
DANGEROUS AND TOXIC MATERIALS	At the end of the construction phase the site and its surrounding area must be free from any chemical, fuel, oil and cement spills that originated as a result of the construction activities.	CHEMICALS			All hazardous substances must be stored in suitable containers as defined in the Method Statement;
		The Contractor must provide method statements for the storage and handling of chemicals on site.	Containers must be clearly marked to indicate contents, quantities and safety requirements	No Action required	
			All storage areas must be bunded. The bunded area must be of sufficient capacity to contain a spill / leak from the stored containers		
			Bunded areas to be suitably lined with a SABS approved liner		
			An Alphabetical Hazardous Chemical Substance (HCS) control sheet must be drawn up and kept up to date on a continuous basis		

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON	
		Pre-construction phase	Construction phase	Operational phase		
			All hazardous chemicals that will be used on site must have Material Safety Data Sheets (MSDS);			
			All employees working with HCS must be trained in the safe use of the substance and according to the safety data sheet			
			Employees handling hazardous substances / materials must be aware of the potential impacts and follow appropriate safety measures. Appropriate personal protective equipment must be made available			
			The Contractor will be responsible for providing method statements. He will also be responsible for training of staff in this regard.			
		FUEL AND OIL			No Action required	The Contractor must ensure that diesel and other liquid fuel, oil and hydraulic fluid is stored in appropriate storage tanks or in bowzers
		The Contractor must provide method statements for the storage and handling of fuel and oil on site.	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/ bowzers 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/ bowzers						

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			<p>The floor of the bund must be sloped, draining to an oil separator</p> <p>Provision must be made for refuelling at the storage area by protecting the soil with an impermeable groundcover. Where dispensing equipment is used, a drip tray must be used to ensure small spills are contained</p> <p>All empty externally dirty drums must be stored on a drip tray or within a bunded area</p> <p>Spill kits must be available on site and in all vehicles that transport hydrocarbons for dispensing to other vehicles on the construction site. Spill kits must be made up of material/product that is in line with environmental best practice (SUNSORB is a recommended product that is environmentally friendly)</p> <p>Where refuelling away from the dedicated refuelling station is required, a mobile refuelling unit must be used. Appropriate ground protection such as drip trays must be used</p> <p>The responsible operator must have the required training to make use of the spill kit in emergency situations</p> <p>In the event of a spill, contaminated soil must be collected in containers and stored in a</p>		

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			central location and disposed of according to the National Environmental Management: Waste Act 59 of 2008.		
			During servicing of vehicles or equipment, a suitable drip tray must be used to prevent spills onto the soil.		
			Leaking equipment must be repaired immediately or be removed from site to facilitate repair		
			Construction area must be monitored for oil and fuel spills		
			Drip trays (minimum of 10cm deep) must be placed under all vehicles that stand for more than 24 hours. Vehicles suspected of leaking must not be left unattended, drip trays must be utilised. The surface area of the drip trays will be dependent on the vehicle and must be large enough to catch any hydrocarbons that may leak from the vehicle while standing.		
		CONCRETE AND CEMENT			
		The contractors must provide and maintain a method statement for "cement and concrete batching". The	Cleaning of cement mixing and handling equipment must be done using proper cleaning trays	No Action required	The Contractor will be responsible for providing method statements. He will also be responsible for
			All empty containers must be stored in a dedicated area and later removed from the site for appropriate disposal at a licensed facility		

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
		method statement must provide information on proposed storage, washing & disposal of cement, packaging, tools and plants	<p>Any spillage that may occur must be investigated and immediate remedial action must be taken</p> <p>The visible remains either of concrete, solid, or from washings, must be physically removed immediately or disposed of as waste to a registered landfill site</p> <p>Cement batching areas must be located in an area where residues are contained and that the location does not fall within storm water channels</p> <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>training of staff in this regard.</p> <p>The ECO will monitor compliance.</p>
TOILETS AND ABLUTION FACILITIES	At the end of the construction phase the site and its surrounding area must be free from any sewage that originated as a result of the construction activities.	The contractor must provide method statement for the operation and maintenance of toilets and ablution facilities	<p>Sanitary arrangements must be to the satisfaction of the ECO. The contractor must keep the toilets in a clean, neat and hygienic condition. The contractor must supply toilet paper to all toilets at all times. Toilet paper dispensers must be provided in all toilets</p> <p>The contractor must be responsible for the cleaning, maintenance and servicing of the toilets. The contractor must ensure that no spillage occurs when the toilets are cleaned or emptied.</p>	No Action required	The Contractor will be responsible for providing method statements. He will also be responsible for training of staff in this regard.

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			<p>The use of ablution facilities and or mobile toilets must be used at all times and no indiscriminate use of the veld for the purposes of ablutions must be permitted under any circumstances</p> <p>Toilets out on site must be secured to the ground and have a sufficient locking mechanism operational at all times</p> <p>The contractor is responsible for providing all sanitary arrangements for his and the sub-contractors team. A minimum of one chemical toilet must be provided per 30 persons and should include male and female toilets.</p>		The ECO will monitor compliance.
WASTE MANAGEMENT	At the end of the construction phase the site and its surrounding area must be free from any hazardous or general waste pollution that originated as a result of the construction activities.	The contractors must provide and maintain a method statement for "solid waste management". The method statement must provide information on the proposed licensed facility to be utilised and details must be kept of record	<p>Waste must be separated into recyclable and non-recyclable waste, and must be separated as follows:</p> <ul style="list-style-type: none"> • Hazardous waste: including (but not limited to) old oil, paint, etc. <p>General waste: including (but not limited to) paper, plastic, glass and construction rubble</p> <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</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	
		keeping for auditing purposes	<p>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, 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>		

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			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		
DUST	Dust prevention measures must be applied to minimise the generation of dust.	The contractors must provide and maintain a method statement for "dust control". The method statement must provide information on the proposed source of water to be utilised.	<p>All forms of dust pollution must be managed in terms of the National Environmental Management: Air quality Act, 2004 (Act No 39 of 2004)).</p> <p>Acceptable dust fall rates for residential areas are: Dust fall rate (D) (mg/m²/day, 30 days average: D<600 Permitted frequency of exceeding dust fall rate: Two within a year, not sequential months</p> <p>A standard test method to be used for measuring dust fall rate and the guideline for locating sampling points shall be ASTM D1739. The latest version of this method shall be used</p>	No Action required	<p>The Contractor will be responsible for providing method statements. He will also be responsible for training of staff in this regard.</p> <p>The ECO will monitor compliance.</p>

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			<p>Excavation, handling and transport of erodible materials must be avoided under high wind conditions or when a visible dust plume is present</p> <p>Removal of vegetation must be avoided until such time as soil stripping is required and similarly exposed surfaces must be revegetated or stabilised as soon as is practically possible.</p> <p>The construction camp must be watered during dry and windy conditions to control dust fallout.</p> <p>Dust production must be controlled by regular watering of roads and work area, should the need arise</p> <p>During high wind conditions, the ECO must evaluate the situation and make recommendations as to whether dust damping measures are adequate, or whether working will cease altogether until the wind speed drops to an acceptable level</p> <p>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>		

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

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

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
		Act, 1962 (Act No. 71 of 1962)	<p>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>training of staff in this regard.</p> <p>The ECO will monitor compliance.</p>
HERITAGE	No intentional destruction of any sites, features or material of cultural heritage (archaeological and/or historical) origin or significance may occur.	Conduct a Phase 1 HIA for the development to identify any sites, features or material of cultural heritage (archaeological and/or historical) origin or significance	<p>In terms of the National Heritage Act, 1999 (Act No. 25 of 1999), construction personnel must be alert and must inform the local heritage agency within 48 hours should they come across any signs of heritage resources.</p> <p>Carry out general monitoring of excavations for potential fossils, artefacts and material of heritage importance.</p> <p>Should any archaeological artefacts be exposed during site activities, work on the area</p>	No action required	<p>The developer and applicant.</p> <p>Study to be conducted by a suitable qualified specialist.</p> <p>Findings to be monitored by the ECO.</p>

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME	ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS			RESPONSIBLE PERSON
		Pre-construction phase	Construction phase	Operational phase	
			<p>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>		
CRIME, SAFETY AND SECURITY	All Contractors and sub-contractors must abide to the rules and regulations of the Occupational Health and Safety Act, 85 of 1993.	Plan to appoint a health and safety officer for the construction site.	The site and crew are to be managed in strict accordance with the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) and the National Building Regulations	No actions required	Health and safety officer.
			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.		
		Compile an Emergency Response Action Plan (ERAP) prior to	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	
		the commencement of the project	Identify fire hazards, demarcate and restrict public access to these areas as well as notify the local authority of any potential threats e.g. large brush stockpiles, fuels etc		
			All unattended open excavations must be adequately fenced or demarcated.		
			Maintain an incidents and complaints register in which all incidents or complaints involving the public are logged.		
			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		
			Workers must be instructed not to trespass onto adjacent land. Trespassers will be prosecuted.		

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 ***Thembelihle Local Municipality in association with the Department of Co-operative Governance, Human Settlements and Traditional Affairs of the Northern Cape (COGHSTA)***. Ultimately, they will be responsible for the development and implementation of the EMP and MMP 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 and MMP are 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

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
6. Existing services and infrastructure	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
	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

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
10. Worker health and safety	<p>A Health and Safety Plan must be developed and implemented by the Contractor for the construction period to ensure worker safety.</p> <p>Should any injury be obtained as a result of work the Contractor must ensure the necessary medical attention is received.</p> <p>The necessary Health and Safety file and incident register must be kept on site at all times.</p>	Contractor, Health and Safety Officer	Continuous
11. Site access & traffic management	Construction vehicles, machinery and workers must be restricted to the designated access roads, and may not drive through undeveloped vegetation outside of the existing access route except where that vegetation falls within the authorised working area (development footprint) at the site.	Contractor ECO	Continuous
12. Vegetation clearing	Vegetation clearing may only commence once the working area has been clearly demarcated to the ECO's satisfaction.	Proponent Contractor ECO	Once-off
13. EMPr	This EMPr must be made binding to the main Contractor and to individual Contractors, and must be included in the tender documentation for the construction contract.	Proponent	Once-off
14. Topsoil & subsoil management	<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 on site.</p> <p>The topsoil must be adequately protected from being blown away or eroded by storm water.</p> <p>Removed subsoil should be stockpiled separately from topsoil.</p> <p>Topsoil should be the final layer applied during rehabilitation, after subsoil/ spoil material has been placed and shaped on the site</p>	Contractor ECO	Continuous
15. Excavations & earthworks	<p>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.</p> <p>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.</p> <p>Machinery must enter and exit the site via the indicated access roads, and may not enter/ exit the river channel at any other location.</p> <p>Excavations and earth-moving may only take place within the demarcated working area</p>	Contractor ECO	Continuous
16. Groundwater contamination	Ensure vehicles are serviced and refuelled in bunded areas	Contractor	Continuous
	Ensure vehicles are checked weekly for faults and serviced timeously if faulty	Contractor	As required
	Should any leaks occur ensure contaminated soil is dug up to 1 cm below the level of visible contamination and disposed of as hazardous waste	Contractor	As required

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
17. Noise	Drip trays should be placed under all vehicles remaining stationary for more than 24 hours	Contractor	Continuous
	Limit construction activities to normal working hours	Contractor	Continuous
	Coincide any excessively noisy activities to minimise duration of inconvenience	Contractor	As required
	Ensure noise standards are complied with and that construction staff are provided with personal protective equipment when undertaking noisy operations	Contractor	Continuous
18. Safety	No children on construction site. Safety fence and controlled access should be enforced Safety signs with necessary information displayed	Proponent Contractor ECO	Continuous
19. Stockpiles	Soil stockpiles must not be situated within 50m of any water course.	Contractor, ECO	Monthly
	If stockpiles are exposed to windy conditions or heavy rain, they should be covered either by vegetation or cloth, depending on the duration of the project. Stockpiles may further be protected by the construction of berms or low brick walls around their bases.	Contractor, ECO	Monthly
	Stockpiles must be kept clear of weeds and alien vegetation growth by regular weeding.	Contractor, ECO	Monthly
	Where contamination of soil is expected, analysis must be done prior to disposal of excess soil to determine the appropriate disposal method. Proof from an applicable waste disposal site where contaminated soils are dumped if and when a spillage / leakage occur must be provided to the ECO upon request.	Contractor, ECO	Monthly
	Stockpiles must not exceed 2m in height unless otherwise permitted by the PM and / or ECO.	Contractor, ECO	Monthly
20. Erosion control	Wind screening and stormwater control must be undertaken where required by the ECO to prevent soil loss from the site.	Contractor, ECO	Twice monthly
	The use of silt fences and sand bags must be implemented in areas that are susceptible to erosion, if required by the ECO.	Contractor, ECO	Twice monthly
	Other erosion control measures that can be implemented are as follows: <ul style="list-style-type: none"> • Brush packing with cleared vegetation; • Mulch or chip packing; • Planting of vegetation; and • Hydro-seeding / hand sowing. 	Contractor, ECO	
	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
	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
21. Hazardous materials	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

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
	Contaminated wastewater must be managed by the Contractor to ensure existing water resources on the site are not contaminated. All wastewater from general activities in the camp must be collected and removed from the site for appropriate disposal at a licenced waste disposal facility or sewage works.	Contractor, ECO	Monthly
	All storage tanks containing hazardous materials must be placed in bunded containment areas with sealed surfaces. The bund wall must be high enough to contain 110% of the total volume of the stored hazardous material. Such bunded areas must be regularly emptied of accumulated rainwater. Wastewater from such emptying, if contaminated, must be disposed at an appropriately licenced waste disposal facility or sewage works.	Contractor, ECO	Monthly
	In the event of a spill, the Contractor must take prompt action to clear polluted areas and prevent spreading of the pollutants. The Contractor will be liable to arrange for professional service providers to clear affected areas, if required.	Contractor, ECO	As required
	Proper facilities for the storage of oils, paints, grease, fuels, chemicals and any hazardous materials to be used must be provided to prevent the migration of spillage into the ground and groundwater. These pollution prevention measures for storage must include a bunded containment area with a wall high enough to contain at least 110% of any stored volume. This containment area must be sited at least 50m away from any drainage line, in a site approved by the ECO.	Contractor, ECO	Monthly
	Cement storage and batching must only take place in a bunded area, and any runoff		
	Any spillage, which may occur, must be investigated and immediate action must be taken. This must be reported to the ECO and to the relevant authorities if so required by the ECO.	Contractor, ECO	As required
22. Cement and concrete batching	Concrete must not be mixed on the ground, but in a bunded area with any runoff captured for disposal as hazardous wastewater.	Contractor, ECO	Continuous
	The batching area is to be located in an area of low environmental sensitivity, as approved by the ECO.	Contractor, ECO	Once-off
	Cement bags must only be stored in a covered, bunded area and not directly on the ground. Used cement bags must be disposed of as hazardous waste.	Contractor, ECO	Weekly
23. Hydrology and stormwater	Silt fences must be used where required by the ECO to remove any suspended silt from stormwater before it enters the stormwater system.	Contractor, ECO	Monthly
	Temporary cut-off drains and berms must be used where necessary to capture stormwater and promote infiltration.	Contractor, ECO	Monthly
	Stormwater and surface water must be diverted away from excavation trenches, and care must be taken to avoid surface stormwater from the site running into the seasonal pan on the site.	Contractor, ECO	Monthly
	No rubble, litter or sand may be deposited into any freshwater systems or water courses.	Contractor, ECO	Monthly
24. General materials handling, use and storage	Choice of location for storage areas must take into account prevailing winds, distances to the seasonal watercourses (50m minimum), general onsite topography and water erosion potential of the soil. Impervious surfaces must be provided where necessary.	Contractor, ECO, Health and Safety Officer	Once-off
	Storage areas must be designated, demarcated and fenced. Storage areas must be secure so as to minimize the risk of crime. They must also be safe from access by unauthorised persons. Fire prevention facilities must be present at all storage facilities.	Contractor, ECO	Monthly

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
	Material Safety Data Sheets (MSDSs) must be readily available on site for all chemicals and hazardous substances to be used on site. Where possible, the available MSDSs should include information on ecological impacts and measures to minimise negative environmental impacts during accidental spills.	Contractor, ECO, Health and Safety Officer	Once-off, as required
	Clear signage must be placed at all storage areas containing hazardous substances / materials.	Contractor, ECO, Health and Safety Officer	Once-off
	The Contractor must be responsible for the training and education of all personnel on site who will be handling the hazardous material about its proper use, handling and disposal. The Contractor must ensure that information on the management of spill and accidental ingestion is kept on site. Staff dealing with these materials / substances must be aware of their potential impacts and follow the appropriate safety measures.	Contractor, Health and Safety Officer	Once-off
	The provisions of the Hazardous Chemical Substances Regulations promulgated in terms of the Occupational Health and Safety Act 85 of 1993 and the SABS Code of Practice must be adhered to. This applies to solvents and other chemicals possibly used in the construction time.	Contractor, Health and Safety Officer	Continuous
	The Contractor must ensure that its staff is made aware of the health risks associated with any hazardous substances used and has been provided with the appropriate protective clothing/equipment in case of spillages or accidents and have received the necessary training.	Contractor, Health and Safety Officer	Continuous
	All excess cement and concrete mixes must be contained on the construction site prior to disposal off site.	Contractor, ECO	Monthly
	Hazardous substances must be stored at least 50m away from any water bodies on site to avoid pollution.	Contractor, ECO	Monthly
25. Fuel storage	Topsoil and subsoil to be protected from contamination.	Contractor, ECO	Monthly
	Fuel and material storage must be away from stockpiles on site in appropriate containers in a bunded area.	Contractor, ECO	Twice monthly
	Chemicals must be mixed on an impermeable surface and provisions must be made to contain spillages or overflows into the soil.	Contractor, ECO	Monthly
	Any storage tanks containing hazardous materials must be placed in bunded containment areas with sealed surfaces. The bund walls must be high enough to contain 110% of the total volume of the stored hazardous material. Drip trays may be used for temporary storage of such materials.	Contractor, ECO	Monthly
	Contaminated soil must be contained and disposed of off-site at an approved hazardous waste disposal site.	Contractor, ECO	Monthly
26. Transportation	Material must be appropriately secured to ensure safe passage between destinations during transportation. Loads must have appropriate cover to prevent them spilling from the vehicle during transit. The Contractor must be responsible for any clean-up resulting from the failure by his employees or suppliers to properly secure transported materials.	Contractor, ECO, Health and Safety Officer	Monthly
27. General management	waste 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
	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

Activity/Impact			Action Required	Responsible Party	Monitoring Frequency
			The Contractor must supply waste bins/skips throughout the site at locations where construction personnel are working. The bins must be provided with lids and an external closing mechanism to prevent their contents blowing out and must be scavenger-proof to deter animals that may be attracted to the waste. The Contractor must ensure that all personnel immediately deposit all waste in the waste bins for removal by the Contractor. Bins must be emptied on a weekly basis and the waste removed to the construction camp where it must be properly contained in scavenger, water and windproof containers until disposed of. The bins must not be used for any purposes other than waste collection.	Contractor, ECO	Monthly
			Ensure that no litter, refuse, wastes, rubbish, rubble, debris and builders waste generated on the premises be placed, dumped or deposited on adjacent/surrounding properties during or after the construction period of the project.	Contractor, ECO	Monthly
			If possible and feasible, all waste generated on site must be separated into glass, plastic, paper, metal and wood and recycled.	Contractor, ECO	Monthly
28.	Hazardous waste management		The waste, resulting from the use of hazardous materials, must be disposed of at a registered hazardous waste disposal site by a certified waste disposal Contractor as approved by the ECO. A disposal certificate must be obtained from the disposal Contractor.	Contractor, ECO	As required
			Staff must be trained in the identification of hazardous waste.	Contractor, ECO	As required
			Temporary storage and disposal of hazardous waste is regulated by legislation which must be complied with, i.e. the Occupational Health and Safety Act.	Contractor, ECO	Monthly
29.	Noise		The Contractor must aim to adhere to the relevant noise regulations and limit noise to within standard working hours.	Contractor, ECO	Monthly
			Construction site camp and other noisy facilities must be located well away from noise sensitive neighbours.	Contractor, ECO	Once-off
			Truck traffic must be routed away from noise sensitive areas, where possible.	Contractor, ECO	As required
			All noise and sounds generated must adhere to SABS 0103 specifications for maximum allowable noise levels for residential areas. No pure tone sirens or hooters may be utilised except where required in terms of SABS standards or in emergencies.	Contractor, ECO	Monthly
			Noisy operations must be combined so that they occur where possible at the same time.	Contractor, ECO	Monthly
			Construction activities must be contained to reasonable working hours. Night-time activities near noise sensitive receptors must not be allowed.	Contractor, ECO	Monthly
			With regard to unavoidable noisy construction activities, the Contractor must liaise with local residents to inform them of such events.	Contractor	As required
			As construction workers operate in a noisy environment, it must be ensured that their working conditions comply with the requirements of the Occupational Health and Safety Act (Act No 85 of 1993). Where necessary, ear protection gear must be worn.	Contractor, ECO, Health and Safety Officer	Monthly
			Noise suppression measures must be applied to all construction equipment where required. Construction equipment must be kept in good working order and where appropriate fitted with silencers which are kept in good working order. Should the vehicles or equipment not be in good working order, the Contractor may be instructed to remove the offending vehicle or machinery from site.	Contractor, ECO, Health and Safety Officer	Monthly

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
30. Worker health and safety	Safety measures, work procedures and first aid must be implemented on site.	Contractor, , Health and Safety Officer	Monthly
	A Health and Safety Plan in terms of the Occupational Health and Safety Act (Act No. 85 of 1993) must be drawn up to ensure worker safety.	Contractor, Health and Safety Officer	Once-off
	Workers must be thoroughly trained in using potentially dangerous equipment.	Contractor, Health and Safety Officer	As required
	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
31. Personal Protective Equipment	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
	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
32. Fauna and Flora	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
	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 (***Thembelihle Local Municipality***) in association with the ***Department of Co-operative Governance, Human Settlements and Traditional Affairs of the Northern Cape (COGHSTA)*** is responsible for ensuring that all environmental management measures prescribed in this EMP and MMP, as well as any other conditions specified by the relevant authorities, are implemented and adhered to

during all phases of the proposed development. The Applicant may delegate the responsibilities for implementing the requirements to other persons/entities, however the Applicant remains responsible for ensuring that the delegated responsibilities are carried out.

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

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

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

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

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

FINES

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

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

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

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

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