

ENVIRONMENTAL MANAGEMENT PROGRAMME

1. INTRODUCTION

The purpose of this Environmental Management Programme (EMPr) is to ensure 'good environmental practice' by taking a holistic approach to the management of environmental impacts during the construction and operation of the proposed clearance of 380,8600 ha of indigenous vegetation in order to establish a township which will also include the establishment of a cemetery on Portion 1 and 2 of the farm Kalahari Gholf en Jag Landgoed No. 775 (to be known as Kathu Extension 6), Gamagara 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 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 has been designed to suit the particular activities and needs of the proposed clearance of 380,8600 ha of indigenous vegetation in order to establish a township which will also include the establishment of a cemetery on Portion 1 and 2 of the farm Kalahari Gholf en Jag Landgoed No. 775 (to be known as Kathu Extension 6), Gamagara 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 was appointed to determine whether the Geology and Soils of the site is suitable for the proposed development

- The Civil Engineer was appointed to determine the capability of existing infrastructure to be linked to proposed development and readily available bulk services.
- 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.
- A SAHRA Specialist has been appointed to determine the possible impact of the development on Archaeological and Cultural features.
- A Botanical specialist has been appointed to determine the impact of the proposed development on the Fauna and Flora of the area.
- A Wetland Specialist was appointed to determine the status of the Wetland.
- An Engineer was appointed to calculate the 1:100 year flood lines for the proposed development. According to section 144 of the National Water Act (ACT No. 36 of 1998), no person may establish a township unless the layout plan shows (in a form acceptable to the local authority concerned) lines indicating the maximum level likely to be reached by floodwaters on average once in every 100 years.
- An Environmental Screening Process was conducted by the EAP to ensure that all the relevant Environmental Legislation is taken into consideration.
- Registered Environmental Assessment Practitioner (EAP) (see Paragraph 2 for details of the EAP-firm).
- Surveyor, to map the contours of the site and to ensure the town planner's and architect's plans are implemented correctly

They were responsible for the following actions:

- The Civil Engineer designed the services in such a manner as to comply with the stipulations of the Red Book. He also devised ways and means to ensure that the project's drainage system takes the surface of the area into account.
- The 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 Geotechnical Engineer assessed the ground and soil conditions of the area in order to ensure that the intended development can be constructed. His recommendations on construction methods, where applicable, must be complied with.
- A 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 streams and the Fauna and Flora of the area.
- A Wetland Specialist was appointed to determine the status of the Wetland
- 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 Government Notice No. R 326 of 2017.

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

(n) any specific information that may be required by the competent authority.

3. DETAILS OF ENVIRONMENTAL ASSESSMENT PRACTITIONER

Environmental Assessment Practitioner (EAP): ¹	Prof. A.B. de Villiers from AB Enviro Consult CC		
Contact person:	Mr. JP de Villiers		
Postal address:	7 Louis Leipoldt Street; Potchefstroom		
Postal code:	2531	Cell:	083 548 8105
Telephone:	018 294 5005	Fax:	018 293 0671
E-mail:	jp@abenviro.co.za		

4. EXPERTISE OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

AB Enviro Consult (CC) is a registered consultancy, owned and operated as an independent unit by the registered owner and consultant: **Prof. A.B. de Villiers**

- **Mr J.P. De Villiers** joined the consultancy during 2004
- **Mrs J.E. du Plooy** is a consultant since 2001

PERSONAL PARTICULARS AND CAREER HISTORY OF PROF DE VILLIERS

ACADEMIC AND PROFESSIONAL QUALIFICATIONS

Post-Matric Qualifications

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

PROFESSIONAL QUALIFICATIONS AND REGISTRATIONS

YEAR	Qualification/ Registration	Institution	Field of Study
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1986	Professional Natural Scientist	S.A. Council for Natural Scientists	Environmental Science
1994	Quality Auditor	ESKOM	Auditing
1998	Personnel & Verifying Auditor	SAATCA	Environmental Auditing
2006	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 Sensing and 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 Transmission	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)

4.1. 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.

4.2 INVOLVEMENT IN COURSES AND WORKSHOPS

4.2.1 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.

4.2.2 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).

4.3 ENVIRONMENTAL PROJECTS

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

4.3.1 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.

4.3.2 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.

4.3.3 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.

4.3.4 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.

4.3.5 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.

4.4 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

YEAR	Qualification/ Registration	Institution	Field of Study
2008	Basic Principles of Ecological Rehabilitation and Mine Closure	Centre for Environmental Management (North West University)	Ecological Rehabilitation

ACADEMIC AND PROFESSIONAL QUALIFICATIONS MRS J.E. DU PLOOY

YEAR	Qualification	Institution	Field of Study
1999	BA	PU FOR CHE	Geography, Tourism
2000	BA (Honns) Cum Laude	PU FOR CHE	Geography
2002	Masters degree in Environmental Management	PU FOR CHE	Environmental Management
2001	Aquabase Intro	AQUABASE	Hydrology
2001	Geomedia Professional	INTERTECH	GIS
2001	Map Info	SPATIAL TECHNOLOGY	GIS

EXPERIENCE OF THE CONSULTANCY

Over a period of 22 years (1996-2018) this consultancy has successfully applied for, and obtained positive ROD's and EA's for more than 350 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.

5. DESCRIPTION OF THE ACTIVITY

Gamagara Local Municipality has appointed **AB Enviro Consult CC**, an independent environmental consultancy, to undertake an Integrated Environmental Impact Assessment for the proposed clearance of 380,8600 ha of indigenous vegetation in order to establish a township which will also include the establishment of a cemetery on Portion 1 and 2 of the farm Kalahari Gholf en Jag Landgoed No. 775 (to be known as Kathu Extension 6), Gamagara Local Municipality, Northern Cape Province.

Preliminary indications are that the township will consist of a mixed use, including: See Figure 2 for a copy of the proposed Layout Plan.

- Residential (350m² minimum): 3886 erven
- Residential (600m² minimum): 787 erven

- Residential (800m² minimum): 391 erven
- Residential Building (flats): 5 erven
- Business: 30 erven
- Church: 11 erven
- Primary School: 3 erven
- Secondary School: 1 erf
- Crèche: 7 erven
- Cemetery: 1 erf
- Public Open Space: 21 erven
- Sub-station: 2 erven
- Recreational (Sports field): 2 erven
- Taxi rank: 1 erf
- **TOTAL: 5148 erven**

The activity is listed in terms of the Regulations (in force since 4 December 2014) in terms of Section 24(M) and 44 made under section 24(5) of the National Environmental Management Act (NEMA) 1998 (Act 107 of 1998) as amended and published in Government Notice No. R 326 of 2017. The proposed development triggers the following regulations and listed activities:

Number and date of the relevant notice:	Activity No (s) (in terms of the relevant notice) :	Listed activity as per project description²:
GN.R. 327, 7 April 2017	23	The development of a cemetery of 5 323 square metres in size.
GN.R. 325, 7 April 2017	15	The clearance of 380,8600 hectares of indigenous vegetation, in order to establish a township on Portion 1 and 2 of the farm Kalahari Gholf en Jag Landgoed No. 775 (to be known as Kathu Extension 6), Gamagara Local Municipality, Northern Cape Province.

5.1 BULK SERVICES (CIVIL ENGINEERING SERVICES)

WATER

Source

The main sources of water for Kathu are:

- Vaal Gamagara Pipeline (Sedibeng Water)
- Dewatering from mining activities (Kumba Iron Ore)
- Municipal boreholes

The study area will be part of Kathu West. In accordance with the Kathu Water Management Plan of 2012 the main water source for Kathu West to be the Vaal Gamagara pipeline.

Potable water from Vaal Gamagara Water Pipeline

The Vaal Gamagara Pipeline is in process of upgrading. The current allocation of the Vaal Gamagara Scheme to Kathu is 500 000 m³/annum (equivalent to 57m³/h or 15,8ℓ/s). The current projected allocation for Kathu (post upgrading of scheme) in accordance with the *Royal Haskoning/Sedibeng Water regional water scheme design report dated 18 January 2016* is 239 ℓ/s (7 537 104 m³/annum).

The design peak flow for the study area is 1.5 x AADD (same as summer peak) which is 5 910 774 ℓ/day or 68.4ℓ/s. It is therefore evident that sufficient potable water supply to the study area is only feasible once the Vaal Gamagara Water Scheme has been upgraded and the desired performance achieved.

However, with the rest of Kathu, especially the East also heavily dependent on the Vaal Gamagara Pipeline, augmentation of water supply to the West should also be considered. This will also reduce the cost of water for the Municipality as potable water from Sedibeng is currently the most expensive available water resource for Gamagara Municipality.

Mine Dewatering and Municipal Borehole fields

Additional options for augmentation of water supply to the study area is mine dewatering and municipal boreholes. Raw water from Sishen Mine is transferred via a 250 mm steel pipe to the Municipal Softener Plant (water treatment works). Raw water is stored in a 1.7ML concrete reservoir before it is passed through a softener (treatment) plant with the capacity of 174 m³/hr or 4.2 ML/day (based on 24 operational hours). Potable water from the plant is stored in a downstream concrete reservoir with a capacity of 3.4ML from which distribution to various supply points manifests. One of the points is the Sesheng 2ML reservoir which is fed by a 100mm diameter steel pipeline from the Softener Plant. Water from the Khai Appel borehole fields also supply the Sesheng 2ML reservoir via a 160mm diameter pipe line. A direct feed from the Sesheng elevated tower to the proposed Kathu West reservoir complex can therefore be done.

Water Treatment

The Vaal Gamagara Water Scheme distributes potable water to Kathu. The main source for the study area therefore does not need any treatment. However, because of the costs of the Gamagara Municipality insisted in augmenting the study area with supply from their other sources namely Mine Dewatering and Municipal boreholes.

The municipal boreholes in the vicinity of the study area currently supply to the Sesheng 2ML reservoir. More boreholes are also envisaged to be explored in the vicinity of the study area.

Mine dewatering passes via the water treatment works (softener plant) for treatment and reaches the Sesheng 2ML reservoir. If the Sesheng reservoir complex and the proposed reservoir complex of the study area to be linked the Municipality's objective to augment from own sources in all Sedibeng/Vaal Gamagara supply areas can be realised. This will trigger other secondary upgrades such as the water treatment works, Sesheng reservoir complex and the related link lines.

Storage and Distribution

In accordance with the water demand calculations the study area will need at least a 13.7ML (48- hour storage capacity) low level reservoir. It also needs a 2ML (2-hour peak storage capacity) elevated reservoir to cater for peak demand. A pump station with back-up power generator to lift water from the low-level reservoir to the elevated reservoir at a rate of 282 l/s completes the system.

Conclusion:

A water demand at peak flow of 70ℓ/s is anticipated. The current Kathu water sources and bulk infrastructure cannot accommodate the demand. The recommended bulk water infrastructure requirements to enable development feasibility are therefore:

- 355mm Ø additional connection to the Vaal Gamagara pipe line to provide at least 70 ℓ/s
- A low-level reservoir with a 13.7 ML storage capacity
- A high-level reservoir with a 2 ML storage capacity
- A booster pump station @ 282 ℓ/s with back-up generator

The formal bulk allocation supply to Kathu from Vaal Gamagara is only 15.8ℓ/s. The bulk pipe line is in process of a major upgrade. An increase in bulk water allocation quota of 239 ℓ/s to Kathu is envisage. Once these upgrades are completed and the desired system performance achieved the study area can be supplied according to its' demand. Augmentation from mine dewatering and municipal borehole water can also be possible in future.

SANITATION

The existing Kathu bulk sewer infrastructure cannot accommodate the calculated/estimated sewer inflows from the study area. The study area will therefore need a dedicated reticulation with main outfall sewer lines and a pump station plus rising main (pump line) to the Waste water treatment works. The existing waste water treatment works is also operating at full capacity which means a significant upgrade should also be needed.

Main Outfall Pipelines

It is envisaged that the entire internal sewer network will require main collectors ranging from 200mm Ø to 355mm Ø to handle the PWWF of 6 308 197ℓ/d or 73.01ℓ/s. With relatively flat terrain sloping to the north west it is expected that all outfall sewer lines to confluence at this lowest point.

The following outfall sewer pipe sizes and lengths have been identified for the Study Area:

1. 200mm Ø PVC-U 400KPa = 825m
2. 250mm Ø PVC-U 400KPa = 3837m
3. 355mm Ø PVC-U 400KPa = 905m

Pump Station and Rising Main

In accordance with the analysis and calculations it can be deduced that a new pump station and rising main with a capacity to accommodate a pumping flow rate of 91.26ℓ/s will be required to transfer sewer from this lowest point of the study area to the WWTW.

The following infrastructure been identified for the Study Area:

1. Dry well pump station capable of a delivery rate at least 91.26 ℓ/s
2. 355mm Ø PVC-U class 12 = 7 540m

Waste Water Treatment Works

In 2014 the Kathu WWTW's capacity was increased to 6.8 Mℓ/d. The study area of 5 148 stands (extension 6 to 10) was not part of the consideration during the planned upgrade of 2014. It is expected that the study area will have an addition loading of 4.38 Mℓ/d on the waste water treatment works. As the works have no spare capacity currently an additional upgrade similar in magnitude to the 6.8Mℓ/d module done in 2014 is required.

During the 2014 upgrades, the old pasveer ditch module was decommissioned via a mothballing method. The decommissioned pasveer ditches is equivalent to 4.4Mℓ/d which can be utilised as a temporary measure whilst the new upgrades are being initiated. The capacity of the old system is just about adequate to accommodate the services demand of the study area. Please note, further investigation should be undertaken to determine what the cost implications will be to recommission pasveer ditch modules and to review whether the old technology is still able to achieve the appropriate standard of effluent in accordance with the Water Use License of the Works

Conclusion

An estimated sewage peak flow of 73.01 ℓ/s will be generated by the fully developed study area. The current bulk sewer infrastructure cannot cater for this impact. The recommended bulk sewer infrastructure requirements to enable development feasibility are therefore:

- 200mm Ø PVC-U 400KPa outfall sewer line
- 250mm Ø PVC-U 400KPa outfall sewer line
- 355mm Ø PVC-U 400KPa outfall sewer line
- Pump station at 91.26 ℓ/s
- 355mm Ø PVC-U class 12 pump line

- 4.4ML/day Waste Water Treatment Works

It is recommended that a separate investigation should be undertaken to determine the costs of recommissioning the mothballed section of treatment works to ensure the accommodation of 4.38ML/d requirement of the development. This should be considered a temporary mitigation to ensure there is sufficient capacity at the WWTW.

STORMWATER

Surface Drainage

All minor stormwater will be accommodated on the surfaced streets and bus and taxi routes. Unsurfaced streets will make use of concrete side drains drifts. Underground systems such as culverts and storm water pipes will be used to convey storm water underneath roads at crossing or to convey water to retention ponds.

Retention Ponds

The natural contours of the study area fall from a south-eastern to a north-western direction. A natural retention ponds is situated near Khai Appel in the north west. Storm water will drain naturally in the direction of the pond at Khai Appel. Formal storm water infrastructure will also be provided to facilitate storm water drainage to the Khai appel retention pond or the perennial Vlermuislaagte River.

6. DESCRIPTION OF THE PROPERTY

The property is located on Portion 1 and 2 of the farm Kalahari Gholf en Jag Landgoed No. 775 (to be known as Kathu Extension 6), Gamagara Local Municipality, Northern Cape Province. The proposed development comprises a total area of 380,8600hectares.

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

C	O	4	1	0	0	0	0	0	0	0	0	0	7	7	5	0	0	0	0	1
C	O	4	1	0	0	0	0	0	0	0	0	0	7	7	5	0	0	0	0	2

Landowner:

Contact person:

Postal address:

Postal code:

Telephone:

E-mail:

Gamagara Local Municipality		
Mr Kgomodikae Leserwane		
PO Box 1001, Kathu,		
8446	Cell:	N/A
053 723 6000	Fax:	053 723 2021
protea@gamagara.co.za		

In instances where there is more than one landowner, please attach a list of landowners with their contact details to this application.

Local authority in whose jurisdiction the proposed activity will fall:

Gamagara Local Municipality

Municipal Ward No:	7		
Nearest town or districts:	Kathu		
Contact person:	Mr Kgomodikae Leserwane		
Postal address:	PO Box 1001, Kathu,		
Postal code:	8446	Cell:	N/A
Telephone:	053 723 6000	Fax:	053 723 2021
E-mail:	protea@gamagara.co.za		

Site Co-ordinates	Latitude (S):			Longitude (E):		
	Coordinates of corner points of study area	27°	41'	34.53"	23°	2'
	27°	40'	51.78"	23°	2'	35.11"
	27°	39'	53.31"	23°	0'	46.92"
	27°	40'	22.94"	23°	0'	43.18"
	27°	40'	35.59"	23°	0'	50.86"
	27°	40'	38.75"	23°	1'	0.50"

The proposed township area detailed above is located within the jurisdiction of the Gamagara Local Municipality that in turn falls within the jurisdiction of the John Taolo Gaetsewe District Municipality.

See Figure 1 for a Locality Map and Sensitivity Map and Figure 2 for a copy of the proposed Layout Plan.

An old dry streambed runs roughly from east to west through the area, while a section of the old (tarred) Sishen-Kuruman road from north to south on the eastern side of the area. The old (now dysfunctional) Khai Appel Recreational Resort/Caravan Park is located on its western boundary, while new residential (township) developments are found on its eastern boundary. A number of old dry pans are located in the area, as well as recent quarries for various materials in some areas. Please see Figure 3 below. A small section close its eastern boundary has also been recently cleared of trees. The area is however not heavily disturbed by past agricultural activities and rural/urban developments. The Sishen Iron Mine is located a few kilometers to the south of the area.

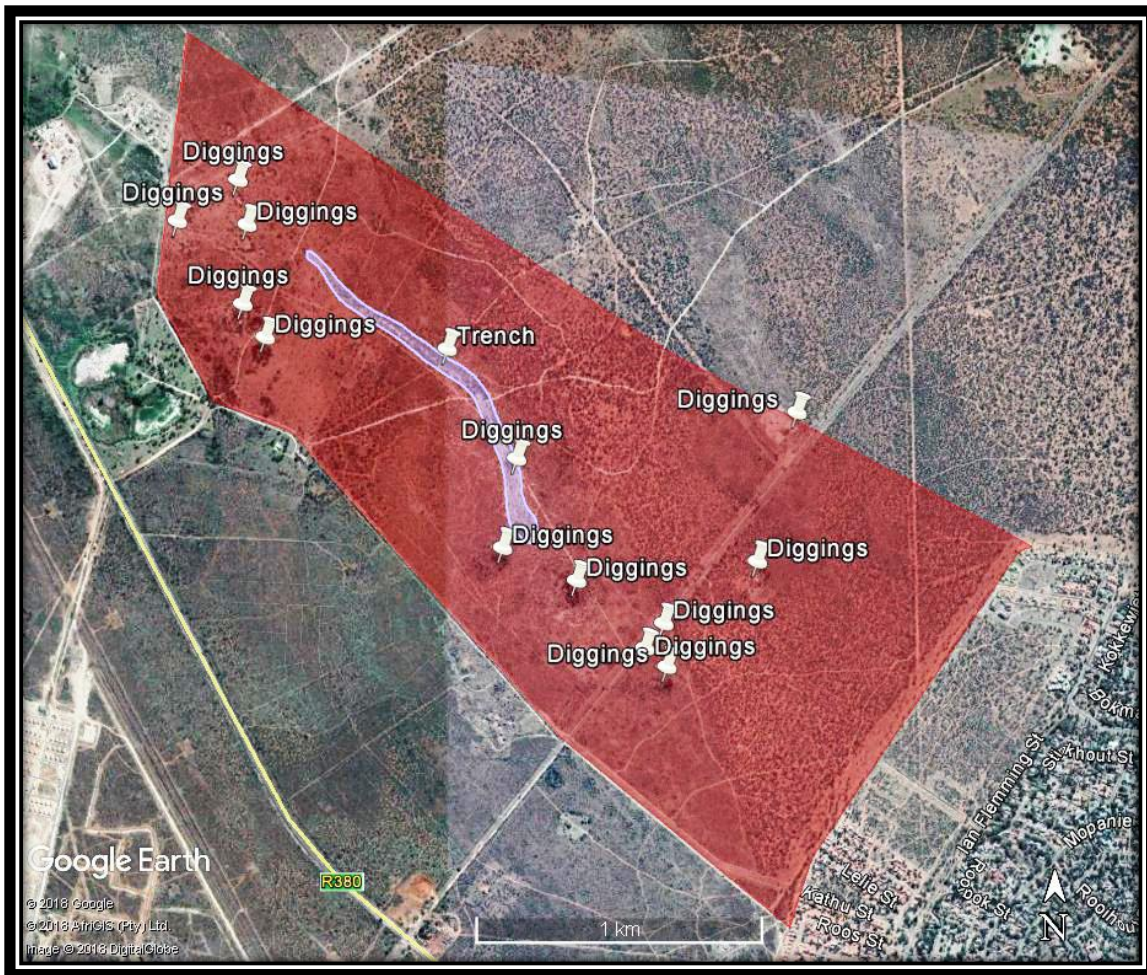
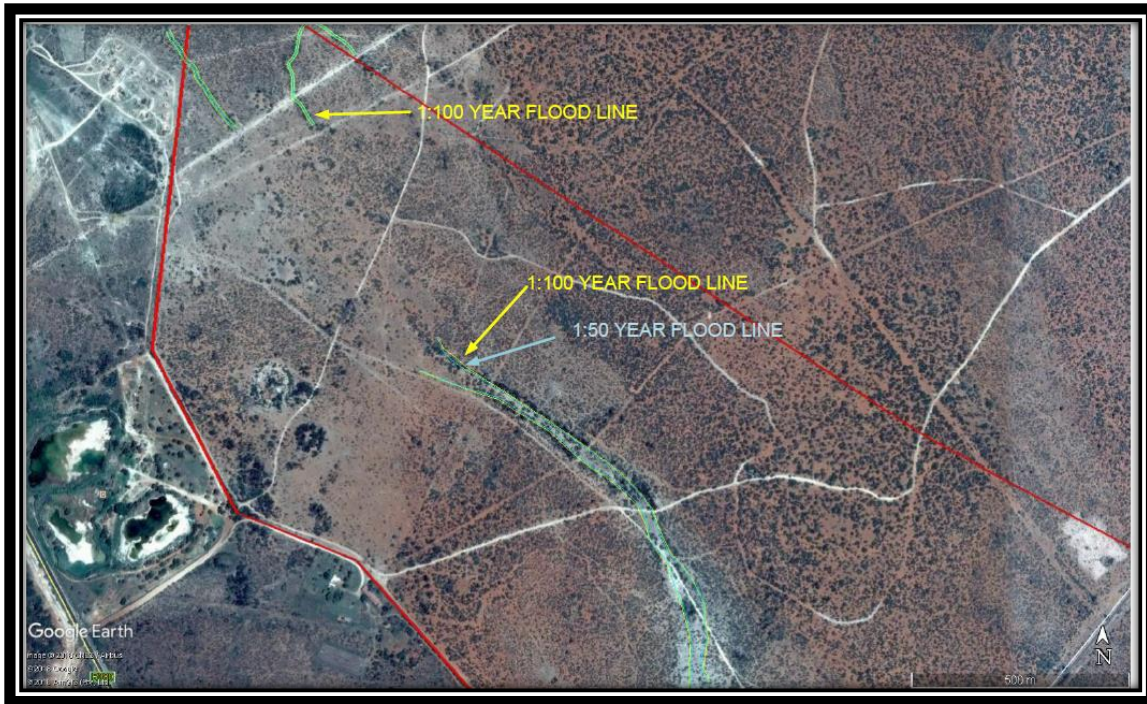


Figure 1 Map of the site with indication of diggings and trench at the site.

A botanical / wetland Specialist has been appointed to assess the old dry streambed that runs from east to west through the area. He concluded that “A trench is also present, probably owing to diggings of the past, though the origin of this trench is not clear”. He further stated that “Wetlands appear to be absent. Historical diggings are present at various places at the site. Water could gather at these diggings. Local dipping of landscape at these diggings may result in some water gathering after rainfall. As a pre-caution the trench and some of the diggings at the site could be part of a stepping-stone conservation corridor in the larger area. If the development is approved as many as practical *Vachellia erioloba* (Camel Thorn) should be conserved to serve as an urban conservation corridor for the Camel Thorn Forest and its buffer zone to the east of the site.”

An Engineer was appointed to determine the possible 1:100 year flood lines for the area. He identified the following areas that may be subject to flooding (Please see Figure 2 Below). These areas were incorporated into the Layout Plan.



Vegetation at much of the site is characterised by shrub-height *Senegalia mellifera* (Black Thorn) savanna. Other indigenous small trees at the site include *Tarchonanthus camphoratus* (Vaalbos) and *Grewia flava* (Velvet Raisin). Few medium-sized *Vachellia erioloba* trees (Camel Thorn) are sparsely distributed in parts visibly dominated by *Senegalia mellifera* at central and western parts of the site. *Vachellia erioloba* (Camel Thorn) increases noticeably in the southeastern, eastern and northeastern parts of the site. A concentration of fairly large *Vachellia erioloba* trees is found in the central-eastern part of the site. Only a few individuals of *Boscia albitrunca* (Shepherd's Tree) are found at the site. Indigenous grass species include *Eragrostis lehmanniana* (Lehman's Love Grass), *Aristida congesta* (Tassel Three-awn) and *Enneapogon cenchroides*. Low shrubs (Karoo bushes) in particular *Pentzia calcarea* are conspicuous at the site.

Some areas at the site appear disturbed and has visible low cover of grasses and herbs. Exotic weed species are found at modified and degraded areas. These invasive weeds include *Argemone ochroleuca* (White-flowered Mexican Poppy), *Schkuhria pinnata* (Dwarf Marigold), *Chenopodium album* (White Goosefoot), *Tagetes minuta* (Khaki Weed), *Bidens pilosa* (Common Blackjack), *Bidens bipinnata* (Spanish Black Jack), *Datura ferox* (Large Thorn-apple), *Datura stramonium* (Common Thorn-apple), *Salsola kali* (Russian Tumbleweed) and *Verbesina encelioides* (Wild Sunflower).

Vachellia karroo (Sweet Thorn) trees is conspicuous at diggings.

There is little scope for the site to be a corridor of particular conservation importance. If the development is approved cultivation of indigenous plant species will be an asset for urban conservation corridors.



Photo 1 A view of the old Sishen-Kuruman Road that runs through a part of the area.



Photo 2 Part of site where bush-encroachment by shrub-height *Senegalia mellifera* (Black Thorn) is conspicuous.



Photo 3 Disturbed open vegetation at part of the site.



Photo 4 Open, disturbed vegetation at the site.



Photo 5 Vegetation near the southern boundary of the site. *Vachellia erioloba* (Camel Thorn) individuals of 5-10 m are scattered throughout this area.



Photo 6 A conspicuous concentration of *Vachellia erioloba* (Camel Thorn) individuals is found at the central eastern part of the site. These *Vachellia erioloba* trees are in the >5-10 m height class but many are over 7.5 m.



Photo 7 Shallow non-perennial streambed and noticeable concentration of *Vachellia karroo* (Sweet Thorn).

Figure 3: LOCALITY MAP

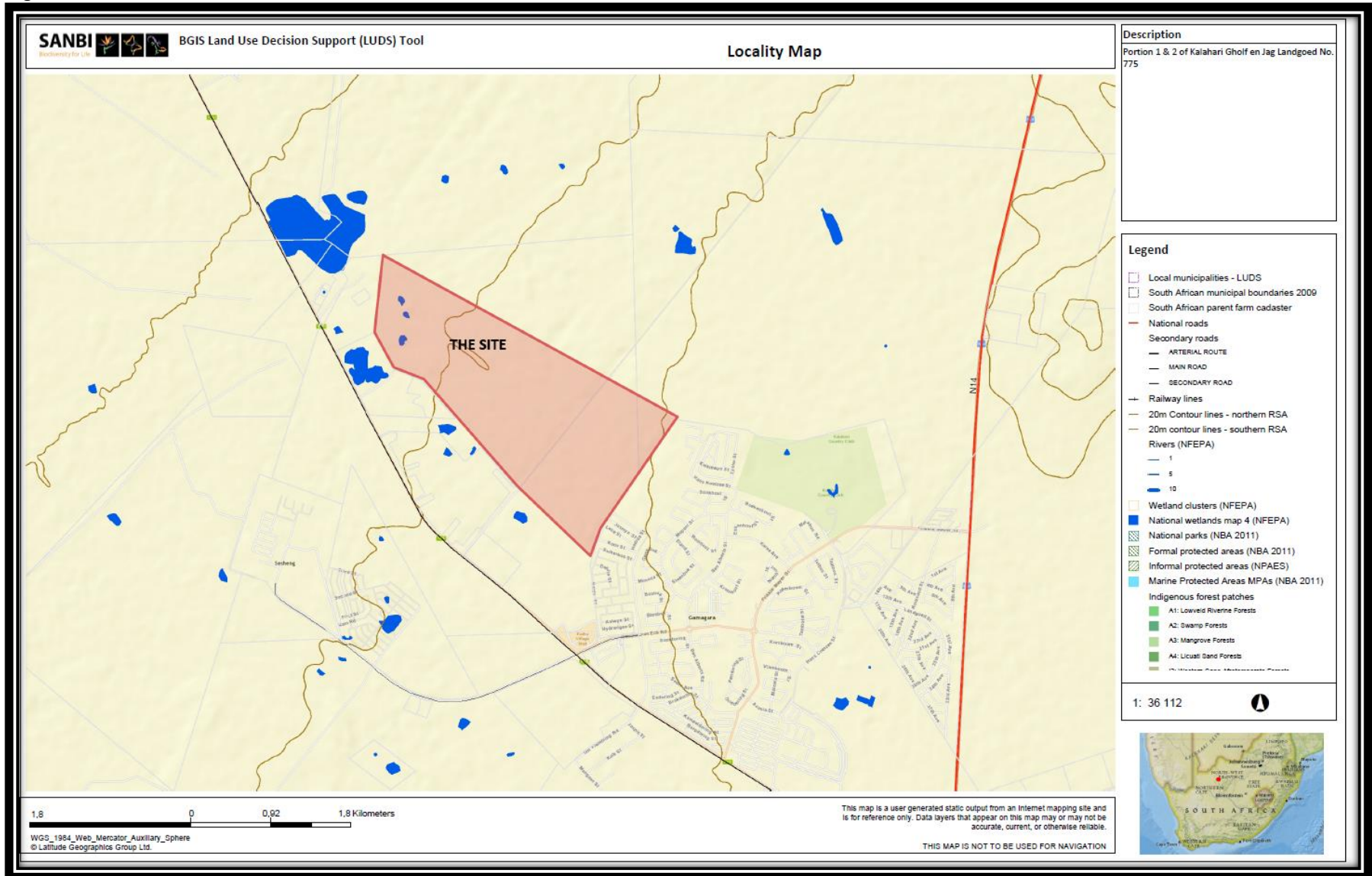


Figure 4: SENSITIVITY MAP

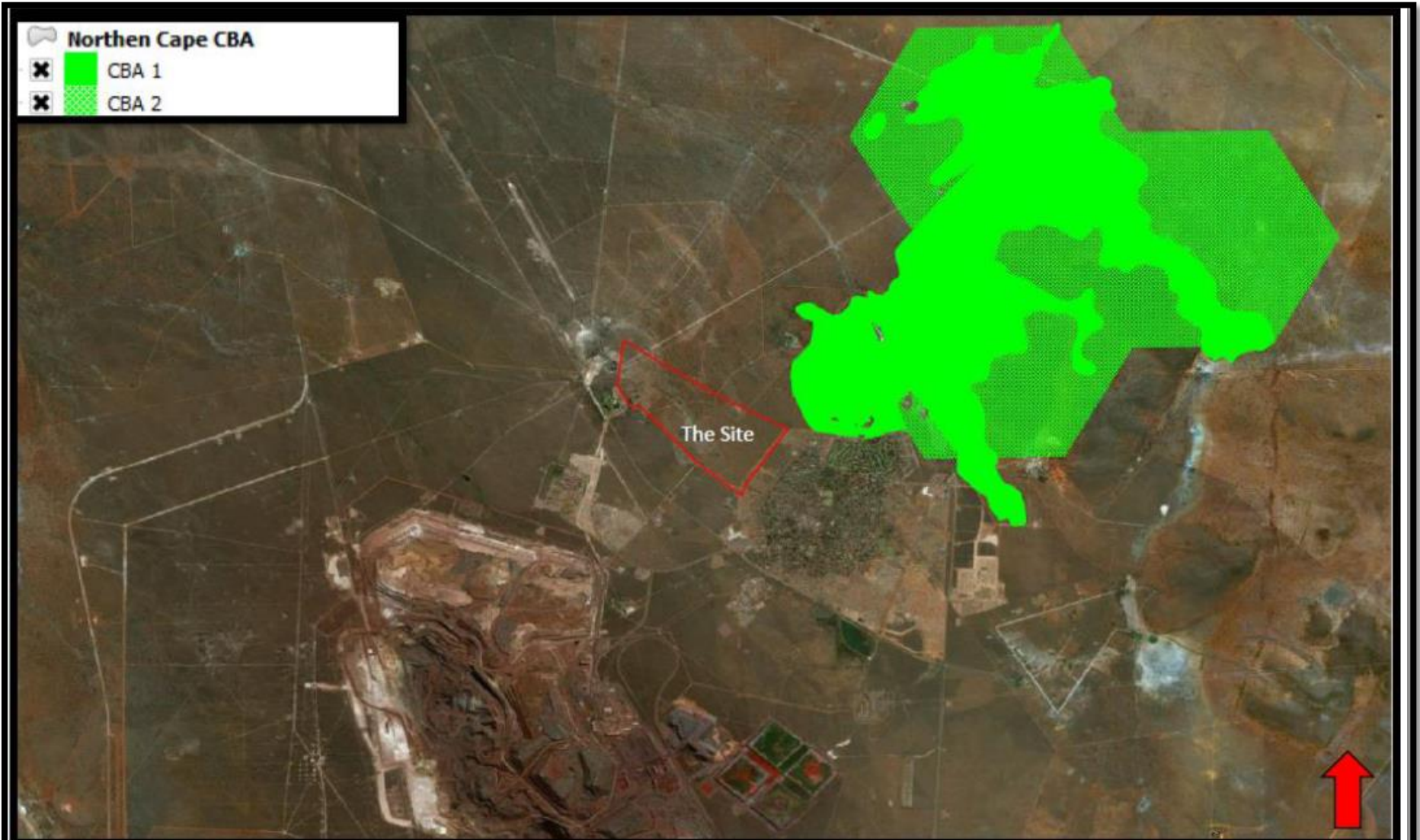


FIGURE 2: SENSITIVITY MAP: PORTION 1 & 2 OF KALAHARI GHOLF EN JAG LANDGOED NO 775

Figure 5: LAYOUT PLAN:



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

7.1 BIO-PHYSICAL ASPECTS

7.1.1 GEOLOGY

The majority of the site is underlain by tholeitic and calc-alkaline basaltic and andesitic lava, tuff and pyroclastic breccia of the Allanridge Formation (Va), Ventersdorp Supergroup, but is covered by recent alluvium (m) in the form of Aeolian red sand (Qw) and calcrete (T-Qc). It is indicated on the geology map as T-Qk/Va.

The site is covered by recent Aeolian red sand with calcrete covering the lava.

No dolomite occurs in the area and no stability investigation is required

If the proposed mitigation measures as described in the Geotechnical report are adhered to, it will ensure a sustainable development as far as this variable is concerned.

7.1.2 TOPOGRAPHY

The site is located on a shallow northwestern slope of 1098 to 1120 MASL, the lowest point towards the perennial Vlermuislaagte River. A detailed site survey has been carried out to establish levels. Historical diggings are present at various places at the site. The Engineering report and the Layout plan will address issues regarding storm water.

7.1.3 CLIMATE

The site is situated within the Northern Cape Province which lies within the summer rainfall region of South Africa. Statistics obtained from the closest Class 1 weather station are that of Kuruman (station number - 0393/778A5). The temperature statistics is for the period 1945 – 1984, while the rainfall records is for the period 1932 - 1984. These statistics gives a good indication of the climatic conditions that may be expected at Kathu.

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

7.1.3.1 RAINFALL

The average yearly precipitation for Kuruman is 455 mm/year. The absolute yearly maximum received was 964 mm during 1974, while the year with the lowest rainfall was 1965 when only 172mm was received. The maximum 24 hr precipitation received was 127 mm on 15 April 1955. The rainy season reaches its maximum during January through to March (with averages in excess of 80 mm). Thunder occur on average 33,8 days per year.

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

7.1.3.2 TEMPERATURE

Summers are hot. A maximum of 40°C was recorded on the 9th of January 1940, while the winters are mild during the day. Frost regularly occur during the night (minimum temperatures of below 0°C have already been recorded during the months April through to September). A minimum of -10 °C was recorded on the 12th of June 1979. In general the daily average maximum (for the year) is 25,9°C, while the average daily minimum for the year is 9,6°C.

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

The project itself cannot influence this variable and is considered “not applicable.”

7.1.3.3 WIND

Winds are highly variable but tend to be northerly with a westerly component becoming dominant in the late winter to early spring, and a easterly component during the summer months.

7.1.4 SOIL

The majority of the site is underlain by tholeitic and calc-alkaline basaltic and andesitic lava, tuff and pyroclastic breccia of the Allanridge Formation (Ra), Ventersdorp Supergroup, but is covered by recent alluvium (m) in the form of Aeolian red sand (Qw) and calcrete (T-Qc). Severe problems are foreseen regarding the excavatability to 1,5m depth almost across the site.

Zoning of the site revealed zones with constraints ie: **highly collapse potential** of the soil, underlain by **calcrete gravel and boulders**. It was zoned as follows:

Engineering Geological Zonation

Special Development with Risk:

Site Class CR to C1R/1A2F: This zone is characterized by very loose collapsible aeolian sand (C to C1) exhibiting an open texture, with thickness less than 0,75m, with less than 10mm movement measured at surface. The risk of hard pan calcrete, calcrete gravel and shallow rock and scattered rock calcrete boulders or rock outcrop (R) will restrict the placing of services. Pneumatic tools, a competent TLB or excavator or

even blasting will be required during the placing of services. Foundations will require special foundation techniques with proper compaction and site specific drainage. It is classified as CR to C1R according the NHBRC guidelines (1995) & SAICE Code of practice (1995) and 1A2F according to the classification for urban development (Partridge, Wood & Brink).

Development with expected problems or increased cost

Site Class PQ: Quarried areas or borrow pits must be rehabilitated including backfilling with a controlled fill to engineer's specification before any development can take place.

Undevelopable:

Site Class PD: Perennial drainage features where the 1:100 year flood line will determine or specify the allowable distance of development from rivers, usually 32m from the center of the river.

Special construction techniques will be required to enable proper development. This includes the use of **special compaction** techniques of strip footings with slab on the ground foundations **or soil or steel reinforced rafts** with **site drainage provision** as described.

7.1.5 SURFACE DRAINAGE

The site is located on a shallow slope towards the northwest. Plate flow is the dominant drainage pattern on site, and a drainage channel intersects the site. Larger areas within the higher lying catchment area can lead to flash floods during heavy rainfalls. Drainage occurs in a northwesterly direction towards the Vlermuislaagte River, but any drainage feature dissipates into the sandy colluvium or pebble marker on site.

A Botanical / wetland Specialist has been appointed to assess the old dry streambed that runs from east to west through the area. He concluded that *"A trench is also present, probably owing to diggings of the past, though the origin of this trench is not clear"*. He further stated that *"Wetlands appear to be absent. Historical diggings are present at various places at the site. Water could gather at these diggings. Local dipping of landscape at these diggings may result in some water gathering after rainfall. As a pre-caution the trench and some of the diggings at the site could be part of a stepping-stone conservation corridor in the larger area. If the development is approved as many as practical Vachellia erioloba (Camel Thorn) should be conserved to serve as an urban conservation corridor for the Camel Thorn Forest and its buffer zone to the east of the site."*

An Engineer was appointed to determine the possible 1:100 flood lines for the area. He identified the following areas that may be subject to flooding (Please see Figure 4 Below). These areas were incorporated into the Layout Plan.

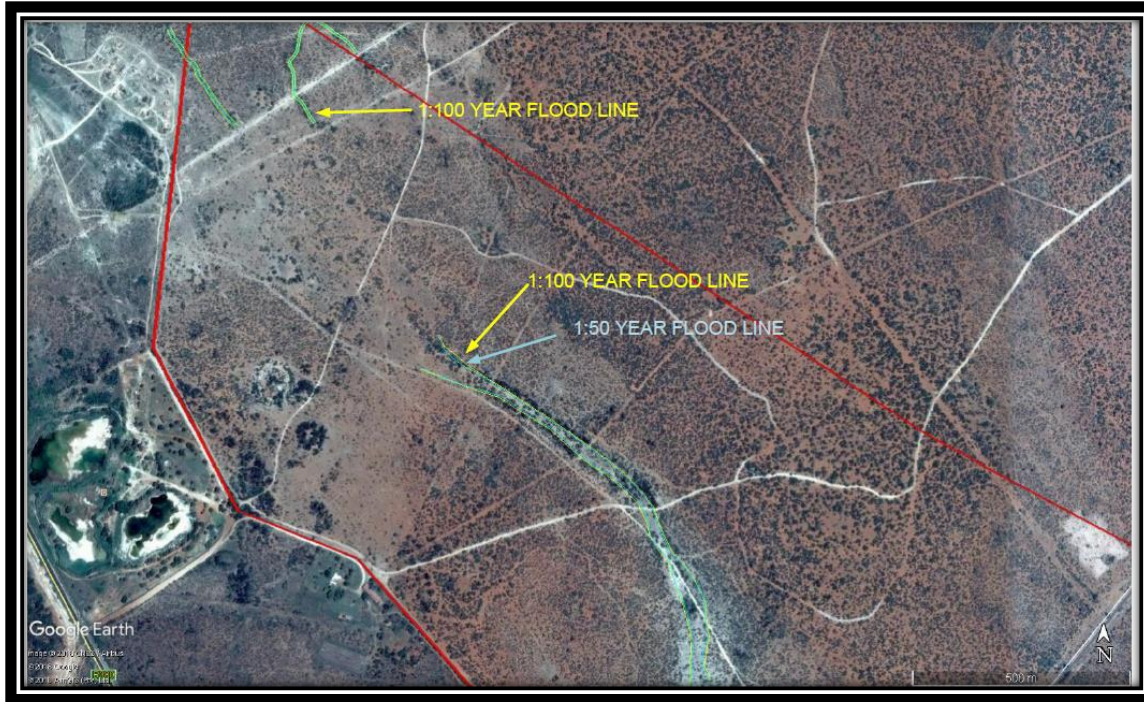


Figure 6: 1:100 year flood lines

Erosion by sheet flow may occur in disturbed areas. Storm water drainage will have to be considered during the planning phase of the development and will have to be incorporated into the final layout plan. 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

7.1.6 GROUND WATER

No seepage or the presence of perennial fluctuations of ground water was encountered on site, but a seasonal perched water table may exist on the calcrete. A calcrete profile indicates that some perennial water level fluctuations occur.

Ground water in the form of seepage was not intersected in any test pit during the investigation, but normal water tightening techniques such as damp course on foundation levels are required. The expected high permeability of the silty sand may lead to leachate from sanitation systems to reach the ground water, and a closed water borne sewage system is recommended.

Possible infiltration into the groundwater must be taken into account. During the construction phase, no spills of lubricants or construction worker sewage should be allowed to pollute the ground water. During the operational phase, sewage systems must also not pollute groundwater. These aspects have been addressed in the EMP.

7.1.8 FAUNA

Mammals

Literature sources that were used are Friedman & Daly (2004), Skinner & Chimimba (2005) and Wilson & Reeder (2005). 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. 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.

No bird's nests of particular conservation concern such as nests of large raptors or nests of sociable weavers, have been found at the site

Reptiles

The Southern African Reptile Conservation Assessment (SARCA) was launched in May 2005 (Branch, Tolley, Cunningham, Bauer, Alexander, Harrison, Turner & Bates, 2006). Its primary aim is to produce a conservation assessment for reptiles of South Africa, Lesotho and Swaziland within a four year period, ending 2009 (Branch *et al.*, 2006). Therefore a full up-dated conservation assessment of reptiles, taking into account the recent IUCN (2001) criteria, will only be available in the near future. While the conservation statuses of reptile species are under revision Alexander & Marais (2007) as well as Tolley & Burger (2007) give useful indications of possible red listings in the near future. There appears to be no threat to any reptile species of particular high conservation importance if the site is developed.

Amphibians

According to Minter, Burger, Harrison, Braack, Bishop and Kloepfer (2004) as well as Du Preez & Carruthers (2009), *Pyxicephalus adspersus* (Giant Bullfrog) is listed as near threatened (Minter *et al.*, 2004; Du Preez & Carruthers, 2009). Though currently this species is listed as Least Concern (IUCN) it remains as species which is considered as of special conservation priority. 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.

Butterflies

Studies about the vegetation and habitat of threatened butterfly species in South Africa showed that ecosystems with a unique combination of features are selected by these often localised threatened butterfly species (Deutschländer and Bredenkamp 1999; Edge 2002, 2005; Terblanche, Morgenthal & Cilliers 2003;

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

Four species of butterfly in Gauteng Province, 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 (Table 4.22 and Table 4.23) follows.

Assessment of threatened butterfly species

***Aloeides dentatis dentatis* (Roodepoort Copper)**

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

***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. This butterfly species may however be found at the core of the Kathu Forest outside the site at low water table situations.

***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 *Chrysothrix aureus* (Golden Opal/ Heidelberg Copper) has very specific habitat requirements, which include rocky ridges with a steep slope and a southern aspect (Terblanche, Morgenthal & Cilliers 2003). Owing to a lack of habitat requirements and ideal habitat the presence of the taxon is highly unlikely.

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

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

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

The proposed global red status for *Orachrysops mijburghi* according to the most recent IUCN criteria and categories is Endangered (Mecenero *et al.*, 2013). *Orachrysops mijburghi* favours grassland depressions where specific *Indigofera* plant species occur (Terblanche & Edge 2007). The Heilbron population of *Orachrysops mijburghi* 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 mijburghi* on the site and it is unlikely that *Orachrysops mijburghi* 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 atlasing project the *Conservation Assessment of Butterflies of South Africa, Lesotho and Swaziland: Red List and Atlas* (Mecenero *et al.*, 2013) it was found that more *Metisella meninx* populations are present than thought before. Based on this valid new information, the conservation status of *Metisella meninx* is now regarded as 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.

7.1.9 FLORA

Terrestrial vegetation at much of the site is characterised by shrub-height *Senegalia mellifera* (Black Thorn) savanna on flat terrain (gentle slopes). Other indigenous small trees at the site include *Tarchonanthus camphoratus* (Vaalbos) and *Grewia flava* (Velvet Raisin). Few medium-sized *Vachellia erioloba* trees (Camel Thorn) are sparsely distributed in parts where *Senegalia mellifera* is visibly abundant such as at central and western parts of the site. *Vachellia erioloba* (Camel Thorn) increases noticeably in the southeastern, eastern and northeastern parts of the site. A concentration of fairly large *Vachellia erioloba* trees is found at an area

in the eastern part of the site. Only a few individuals of *Boscia albitrunca* (Shepherd's Tree) are found at the site.

In broad terms the site contains a *Senegalia mellifera* (Black Thorn) savanna largely in the western parts and a *Vachellia erioloba* (Camel Thorn) mixed savanna largely in the eastern parts.

A trench and diggings are present at the site where *Vachellia karroo* (Sweet Thorn) trees are often conspicuous.

Roads and tracks are found at the site. Bush-encroachment characterized by dense covers of *Senegalia mellifera* (Black Thorn) is encountered at some parts of the site whereas in other parts vegetation appears sparse and degraded.

The vegetation type representing the Savanna Biome at the site is Kathu Bushveld (SVk 12). Kathu Bushveld is not listed as threatened according to the National List of Threatened Ecosystems (2011).

Trench and diggings at the site could be conservation corridors of particular conservation concern whether as linked or stepping stone corridor systems.

Ecological sensitivity at the site is medium-low at the flat areas where a visible high cover of *Senegalia mellifera* is present. Ecological sensitivity at the concentration of fairly large *Vachellia erioloba* trees at an area at the eastern part of the site is medium to medium-high.

No Threatened or Near Threatened plant or animal species appear to be present at site.

Two plant species which are not threatened but listed as Declining, *Boophone disticha* and *Vachellia erioloba* are present at the site.

If the development is approved individuals of the Declining plant species *Boophone disticha* need to be relocated to a suitable site nearby before the construction phase. *Boophone disticha* (Poison Bulb) contains highly poisonous substances and the translocation operation should be done with necessary care.

Two protected tree species *Vachellia erioloba* (Camel Thorn) and *Boscia albitrunca* (Shepherd's Tree) are found at the site. In terms of a part of section 15(1) of the National Forests Act No. 84 of 1998, no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a license granted by the Minister. If developments are approved, such a permit should be applied for.

Establishment of exotic weeds should be monitored and exotic weeds at the site should be eradicated. A declared invader such as the mesquite tree (*Prosopis* species), should not be planted or allowed to spread from adjacent areas to the proposed footprint.

The site falls outside the Kathu Forest and its buffer zone. The conservation of *Vachellia erioloba* (a protected tree species that is also listed as Declining) should therefore receive special attention. If the development is approved a special effort should be made (apart from applying for the necessary permits) to conserve and cultivate *Vachellia erioloba* (Camel Thorn) trees to enhance the conservation of these magnificent trees in the larger area.

Three sample plots KT1, KT2 and KT3 of 50 m x 50 m were deliberately placed where conspicuous densities of *Vachellia erioloba* is present to gain an idea of the densities and height class distribution of *Vachellia erioloba* in the eastern half of the site where *Vachellia erioloba* is conspicuous in the mixed *Vachellia erioloba* savanna at the site. Table 4.26 of the Botanical / Wetland Specialist's Report indicates densities and height classes of Camel Thorn trees, *Vachellia erioloba* (= *Acacia erioloba*) at the site. No camel thorn trees taller than 10 m are found at the site (this is in contrast to other areas north and north-east of Kathu where such larger Camel Thorn trees are found). A relatively high density of Camel Thorn trees > 2 m of up to 96/ ha is present at the central-eastern part of the site. In other areas where conspicuous densities of *Vachellia erioloba* are found the density of individuals taller than 2 m ranges from 52/ ha to 84/ ha. Overall the density of *Vachellia erioloba* individuals taller than 2 m ranges from 0/ ha at the *Senegalia mellifera* savanna at the western parts of the site to around 54/ ha, 84/ha in eastern parts of the site and then at its most dense around 96/ ha at the central-eastern parts of the site.

If the development is approved, the key would be to conserve and cultivate as many as practical locally indigenous tree species at the urban area so that an urban conservation corridor could be created for the Kathu Forest which is further to the east outside the site.

7.2 SOCIO ECONOMIC FACTORS

7.2.1 SOCIAL AMENITIES

As in the rest of South Africa, there is a housing shortage in the area. This is totally unacceptable 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 that 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 will address this shortage.

During the construction phase of the proposed development, jobs will be created and thus the unemployment rate of the area will be reduced.

7.2.2. AIR QUALITY

Air quality will have no influence on the project. The project will however create a certain amount of dust during the construction phase. If proper dust suppression measures are implemented this variable will have very little impact (low in intensity and significance during the construction phase).

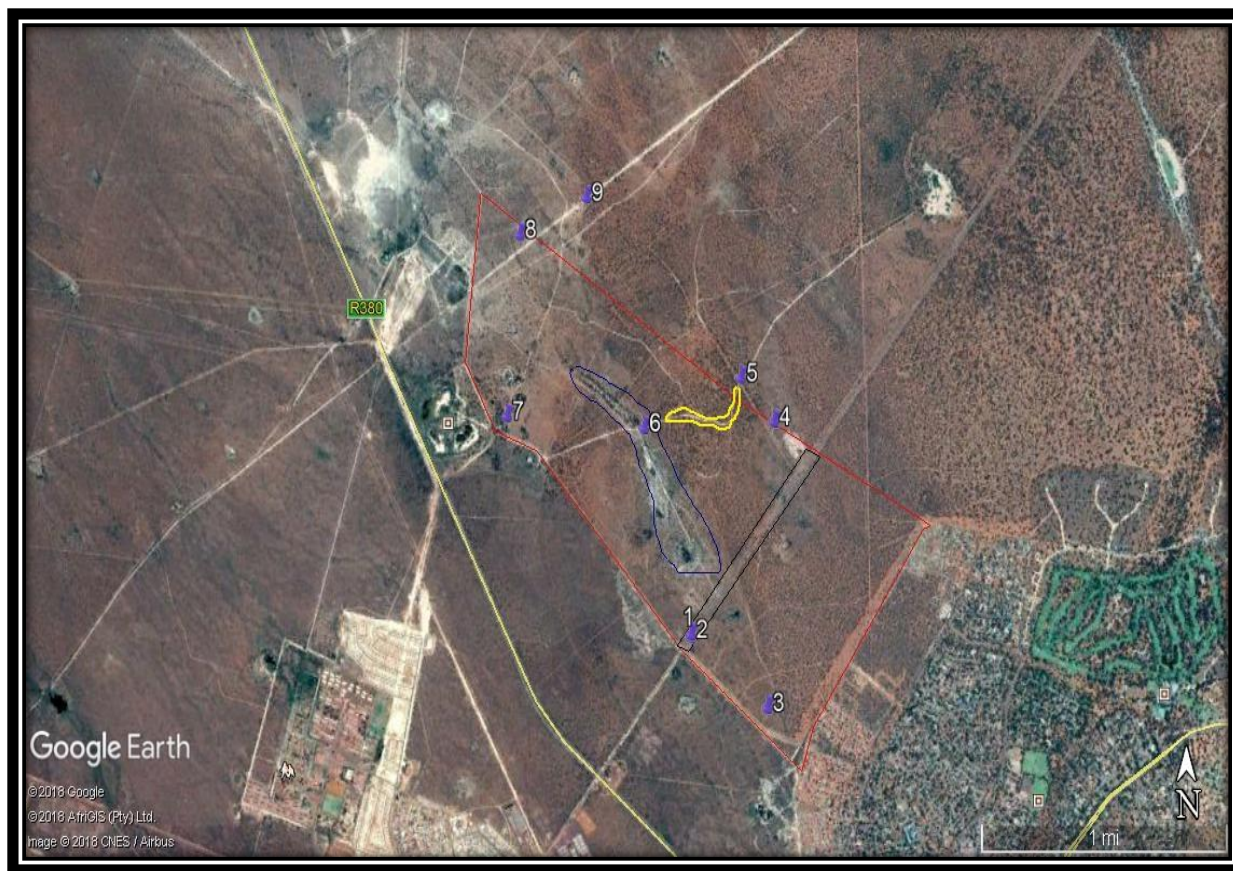
7.2.3 NOISE

It is a fact that a certain amount of noise will be generated during the construction phase of the project. Noise levels should however rarely exceed the allowable limits. It is unlikely that the project will create any more noise during the operational phase than that already experienced on site.

7.2.4 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, although some archaeological material & historical sites were identified during the assessment in January 2018.

A total of 9 sites were found during the assessment of the area, with 8 of these Stone Age and 1 a recent historical grave site. Three (3) of the Stone Age sites are located around the old Sishen-Kuruman tar road periphery/in the road reserve and on the surface of a smaller graded dirt road in the area. The tar road material might come from a secondary source. The number of sites and finds dating to the Stone Age might be more than those identified and recorded during the assessment, as it is clear that the area could contain many more similar sites and scatters of material of varying density throughout. The old streambed that runs in the area also contained some scattered tools from the MSA/LSA, but the whole section was not walked and therefore the whole streambed section is a potential area for the presence of Stone Age sites.



Aerial view of study area (red polygon) & Sites found. The old tarred road between Sishen & Kuruman is demarcated in black; while the dry streambed has been demarcated in blue and the Site 5 road in yellow (Google Earth 2018).

Sites 1 & 2 are located in close proximity to each other and are situated next to the old tar road and in the road reserve. Stone tools are scattered amongst gravel used for the road construction and include cores, handaxes, possible choppers, broken blades, flakes and waste. When the rest of the tar road section was assessed it became clear that these types of tools are located only close to and in the road reserve (an approximately 15m section both sides). Beyond that hardly any material occurs. It is highly likely that this Stone Age material comes from a secondary source (i.e. a quarry from which the road building material was sourced) and is not in situ. ***The range of material found here makes the “road site” relatively significant and if the road is to be impacted (re-used/removed) then it is recommended that possible surface sampling of representative material is undertaken. The source of the material should also be traced and the Stone Age material mapped along the road.***

Site 5 is located along another road in the study area. This is a dirt road that has been graded through a section of red aeolian sands and MSA & LSA artifacts (scrapers, blades, flakes) have been exposed in the road and next to it. ***The area around the road (in the red sands) most likely also contain scatters of tools that will be exposed eventually through natural erosion and care should be taken should development occur here that if material is uncovered an expert be called in to investigate.***

Site 6 is located in the old dry streambed in the area. Scattered/individual Stone tools are found throughout the area. The material has been heavily rolled (water working) and includes MSA/LSA flakes, blades, scrapers and other artifacts. **It is recommended that the streambed area be avoided by the development.** Sites 3, 4, 8 & 9 are all surface sites containing single or denser scatter of MSA/LSA tools (blades, scrapers, cores, flakes and waste) on them. One of these sites (Site 9) falls outside the footprint of study area and is located in an old dry pan area.

It is highly likely that many more similar surface sites and scatters of Stone Age material are located in the study area but might not be visible at this current stage. Material is covered by the red aeolian sands and will erode out over time. It is therefore also possible that development actions could uncover more sites and material. It is recommended that a more detailed mapping and assessment of the Stone Age of the study area be undertaken.

The Site 7 graveyard is located close to the fence with the Khai Appel Resort/Caravan Park and contains between 12 and 15 graves. Most of the graves are stone-packed and with cement borders, while a few have cement headstones with inscriptions. Three individuals could be identified and includes (1) Beney Konieng who was born in April 1959 and died on 5 April 1960; (2) Mrs. Ross Hugo who died on the 20th of October 1961 and (3) Mrs. L. Sebege who was born in 1889 and died in 1965. **Graves always carry a High Cultural Significance rating and should not be impacted if possible and be left intact. If the site cannot be avoided then the graves can be exhumed and relocated after all due processes (social consultation/getting consent/permits have been obtained) have been successfully completed. The best would be however to keep the site fenced-off and protected.**

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

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	Minimizing eradication of vegetation.

ENVIRONMENTAL ASPECTS	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS
	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.	
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. Protected trees with active bird nests or any other significant biodiversity features may not be damaged or disturbed without a valid Fauna Permit from Nature Conservation.
TOPSOIL & SUBSOIL MANAGEMENT		
Topsoil (where present) will be removed from any area where physical disturbance of the surface will occur.	Removed topsoil and subsoil should be stockpiled for the duration of the active construction period, and utilized for the final landscaping and rehabilitation of disturbed areas on site	The topsoil must be adequately protected from being blown away or eroded by storm water. Removed subsoil should be stockpiled separately from topsoil. Topsoil should be the final layer applied during rehabilitation, after subsoil/ spoil material has been placed and shaped on the site
EXCAVATIONS & EARTHWORKS		
It will be necessary to employ heavy machinery (excavators, back-actors, bulldozers, dump trucks etc.) for the earthmoving required	Use of heavy machinery can substantially increase the likelihood, intensity and significance of potential negative environmental impacts, and it is thus essential that earthworks be performed under constant supervision, and that operators must be made aware of all the environmental obligations, as there is always the potential to inflict damage to sensitive areas.	Use of machinery should be restricted to only that which is strictly required, and the unnecessary or excessive movement/ use of such machinery must be kept to a minimum. Excavations and earth-moving may only take place within the demarcated working area
DANGEROUS AND TOXIC MATERIALS (CHEMICALS)		
Safe storage of chemicals See also below for further aspects on this subject Availability of safety kits to prevent oils/toxic materials spreading in the environment 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

ENVIRONMENTAL ASPECTS	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS
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 on and for the canal.	Minimise the possibility of concrete residue entering into the surrounding environment	No evidence of contaminated soil on the construction site
TOILETS AND ABLUTION FACILITIES		
Clean sanitary environment	Clean and sanitary environment	Toilets for workers in accordance with the instructions in the EMP
WASTE MANAGEMENT		
A clean and waste free environment	Clean environment with waste handled in accordance with the EMP	No waste in the environment
WORKSHOP EQUIPMENT, MAINTENANCE AND STORAGE OF MATERIAL		
Clean and safe work area	Clean and safe work area	Safe and clean work and storage area
FIRES		
No burning of waste and or fires originating from the construction area	No burning of waste and or fires originating from the construction area	No fire incidents
OTHER ENVIRONMENTAL ASPECTS		
Stockpiles All stockpiled material must be easily accessible without any environmental damage to adjacent grasslands/farmlands. All temporarily stockpiled material must be stockpiled in such a way that the spread of materials are minimised. The stockpiles may only be placed within the demarcated areas - the location of which must be approved by the ER or ECO. Stockpiled material at batching plant must be contained to prevent the spread of gravel in the area.	Properly constructed and well maintained stockpiles	No erosion or spread of material from stockpiles Gravel stockpiles must be properly managed
Erosion, sedimentation and storm water No erosion and or sedimentation	<ul style="list-style-type: none"> • Minimise scarring of the soil surface and land features • Minimise disturbance and loss of soil • Minimise construction footprint 	No erosion or sedimentation.
Vegetation		

ENVIRONMENTAL ASPECTS	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS
The contractor must avoid vegetated areas that will not be cleared.	Minimise impacts on vegetation	Limit impact on vegetation
Waste management Any illegal dumping of waste must not be tolerated. This aspect must be closely monitored and reported on; proof of legal dumping must be able to be produced on request. Bins must be clearly marked for ease of management. Sufficient closed containers must be strategically located around the construction site to handle the amount of litter, wastes, rubbish, debris, and builder's wastes generated on the site.	<ul style="list-style-type: none"> Sustainable management of waste; to keep the site neat and tidy. This will control potential influx of vermin and flies thereby minimising the potential of diseases on site and the surrounding environment. It will also minimise the potential to pollute soils, water resources and natural habitats 	<ul style="list-style-type: none"> Disposal of rubble and refuse in an appropriate manner with no rubble and refuse lying on site Sufficient containers available on site
Dust Dust production must be controlled by regular watering of roads and works area, should the need arise.	Reduce dust fall out	No visible signs of dust
SAFETY	Children's access to construction site controlled, Access to construction camp controlled Safety aspects considered	No children on construction site Safety fence and controlled access available Safety signs with necessary information displayed

9. ENVIRONMENTAL IMPACT MANAGEMENT OUTCOMES

9.1 ASSESSMENT CRITERIA

Impacts were rated 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).

Nature of the potential impact		Description of the effect, and the affected aspect 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
	Medium	There is a moderate chance of correcting the adverse impact
	High	There is a high chance in correcting the adverse impact
Risk	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

Nature of the potential impact		Description of the effect, and the affected aspect of the environment
	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.

ENVIRONMENTAL IMPACT ASSESSMENT (Construction phase)

ALTERNATIVE 1: Mixed land use township (Preferred Alternative)

Environmental Attribute	Environmental Attribute	Environmental Attribute	Environmental Attribute	Environmental Attribute	Environmental Attribute
DIRECT IMPACTS:					
Geographical Physical Social Economic	380,8600 ha of indigenous vegetation will be transformed in order to establish the development.	Duration	Long term	Obtain the necessary environmental authorization for the development. Implement the mitigation measures as described in the Environmental Management plan.	Long term
		Extent	Local		Local
		Magnitude (Intensity)	High		High
		Probability	Definite		Definite
		Significance	Medium		Medium
		Reversibility	Low		Low
		Risk	Medium		Medium
	A Cemetery will form part of the development.	Duration	Long term	Conduct the necessary Geo-Hydrological investigation to ensure that the area is suited for this land use.	Long term
		Extent	Local		Local
		Magnitude (Intensity)	High		High
		Probability	Definite		Definite
		Significance	Medium		Medium
		Reversibility	Low		Low
		Risk	Medium		Medium
	Un-rehabilitated, disturbed surfaces can lead to erosion and dust pollution.	Duration	Short term	Start the rehabilitation of disturbed surfaces as soon as possible. Spray bare surfaces with water to prevent dust pollution.	Medium term
		Extent	Local		Local
		Magnitude (Intensity)	Low		Medium
		Probability	Definite		Definite
		Significance	Medium		Medium
		Reversibility	High		High
		Risk	Low		Medium
	Foreign plant species are likely to invade disturbed areas.	Duration	Short term	Start the extermination of any invasive species as soon as possible and maintain the eradication programme.	Medium term
		Extent	Local		Local
		Magnitude (Intensity)	Low		Low
		Probability	Definite		Definite
		Significance	Medium		Medium
		Reversibility	High		High
		Risk	Low		Medium
Poorly planned ablution facilities for construction workers may cause pollution of surface and underground water.	Duration	Short term	Provide portable ablution facilities that will not cause pollution during the construction phase.	Short term	
	Extent	Local		Local	
	Magnitude (Intensity)	Medium		Medium	
	Probability	Definite		Definite	
	Significance	Medium		Medium	
	Reversibility	High		High	
	Risk	Low		Medium	
The proposed project can impact on the soil and geology.	Duration	Long term	The findings of the Geo-Technical Engineer must be incorporated into the design of the project. Prevent spills of lubricants/oils that can take place on bare soil. This will include the use	Long term	
	Extent	Local		Local	
	Magnitude (Intensity)	Low		Medium	
	Probability	Definite		Definite	
	Significance	Medium		Medium	
	Reversibility	High		High	
	Risk	Low		Medium	

ENVIRONMENTAL IMPACT ASSESSMENT (Construction phase)

ALTERNATIVE 1: Mixed land use township (Preferred Alternative)

Environmental Attribute	Environmental Attribute	Environmental Attribute	Environmental Attribute	Environmental Attribute	Environmental Attribute
				of drip trays for vehicles that are standing for more than 24 hours.	
	The vegetation of the area will be removed during the construction phase, which will destroy floral and faunal habitats.	Duration	Short term	Start with the rehabilitation of vegetation to minimize the negative effects of the removal of plants. The rule must be to minimize the disturbance of animal life by keeping the footprint as small as possible. No snares may be set.	Short term
		Extent	Local		Local
		Magnitude (Intensity)	Medium		Medium
		Probability	Definite		Definite
		Significance	Medium		Medium
		Reversibility	High		High
		Risk	Low		Medium
	Open trenches can be dangerous as they can either collapse on people or on equipment and people-especially small children, can fall into it.	Duration	Short term	Ensure that the trenches are dug according to specifications as prescribed by the Civil Engineer. Ensure that the trenches stay open for as short a time as possible. Ensure that open trenches are demarcated as required by the Occupational Health and Safety Act.	Short term
		Extent	Local		Local
		Magnitude (Intensity)	Medium		Medium
		Probability	Definite		Definite
		Significance	Medium		Medium
		Reversibility	High		High
		Risk	Low		Medium
Indirect impacts:					
Geographical Physical Social Economic	Dust generation from the proposed project could impact on the surrounding area.	Duration	Short term	Spray water on open surfaces to ensure that dust does not cause air pollution during construction. Start the rehabilitation of disturbed surfaces as soon as possible	Short term
		Extent	Local		Local
		Magnitude (Intensity)	Low		Low
		Probability	Probable		Probable
		Significance	Medium		Medium
		Reversibility	High		High
		Risk	Low		Medium
	Spills of lubricants / oils can take place on bare soil.	Extent	Local	Prevent spills of lubricants/oils that can take place on bare soil. This will include the use of drip trays for vehicles that are standing for more than 24 hours. Ensure that all construction vehicles are in good working	Local
		Magnitude (Intensity)	Low		Low
		Probability	Probable		Probable
		Significance	Medium		Medium
		Reversibility	High		High
		Risk	Low		Medium

ENVIRONMENTAL IMPACT ASSESSMENT (Construction phase)					
ALTERNATIVE 1: Mixed land use township (Preferred Alternative)					
Environmental Attribute	Environmental Attribute	Environmental Attribute	Environmental Attribute	Environmental Attribute	Environmental Attribute
				order and not leaking oil and or fuel. No vehicles may be serviced on site.	
	Waste materials such as glass, plastic, metal or paper present a possible pollution hazard	Extent	Local	Implement the management plan to ensure that: All construction rubble is disposed of in a safe and environmentally acceptable manner. NO concrete, gravel or other rubbish will be allowed to remain on site after the construction phase. All cement is housed as to prevent spills (due to rain and or handling errors). NO glass, plastic, metal, or paper shall be allowed to pollute the area.	Local
		Magnitude (Intensity)	Low		Low
		Probability	Probable		Probable
		Significance	Medium		Medium
		Reversibility	High		High
		Risk	Low		Medium
	Non-compliance to the relevant legislation may cause social and environmental problems.	Extent	Local	Ensure that contractors (construction phase) abide by all the requirements of the Occupational Health and Safety Act. Ensure that all contractors are aware of the consequences of non-compliance to the relevant legislation regarding the above-mentioned act as well as with regard to the environment (acts, regulations, and special guidelines).	Local
		Magnitude (Intensity)	Medium		Medium
		Probability	Probable		Probable
		Significance	Medium		Medium
		Reversibility	High		High
		Risk	Low		Medium
	New employment opportunities will be created. Local skills development will take place.	Extent	Local	No mitigation measures needed apart from the fact that contractors will have to ensure that they abide to the requirements of the Occupational Health and Safety Act and the Employment Equity Act.	Local
		Magnitude (Intensity)	Medium		Medium
		Probability	Definite		Definite
		Significance	Medium		Medium
		Reversibility	Medium		Medium
		Risk	Low		Medium
Cumulative impacts:					
Geographical		Extent	Local		Local

ENVIRONMENTAL IMPACT ASSESSMENT (Construction phase)

ALTERNATIVE 1: Mixed land use township (Preferred Alternative)

Environmental Attribute	Environmental Attribute	Environmental Attribute	Environmental Attribute	Environmental Attribute	Environmental Attribute
Physical Social Economic	Enhancement of the social well-being of the local communities for which the development is intended	Magnitude (Intensity)	Medium	Ensure that the development is constructed as planned.	Medium
		Probability	Definite		Definite
		Significance	Medium		Medium
		Reversibility	Medium		Medium
		Risk	Low		Medium
	<u>Solid waste:</u> The proposed development will add additional solid waste into the existing waste stream of the Gamagara Local Municipality. <u>Sewage:</u> The proposed development will add additional sewage into the existing sewage stream of the Gamagara Local Municipality. <u>Water supply:</u> The proposed development will add pressure to the water supply of Gamagara Local Municipality's Water.	Extent	Local	Before development can commence, ensure the works in relation to the upgrading of bulk water and ablation supply pipelines; reservoirs; pump stations and WWTW as described in the Civil Engineer's Recommendations are constructed and operational. Ensure that the development is constructed as planned by the Civil Engineer.	Local
		Magnitude (Intensity)	Medium		Medium
		Probability	Definite		Definite
		Significance	High		High
		Reversibility	High		High
		Risk	Low		High
	Two protected tree species <i>Vachellia erioloba</i> (Camel Thorn) and <i>Boscia albitrunca</i> (Shepherd's Tree) are found at the site	Extent	Local	In terms of a part of section 15(1) of the National Forests Act No. 84 of 1998, no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a license granted by the Minister. If developments are approved, such a permit should be applied for	Local
		Magnitude (Intensity)	Medium		Medium
		Probability	Definite		Definite
		Significance	High		High
		Reversibility	Low		Low
		Risk	Medium		Medium
	Indigenous vegetation will be removed.	Extent	Local	No mitigation measures possible.	Local
		Magnitude (Intensity)	Medium		Medium
		Probability	Definite		Definite
		Significance	High		High
		Reversibility	Low		Low
		Risk	Medium		Medium
		Extent	Local		Local

10. MITIGATION MEASURES

10.1. GEOLOGY

Pre-construction phase

- Plan for excavations that may be necessary to install the infrastructure - this is the responsibility of the engineer.
- Plan for the dumping of excess rock spoils at a suitable site. No excess rock spoils will be allowed to remain on site. Ensure that contractors are aware of this prerequisite. It will be the responsibility of the contractor to ensure that this task is adequately planned for, and that a proper site is determined. The ECO will be responsible to monitor this aspect.
- Plan the construction of foundations according to the specifications as determined by the geotechnical Engineer. This will be the responsibility of the Civil Engineer to be monitored by the ECO.

Construction phase

- Use the most practical methods (limiting force) for the excavations necessary to establish the infrastructure. If explosives are to be used, the ECO must first of all ensure that it is necessary and secondly ensure, together with the Safety Officer, that all procedures as required by law are implemented.
- Ensure that no rock spoils remain in the area. This should be monitored by the ECO and will remain the responsibility of the contractor.
- Ensure that excess spoils are removed to a suitably licensed site. This should be monitored by the ECO and will remain the responsibility of the contractor.

Operational phase

- No further management steps are necessary for this variable during the operational phase of the project.

10.2. TOPOGRAPHY

Certain management steps, which are related to the topography, will be described in other sections of the management plan (climate, drainage, aesthetics etc.).

Pre-construction phase

- Plan the layout of the proposed development taking gradients into account. This will be the responsibility of the Town Planner and the Civil Engineer, using the topographical map provided by the Surveyor.
- Plan to prevent concentrated runoff by means of a storm water management plan (Including detailed design of storm water outlet structures). This will be the Civil Engineer's responsibility, using the topographical map provided by the surveyor.
- Plan that the amount of post-developed runoff which is discharged into the existing drainage system does not exceed the pre-developed discharge in a major storm event; as to prevent flooding of the natural water courses.
- The overall design criteria and approach, including geometric design and road layer design, are to be constructed to standards as specified in SABS 1200. Road materials conforming to the requirements of TRH 14 will be specified.

Construction phase

- Construct structures to prevent concentrated runoff. This will be done by the developer in accordance with the Town Planner's layout plan and Civil Engineer's Storm Water Management Plan to be monitored by the ECO.
- Roads are to be constructed to standards as specified in SABS 1200. Road materials conforming to the requirements of TRH 14 will be specified.
- All storm water management will be in accordance with DW&S and DENC specifications.
- The layouts of the proposed erven have been planned taking the prerequisite with regard to slopes and the optimisation of slopes into full consideration. Construct as planned. This will be the responsibility of the contractor.
- The ECO will have to monitor the above to ascertain that the measures taken are according to the designs.

Operational phase

- Maintain anti-erosion and runoff measures. This will be the responsibility of the municipality after construction has been completed.
- Implement monitoring plans and safety checks of the associated water runoff structures, especially after high rainfall events.

10.3. CLIMATE

10.3.1. RAINFALL

Pre-construction phase

- Plan for extreme events to ensure that no concentrated runoff in excess of the capacity of the drainage network occurs. In the event of an extreme event occurring, plan to move all contractors from the construction site. They can only move back to the construction sites once all damage caused by the extreme event has been mitigated. This will have to be initiated by the developer and executed by the contractor and monitored by the ECO.
- Develop a contingency plan to cope with very hot dry spells and the possibility of fires occurring. This will have to be done by the contractor and monitored by the ECO.
- Plan for extreme events to ensure that no concentrated runoff in excess of the capacity of the drainage network occurs. The Civil Engineer has to ensure the detailed design of the internal roads and related storm water system, to ensure that adequate provision will be made for storm water management.
- Plan for dust suppression during dry spells. This will have to be done by the contractor and monitored by the ECO.

Construction phase

- Implement the above-mentioned steps to ensure that the effects of extreme events can be mitigated. It is extremely important to ensure that the effects of high rainfall events are planned for during the pre-construction phase. This will prevent erosion during the construction phase when large tracts of land could be denuded. This will have to be done by the contractor and monitored by the ECO.
- Implement fire prevention and control measures. To be implemented by the contractor and monitored by the ECO.
- Implement dust suppression measures. This is the responsibility of the contractor to be monitored by the ECO.

Operational phase

- Implement the steps described in the previous phase to ensure that the anti-erosion measures are

implemented and that erosion prevention structures are maintained. This will be the responsibility of the municipality after construction has been completed.

10.3.2 TEMPERATURE

No further management steps will be needed other than those described in the previous section.

10.3.3 WIND

If the management steps described in the section with regard to dust suppression is properly implemented, no extra management steps will be needed to mitigate the possible effects of this variable.

10.4 SOIL

Pre- construction phase

- Plan the development and associated infrastructure in such a manner that minimum disturbance of soil is necessary. This will be the responsibility of the developer.
- Undertake the necessary detailed engineering investigations and plan to implement their findings. This has to be done by the Geotechnical Engineer and his findings will have to be incorporated into the town planner's final designs.
- Each individual stand must be planned to minimise soil impacts and to ensure that the necessary Geotechnical findings are implemented. This will have to be done by the Geotechnical Engineer and his findings will have to be incorporated into the Town Planner's layout plan.
- Ensure that the planned surface water runoff control structures do not cause erosion in the areas to which the water is diverted to. This will have to be planned for by the Civil Engineer.
- Plan to control erosion as specified in the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983).

Construction phase

- Construct the general infrastructure in such a manner that minimum disturbance of soil occurs. This will be the responsibility of the developer to be implemented by the contractor and monitored by the ECO.
- Implement the plans to ensure that the infrastructure will cause minimum soil disturbance. This will have to be done by the contractor and monitored by the ECO.
- Ensure that each individual stand is developed in such a way that soil impacts are minimised. This will have to be done by the contractor and monitored by the ECO.
- If topsoil is removed for construction purposes, it should be stockpiled in such a manner that the soil does not erode (a maximum side slope of 18° is allowable). Excess topsoil must be used for soil rehabilitation of previously disturbed areas. This is the responsibility of the contractor to be monitored by the ECO.
- Control erosion as specified in the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983).

Operational phase

- Implement a maintenance plan to ensure that no soil erosion can occur as specified in the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983).
- It is crucially important to maintain anti-erosion structures. See other sections dealing with surface drainage and flora. This will be the responsibility of the developer after construction has been completed.
- Ensure the graves are excavated as per the approved layout plan.

10.5. WATER

10.5.1. SURFACE WATER

Pre-construction phase

- Plan to ensure that all contractors that are employed on site are aware of their responsibilities with regard to the prevention of pollution of water according to the requirements of the National Water Act, 1998 (Act 36 of 1998). This will be the responsibility of the developer and will have to be monitored by the ECO.
- No raw sewage or other pollutants such as plastic, oil, cement, etc. will be allowed to pollute water. (See also sections on underground water and socio-economic aspects). This will be the responsibility of the developer and the contractor and will have to be monitored by the ECO.
- Develop a management plan to ensure a clean-water environment during all phases of the project. The services of a suitably qualified engineer are essential in the planning phase. The Civil Engineer will be responsible to develop such a plan.
- Design all storm water structures (and other surface water flow modifications) in such a manner that the impact on the natural systems are minimised (see section: 10.2 Topography, re: drainage and storm water flow above). The system must comply with the requirements of the Local Authority and DW&S. Keep in mind that increased runoff invariably results from enlarged bare surfaces. All excess runoff structures must terminate in infiltration structures (thereby ensuring maximum groundwater recharge). The Civil Engineer will be responsible to develop such a plan.
- Plan to slope ground surfaces in such a way that no ponding occurs. This will have to be done by the contractor and monitored by the ECO.
- Plan to prevent concentrated runoff by means of a storm water management plan (Including detailed design of storm water outlet structures – see Storm water management plan). This will be the Civil Engineer's responsibility, using the topographical map provided by the surveyor.

Construction phase

- Ensure that contractors are aware of their responsibilities as far as water pollution is concerned in terms of the requirements of the National Water Act, 1998 (Act 36 of 1998). It will be imperative to monitor their activities. It is suggested that a penalty clause be inserted in the contracts to enable the applicant to take the necessary rehabilitation measures in case of non-compliance. This will have to be done by the developer and monitored by the ECO.
- Implement the water management plan and construct the necessary storm water structures to ensure adequate and sustainable water dispersion (See Section 10.2 Topography). This will have to be done by the contractor and monitored by the ECO.

Operational phase

- Maintain the surface water management infrastructure. This will be the responsibility of the municipality after construction has been completed.
- Implement monitoring plans and safety checks of the water runoff structures.

10.5.2. GROUND WATER

Pre- construction phase

- Ensure that all activities that may possibly affect ground water are performed in accordance with the requirements of the National Water Act, 1998 (Act 36 of 1998), DW&S and the Local Authority. The correct installation and maintenance of the sewerage system must be regarded as having a high priority.
- The Civil Engineer will do the planning of the installation of the above-mentioned system. The responsibility

will however remain that of the developer to ensure that the contractors install the sewage system as planned. It will be essential that the ECO monitor this aspect very closely.

- Plan for adequate chemical toilets to be used by contractors during the construction phase. The provision and maintenance of which must form part of the contractor liabilities and must be described as such in their contracts. It will be essential that the ECO monitor this aspect very closely.
- Plan for the regular inspection of sewage pipelines throughout the life cycle of the project. This will be the responsibility of the developer.
- The storage and handling of lubricants, oils, paint and material such as cement must be provided for as part of the different contractor's contracts. Specially demarcated and secure storage facilities must be provided for. It will be essential that the ECO monitor this aspect very closely.
- Plan the disposal from hard surfaces in such a manner that the water can infiltrate into the underground without causing surface erosion. The Civil Engineer will do this.
- Appoint a Geo-hydrological Specialist to conduct the necessary Geo-Hydrological investigation to ensure that the area is suited for use as a cemetery.

Construction phase

- Implement the mitigation measures as described in the pre-construction phase. This will be the responsibility of the developer to be monitored by the ECO.
- Construct the sewage system in such a manner that no spillage is possible.
- Ensure that all construction activities that may possibly affect ground water are performed in accordance with the requirements of the National Water Act, 1998 (Act 36 of 1998), DW&S and the Local Authority. This will have to be done by the contractor and monitored by the ECO.
- Ensure that adequate chemical toilets are available and are used by contractors during the construction phase - the provision and maintenance of which must form part of the contractor's liabilities. It will be essential that the ECO monitor this aspect very closely.
- The storage and handling of lubricants, oils, paint, and material such as cement must be provided for as part of contractor's contracts. Specially demarcated and secure storage facilities must be used. It will be essential that the ECO monitor this aspect very closely.
- Construct the disposal from hard surfaces in such a manner that the water can infiltrate into the underground water without causing surface erosion. This will have to be done by the contractor and monitored by the ECO to ensure that the construction is according to the plan.

Operational phase

- Continue to treat all operational activities that may possibly affect ground water in accordance with the requirements of DW&S and the Local Authority. This will be the responsibility of the developer after construction has been completed.
- Maintain the disposal systems that originate on hard surfaces in order to allow the water to infiltrate into the underground without causing surface erosion. This will be the responsibility of the developer after construction has been completed.

10.6. FLORA

Pre-construction phase

- Plan for the rehabilitation of all areas disturbed during construction. This will be the responsibility of the developer.
- Prepare a contingency plan to deal with the invasive species in terms of the Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983). This will be the responsibility of the developer to be executed by the contractor and monitored by the ECO.
- Plan to prevent veldt fires in the adjoining land. Firebreaks should be established in terms of the

requirements and conditions of the National Veldt and Forest Fires Act (Act No. 101 of 1998). Plan a fire-fighting program that adheres to the by-laws of the Local Municipality. This will be the responsibility of the contractor to be monitored by the ECO.

- Two protected tree species *Vachellia erioloba* (Camel Thorn) and *Boscia albitrunca* (Shepherd's Tree) are found at the site; In terms of a part of section 15(1) of the National Forests Act No. 84 of 1998, no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a license granted by the Minister. Apply for the necessary permits

Construction phase

- Implement the eradication programme for invasive species in terms of the Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983). This will have to be done by the contractor and monitored by the ECO.
- Rehabilitate areas as soon as construction activities allows it. The sooner rehabilitation starts, the more beneficial it will be for the overall environment. To be implemented by the contractor and monitored by the ECO.
- Implement the plan to prevent veldt fires in the adjoining land. Establish firebreaks in terms of the requirements and conditions of the National Veldt and Forest Fires Act (Act No. 101 of 1998). Fire-fighting programs must adhere to the by-laws of the Local Municipality. This will have to be done by the contractor and monitored by the ECO.
- Only cut, disturb, damage or destroy *Vachellia erioloba* (Camel Thorn) and *Boscia albitrunca* (Shepherd's Tree) as per permits obtained.

Operational phase

- Implement the rehabilitation plan for disturbed areas. Ensure that rehabilitation is in accordance with the above-mentioned criteria. This will be the responsibility of the developer after construction has been completed.
- Continue with invader eradication. This will be the responsibility of the developer after construction has been completed.

10.7. FAUNA

Pre-construction phase

- Develop a management plan with CLEAR instructions to ensure that the least disturbance of fauna will take place during all phases of the project. The principle of NO disturbance of animal life must be the rule. This will be the responsibility of the developer to be executed by the contractor and monitored by the ECO.

Construction phase

- Implement the management plan to ensure that the least disturbance of fauna will occur. This will have to be done by the contractor and monitored by the ECO.

Operational phase

- Maintain management plan for the preservation of fauna. This will be the responsibility of the developer after construction has been completed.

10.8. AIR QUALITY

Pre-construction phase

- Impose a speed limit on vehicles using all non-surfaced roads in order to curb dust. This will have to be enforced by the contractor and monitored by the ECO.
- Plan for the implementation of rehabilitation as described in previous sections of this management plan. This will be the responsibility of the contractor and the action will be monitored by the ECO.
- Ensure that contractor's contracts contain clauses with their responsibilities with regard to possible losses incurred from fires originating from their contract areas. They will be held responsible for damages in the case of a fire spreading from their site.
- Plan to ensure that NO refuse is burnt. This will be the responsibility of the contractor to be executed by the contractor and monitored by the ECO.

Construction and operational phases

- Implement the measures devised in the pre-construction phase by rehabilitating as soon as possible. This will be the responsibility of the contractor to be executed by him and monitored by the ECO.
- Enforce speed regulations. This will have to be enforced by the contractor and monitored by the ECO during the construction phase, and will be the responsibility of the applicant during the operational phase.
- No refuse may be burnt on site. This will have to be done by the contractor and monitored by the ECO during the construction phase.

10.9. NOISE

Pre-construction phase

- Plan to ensure that construction vehicles are fitted with proper noise reduction fittings such as silencers. This will have to be done by the contractor and monitored by the ECO.
- Plan to ensure that no houses are build closer than 25 meters from the railway line. This will have to be done by the Town planner and monitored by the ECO.

Construction and Operational phase

- Implement the measures devised in the pre-construction phase. This will have to be done by the contractor and monitored by the ECO.
- Normal working hours are between 08h00 and 17h00 (Mondays to Saturdays). No work will be allowed on Sundays or outside of the abovementioned hours. This will have to be done by the contractor and monitored by the ECO.

10.10. ARCHAEOLOGY

If during the construction phase any archaeological / historical / cultural features are discovered, the work in the direct vicinity of the find must be stopped. Under no circumstances shall any artifacts be destroyed. Such a site must be marked and fenced off and SAHRA notified as soon as possible.

Pre-construction phase

- Graves always carry a High Cultural Significance rating and should not be impacted if possible and be left intact. If the site cannot be avoided then the graves can be exhumed and relocated after all due processes (social consultation/getting consent/permits have been obtained) have been successfully completed. Plan to demarcate the area as a no – go zone.
- *The range of material found here makes the "road site" relatively significant and if the road is to be impacted (re-used/removed) then it is recommended that possible surface sampling of representative material is*

undertaken. The source of the material should also be traced and the Stone Age material mapped along the road.

- The area around the road (in the red sands) most likely also contain scatters of tools that will be exposed eventually through natural erosion and care should be taken should development occur here that if material is uncovered an expert be called in to investigate.
- It is recommended that the streambed area be avoided by the development. It is highly likely that many more similar surface sites and scatters of Stone Age material are located in the study area but might not be visible at this current stage. Material is covered by the red aeolian sands and will erode out over time. It is therefore also possible that development actions could uncover more sites and material. It is recommended that a more detailed mapping and assessment of the Stone Age of the study area be undertaken.

Construction and Operational phase

- Maintain the no-go zone by fencing off the graveyard and maintaining it as such.

10.11 AESTHETICS

Pre-construction phase

- Plan to/for:
- Implement proper maintenance of all areas on the property that will help to enhance the aesthetics of the site.

Construction and Operational phase

- Implement the steps described in the pre-construction phase. This will be the responsibility of the developer during and once construction has been completed.

10.12 OTHER SOCIO-ECONOMIC FACTORS

Pre-construction phase

- Plan the project in such a way that optimal use is made of local labour. All labour practices must conform to the rules and regulations of the Occupational Health and Safety Act, 85 of 1993. This will be the responsibility of the developer to be executed by the contractor and monitored by the ECO.
- Devise a management plan for the project as a whole to ensure that the environmental issues can be addressed as described in this report. This will be the responsibility of the developer.
- Ensure that the management steps concerning the construction phase of the project are part of the construction contracts. This will be the responsibility of the developer to be monitored by the ECO.
- Ensure that all the people involved with the project are aware of the implications of non-compliance. This will be the responsibility of the developer to be monitored by the ECO.
- It is imperative to devise a set of rules that must form part of the overall management strategy of the development. These rules must provide for all the issues raised in this document with regard to sound environmental practices as well as with regard to good housekeeping. This will be the responsibility of the developer to be monitored by the ECO.
- Plan for solid waste storage and disposal. All solid waste generated during all the phases of the project will be stored on site and disposed of only at a suitably licensed site in accordance with the stipulations of the National Environmental Act, 1998 (Act No. 107 of 1998, as amended). This will be the responsibility of the developer and contractors, to be monitored by the ECO.
- Plan to ensure that the transportation, storage and handling of hazardous materials on site conforms to the rules and regulations stipulated in terms of the Hazardous Substances Act, No. 15 of 1973. This will be the

- responsibility of the developer to be monitored by the ECO.
- Plan to implement all the instructions and mitigation measures contained in the specialists reports. This will be the responsibility of the developer to be monitored by the ECO.

Construction phase

- Utilise local labour optimally. Ensure that all labour practices conform to the rules and regulations of the Occupational Health and Safety Act, 85 of 1993. This will be the responsibility of the developer and contractors, to be monitored by the ECO.
- Solid waste storage and disposal. All solid waste generated during all the phases of the project will only be stored on site temporarily and disposed of at a suitably licensed site in accordance with the stipulations of the National Environmental Act, 1998 (Act No. 107 of 1998, as amended). This will be the responsibility of the developer and contractors, to be monitored by the ECO.
- Ensure that the transportation, storage and handling of hazardous materials on site conforms to the rules and regulations stipulated in terms of the Hazardous Substances Act, No. 15 of 1973. This will be the responsibility of the developer to be monitored by the ECO.
- Enforce management steps with regard to provisions in contractor contracts. This will be the responsibility of the developer to be monitored by the ECO.
- Install all services as planned and described in the various reports mentioned in this document. This will be the responsibility of the developer and the contractors, to be monitored by the ECO.

Operational phase

- Maintain all infrastructures in an environmentally responsible manner. This will be the responsibility of the developer after construction has been completed.
- All solid waste generated during this phase of the project will only be stored on site temporarily and disposed of at a suitably licensed site in accordance with the stipulations of the National Environmental Act, 1998 (Act No. 107 of 1998, as amended). This will be the responsibility of the developer.

10.13 SITE SPECIFIC MITIGATION MEASURES FOR THE CONSTRUCTION PHASE

10.13.1 Site Establishment

- Ensure that all site personnel have a basic level of environmental awareness training. The Contractor must submit a proposal for this training to the ECO for approval. Topics covered should include;
 - What is meant by “Environment?”
 - Why the environment needs to be protected and conserved
 - How construction activities can impact on the environment
 - What can be done to mitigate against such impacts
 - Awareness of emergency and spills response provisions
 - Social responsibility during construction e.g. being considerate to local residents
- Training should be undertaken by a party such as the ECO who has sufficient expertise and knowledge of environmental issues.
- It is the Contractor’s responsibility to provide the site foreman with environmental training and to ensure that the foreman has sufficient understanding to pass this information onto the construction staff.
- Use should be made of environmental awareness posters on site.
- The need for a “clean site” policy also needs to be explained to the workers.
- Staff operating equipment (such as excavators, loaders, etc.) shall be adequately trained and sensitised to any potential hazards associated with their tasks.
- Unsocial activities such as consumption or illegal selling of alcohol, drug utilisation or selling and prostitution

on site shall be prohibited. Any persons found to be engaged in such activities should receive disciplinary or criminal action taken against them.

- Secure the site in order to reduce the opportunity for criminal activity in the locality of the construction site.
- No site staff, other than security personnel and skeleton staff will be housed on site. Security personnel and skeleton staff must be supplied with adequate protective clothing, ablution facilities, water and refuse collection facilities, facilities for cooking and heating so that open fires are not necessary.
- 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.
- The contractor must ensure that all emergency procedures are in place prior to commencing work. Emergency procedures must include (but not be limited to) fire, spills, contamination of the ground, accidents to employees, use of hazardous substances and materials, etc.
- The contractor must ensure that lists of all emergency telephone numbers/contact persons are kept up to date and that all numbers and names are posted at relevant locations throughout the construction site.
- The nearest emergency service provider must be identified during all phases of the project as well as its capacity and the magnitude of accidents it will be able to handle. The contact details of this emergency centre, as well as the police and ambulance services must be available at prominent locations around the construction site and the construction crew camps.

10.13.2 Construction camp

- Choice of site for the Contractor's camp requires the Project Manager's permission and must take into account location of local residents.
- The size of the construction camp should be minimized.
- Adequate parking must be provided for site staff and visitors. This should not inconvenience or serve as a nuisance to neighbours.
- The Contractor must attend to drainage of the camp site to avoid standing water and / or sheet erosion.
- Suitable control measures over the Contractor's yard, plant and material storage to mitigate any visual impact of the construction activity must be implemented.

10.13.3 Stockpiles

- All stockpiled material must be easily accessible without any environmental damage to adjacent grasslands/farmlands.
- All temporarily stockpiled material must be stockpiled in such a way that the spread of materials are minimised.
- The stockpiles may only be placed within the demarcated areas the location of which must be approved by the ECO.
- The contractor must avoid vegetated areas that will not be cleared.
- Stockpiles are to be stabilised if signs of erosion are visible.

10.13.4 Oil and chemicals

- The contractor must provide **method statements** for the "handling & storage of oils and chemicals", "fire", and "emergency spills procedures".
- These substances must be confined to specific and secured areas within the contractor's camp, and in a way that does not pose a danger of pollution even during times of high rainfall. These areas must be imperviously bunded with adequate containment (at least 1.5 times the volume of the fuel) for potential spills or leaks
- 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.

- The depth of the drip tray must be determined considering the total amount / volume of oil in the vehicle. The drip tray must be able to contain the volume of oil in the vehicle.
- 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).
- All spilled hazardous substances must be contained in impermeable containers for removal to a licensed hazardous waste site, (this includes contaminated soils, and drenched spill kit material).

10.13.5 Cement

- The contractors must provide and maintain a **method statement** for "cement and concrete batching". The method statement must provide information on proposed storage, washing & disposal of cement, packaging, tools and plants.
- The mixing of concrete must only be done at specifically selected sites on mortar boards or similar structures to contain run-off into soils rocky outcrops, streams and natural vegetation.
- Cleaning of cement mixing and handling equipment must be done using proper cleaning trays.
- All empty containers must be stored in a dedicated area and later removed from the site for appropriate disposal at a licensed facility.
- Any spillage that may occur must be investigated and immediate remedial action must be taken.
- The visible remains either of concrete, solid, or from washings, must be physically removed immediately or disposed of as waste to a registered landfill site.
- Cement batching areas must be located in an area where residues are contained and that the location does not fall within storm water channels.

10.13.6 Dangerous and Toxic Materials

(Provision of storage facilities)

- Materials such as fuel and oil must be sealed and stored in bermed areas or under lock and key, as appropriate, in well-ventilated areas.
- Sufficient care must be taken when handling these materials to prevent pollution. Training on the handling of dangerous and toxic materials must be conducted for all staff prior to the commencement of construction.
- In the case of pollution of any surface or groundwater, the Regional Representative of the **Department of Water and Sanitation (DW&S)** must be informed immediately.
- Storage areas must display the required safety signs depicting "no smoking", "No Naked lights" and "Danger". Containers must be clearly marked to indicate contents as well as safety requirements.
- The contractor must supply a **method statement** for the storage of hazardous materials.
- Material Safety Data Sheets (MSDS) must be prepared for all hazardous substances on site and supplied by the supplier where relevant. MSDS's must be updated as required.

10.13.7 Storage of fuels and oils

- The contractors must provide and maintain a **method statement** for "Fuel tanks and refuelling procedures".
- Fuel storage tanks on the site must be on an impervious surface that is bunded and able to contain at least 110% of the volume of the tanks. The filler tap must be inside the bunded area where possible and the bund wall must not have a tap or valve.
- A Flammable Liquid License must be obtained for diesel volumes greater than 200 litres.
- Environmental Authorisation is required for volumes greater than 80 000 litres
- 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).
- Fuel storage tanks must be placed so that they are out of the way of traffic, so that the risk of the tanks being ruptured or damaged by vehicles is minimised.

10.13.8 Use of dangerous and toxic materials

- The contractor must keep the necessary materials and equipment on site to deal with spills/ fire of the materials present should they occur.
- The contractor must set up a procedure for dealing with spills/ fire, which will include notifying the ECO and the relevant authorities prior to commencing with construction. These procedures must be developed in consultation with and approval by the appointed ECO.
- A record must be kept of all spills and the corrective action taken.

10.13.9 Toilets and ablution facilities

- The contractor is responsible for providing all sanitary arrangements for his and the sub-contractors team. A minimum of one chemical toilet must be provided per 15 persons.
- Sanitary arrangements must be to the satisfaction of the ECO. Toilets must be of the chemical type. 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.
- Toilets provided by the contractor must be easily accessible and a maximum of 50m from the works area to ensure they are utilised. All toilets will be located within the contractor's camp. Should toilets be needed elsewhere, their location must first be approved by the ECO.
- The contractor must ensure that toilets are moved with the labour force.
- The contractor must be responsible for the cleaning, maintenance and servicing of the toilets. The contractor must ensure that all toilets are cleaned and emptied before the builder's or other public holidays.
- Toilets out on site must be secured to the ground and have a sufficient locking mechanism operational at all times.

10.13.10 Waste management

- The contractors must provide and maintain a **method statement** for "solid waste management". The method statement must provide information on the proposed licensed facility to be utilised and details must be kept of record keeping for auditing purposes.
- Waste must be separated into recyclable and non-recyclable waste, and must be separated as follows:
 - **Hazardous waste:** including (but not limited to) old oil, paint, etc.,
 - **General waste:** including (but not limited to) construction rubble.
- Any illegal dumping of waste must not be tolerated, this action will result in a fine and if required further legal action will be taken. This aspect must be closely monitored and reported on; proof of legal dumping must be able to be produced on request.
- Bins must be clearly marked for ease of management.
- All refuse bins must have a lid secured so that animals cannot gain access.
- Sufficient closed containers must be strategically located around the construction site to handle the amount of litter, wastes, rubbish, debris, and builder's waste generated on the site.
- 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.
- 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.

- Chemical containers and packaging brought onto the site must be removed for disposal at a suitable site.
- A skip, with a cover, must be used to contain refuse from campsite bins, rubble and other construction material.

10.13.11 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 and the details of the licenses acquired for such usage.
- **Potable water must, wherever possible, not be used as a means of dust suppression**, and alternative measures must be sourced. The use of 'grey' water must be investigated as an alternative. The contractor will be responsible to source this water and obtain the required approvals to utilise this water for the purpose of dust suppression.
- The construction camp must be watered during dry and windy conditions to control dust fallout.
- Dust production must be controlled by regular watering of roads and work area, should the need arise.
- At the end of construction, the site camp must be fully rehabilitated by removing the temporary surface, ripping the area to loosen the soil and the area must be re-vegetated with local indigenous vegetation only.
- All vehicles transporting upgrading material (e.g. soil, rubble etc.) must be covered with a tarpaulin, and speed limits of 20 km/h must be adhered to.
- Excessive dust conditions must be reported to the ECO.
- All forms of dust pollution must be managed in terms of the Atmospheric Pollution Prevention Act, 1965 (Act No. 45 of 1965)

10.13.12 Workshop equipment, maintenance and storage

- The contractors must provide and maintain a **method statement** for "workshop maintenance and cleaning of plant".
- Leaking equipment must be repaired immediately or be removed from site to facilitate repair. All potentially hazardous and non-degradable waste must be collected and removed to a registered waste site.
- Cleaning and remediation must be done with products that are in line with best environmental practice.
- A **method statement** is required from the Contractor, tendering for the project to show procedures for dealing with possible emergencies that can occur, such as fire and accidental leaks and spillage.
- The Contractor must be in possession of an emergency spill kit that is complete and available at all times on site. The Contractor must ensure that senior and other relevant members of the workforce are trained in dealing with spills by using emergency spill kits.
- The following must be applied:
 - All contaminated soil shall be removed and disposed of as hazardous waste at a registered facility or placed in containers to be taken to one central point where bio-remediation can be done. (Bio-remediation should only be an option if an Environmental Authorisation has been issued)
 - A specialist Contractor shall be used for the bio-remediation of contaminated soil where the required remediation material and expertise is not available on site.
 - All spills of hazardous substances must be reported to the ECO.
- The contractor must comply with the regulations of the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993).

10.13.13 Noise

- In terms of noise impact for various increases over the ambient, the National Noise Regulations define an increase of 7dB as "disturbing". Noise levels during construction must therefore be kept within 7dB of the

baseline data.

- All construction vehicles must be in a good working order to reduce possible noise pollution.
- Noisy activities must be reserved for daytime hours.

10.13.14 Fires

- The contractors must provide and **maintain a method statement** for "fires", clearly indicating where and for what, fires will be utilised plus details on the fuel to be utilised
- Absolutely no burning of waste is permitted.
- Fires will only be allowed in facilities especially constructed for this purpose within fenced Contractor's camps. Wood, charcoal or anthracite are the only fuels permitted to be used for fires. The contractor must provide sufficient wood (fuel) for this purpose.
- Fires within the designated areas must be small in scale so as to prevent excessive smoke being released into the air.
- The contractor must designate a smoking area for the labour force so as to prevent unanticipated incidents of veldt fires.
- No wood is to be collected, chopped or felled for fires from private or public property as well as from no-go or sensitive areas within the site and any surrounding natural vegetation.

10.13.15 Erosion and sedimentation

- Surface water or storm water must not be allowed to concentrate, or to flow down cut or fill sloped routes without erosion protection measures being in place.
- Ensure that storm water channels do not discharge straight down the contours. These must be aligned at such an angle to the contours that they have the least possible gradient.
- 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.
- All disturbed areas will require rehabilitation and must be mulched to encourage vegetation re-growth. Mulch used must be free from alien seed.
- These areas must be cordoned off so that vehicles or construction personnel cannot gain access to these areas.

10.13.16 Fauna

- All activities on site must comply with the regulations of the Animal Protection Act, 1962 (Act No. 71 of 1962).
- All construction workers must be informed that the intentional killing of any animal is not permitted as faunal species are a benefit to society. Poaching is illegal and it must be a condition of employment that any employee caught poaching will be dismissed. Employees must be trained on how to deal with fauna species as

intentional killing will not be tolerated. In the case of a problem animal e.g. a large snake, a specialist must be called in to safely relocate the animal if the ECO is not able to.

- 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.

10.13.17 Flora

- The contractor must rehabilitate the construction camp and any other disturbed areas once construction activities have terminated. Compacted areas will be ripped and mulched in order to ensure recovery of the natural vegetation cover. A method statement must be provided and maintained by the contractor.
- It is imperative to keep any disturbances associated with construction into the mid- and upper slopes of rocky hills, if development is approved, to an absolute minimum
- Once activities on site are complete, rehabilitation of un-built areas must be undertaken in order to restore the aesthetic & ecological value of the area.
- **Under no circumstances shall open fires be allowed on site**, fires will only be permitted in adequate facilities within the crew camp, Forest Act, 1984 (Act No. 122 of 1984).
- Two protected tree species *Vachellia erioloba* (Camel Thorn) and *Boscia albitrunca* (Shepherd's Tree) are found at the site. In terms of a part of section 15(1) of the National Forests Act No. 84 of 1998, no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a license granted by the Minister. If developments are approved, such a permit should be applied for.

10.13.18 Heritage

- 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.
- Should any archaeological artefacts be exposed during site activities, work on the area where the artefacts were found must cease immediately and the ECO must be notified within 48 hours.
- Under no circumstances must archaeological artefacts be removed, destroyed or interfered with.
- Graves always carry a High Cultural Significance rating and should not be impacted if possible and be left intact. If the site cannot be avoided then the graves can be exhumed and relocated after all due processes (social consultation/getting consent/permits have been obtained) have been successfully completed. The best would be however to keep the site fenced-off and protected

10.13.19 Crime, safety and security

- No site staff, other than security personnel and skeleton staff will be housed on site. Security personnel and skeleton staff must be supplied with adequate protective clothing, ablution facilities, water and refuse collection facilities, facilities for cooking and heating so that open fires are not necessary.
- 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.
- The contractor must ensure that all emergency procedures are in place prior to commencing work.

Emergency procedures must include (but not be limited to) fire, spills, contamination of the ground, accidents to employees, use of hazardous substances and materials, etc.

- The contractor must ensure that lists of all emergency telephone numbers / contact persons are kept up to date and that all numbers and names are posted at relevant locations throughout the construction site.
- The nearest emergency service provider must be identified during all phases of the project as well as its capacity and the magnitude of accidents it will be able to handle. The contact details of this emergency centre, as well as the police and ambulance services must be available at prominent locations around the construction site and the construction crew camps.

10.13.20 Visual Impact

- Rubble and litter must be removed every two weeks or more often as the need arises and be disposed of at a registered landfill.
- The ECO should comment on the visual impact as part of the ECO's monitoring requirements.

10.13.21 Hydrology

- In the event of pollution caused as a result of construction activities, the contractor, according to section 20 of the National Water Act, 1998 (Act No. 36 of 1998) is responsible for all costs incurred by organisations called to assist in pollution control and/or to clean up polluted areas.
- No wastewater may run freely into any naturally vegetated areas. Run-off containing high sediment loads must not be released into drainage channels.
- Approval must be obtained from DW&S for any activities that require authorisation in terms of Section 39 of the National Water Act, 1998 (Act No. 36 of 1998).

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 any 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 **Gamagara Local Municipality**. Ultimately, they will be responsible for the development and implementation of the EMP and for ensuring that the conditions in the eventual Environmental Authorization (EA) are satisfied. Although construction activities will be contracted out, the liability associated with non-compliance still rests with the Project Proponent. The Project Proponent (and not

the Contractor) is therefore responsible for liaising directly with the relevant authorities with respect to the preparation and implementation of the EMP and meeting EA conditions.

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

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

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

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

11.2.2 ENVIRONMENTAL CONTROL OFFICER (ECO)

The appointed Environmental Control Officer (ECO) is responsible for monitoring the site at regular intervals (including pre-construction set-up and final rehabilitation), in order to ensure that the provisions of this EMP 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, the progress of the implementation of this, 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, (Two protected tree species <i>Vachellia erioloba</i> (Camel Thorn) and <i>Boscia albitrunca</i> (Shepherd's Tree) are found at the site) 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

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
	The Contractor may not commence work on that activity until such time as the Method Statement has been approved in writing.	Contractor, PM, ECO	Continuous
	The Contractor must carry out the activities in accordance with the approved Method Statement.	Contractor, PM, ECO	Continuous
	Under certain circumstances, the PM may require changes to an approved Method Statement. In such cases the proposed changes must be agreed upon in writing between the Contractor and the PM, and appropriate records retained.	Contractor, PM, ECO	Continuous
	Approved Method Statements must be readily available on the site and must be communicated to all relevant personnel. Approval of the Method Statement shall not absolve the Contractor from any of his/her obligations or responsibilities in terms of the EMPr specifications.	Contractor, Proponent	Continuous
6. Existing services and infrastructure	The Contractor must ensure that existing services (e.g. roads, pipelines, power lines and telephone services) are not damaged or disrupted unless required by the contract and with the permission of the PM, ensuring the necessary 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	Contractor, ECO	Once-off

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
	the foreman has sufficient understanding to pass this information onto the construction staff.		
	Training must be provided to the staff members in the use of the appropriate fire-fighting equipment.	Contractor, Health and Safety Officer	Once-off
	The Contractor must ensure that all staff operating machinery/construction vehicles are adequately trained to carry out the designated tasks.	Contractor, Health and Safety Officer	Once-off
10. Worker health and safety	<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 location.</p> <p>Excavations and earth-moving may only take place within the demarcated working area</p>	Contractor ECO	Continuous

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
16. Groundwater contamination	Ensure vehicles are serviced and refuelled in bunded areas	Contractor	Continuous
	Ensure vehicles are checked weekly for faults and serviced timeously if faulty	Contractor	As required
	Should any leaks occur ensure contaminated soil is dug up to 1 cm below the level of visible contamination and disposed of as hazardous waste	Contractor	As required
	Drip trays should be placed under all vehicles remaining stationary for more than 24 hours	Contractor	Continuous
17. Noise	Limit construction activities to normal working hours	Contractor	Continuous
	Coincide any excessively noisy activities to minimise duration of inconvenience	Contractor	As required
	Ensure noise standards are complied with and that construction staff are provided with personal protective equipment when undertaking noisy operations	Contractor	Continuous
18. Safety	No children on construction site. Safety fence and controlled access should be enforced Safety signs with necessary information displayed	Proponent Contractor ECO	Continuous
19. No go areas	Any sensitive areas identified as such by the ECO need to be considered no-go areas.	Contractor, ECO	Monthly
	The Contractor must, as advised by the ECO, erect temporary fencing along the perimeter of designated sensitive no-go areas. Temporary fencing must, as a minimum, consist of wooden or metal posts at 3 m intervals, with two plain wire/plastic strands tensioned horizontally at heights of 300 mm and 900 mm above the ground – it is essential that the strands are visible. The Contractor must maintain in good order all demarcation fencing and barriers for the duration of construction activities, or as otherwise instructed. Commercial type danger tape should not be used, as this perishes rapidly, and pollute the environment when torn and blown away by strong winds.	Contractor, ECO	Once-off, as required
20. 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
21. Erosion control	Wind screening and stormwater control must be undertaken where required by the ECO to prevent soil loss from the site.	Contractor, ECO	Twice monthly

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
	The use of silt fences and sand bags must be implemented in areas that are susceptible to erosion, if required by the ECO.	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
22. Hazardous materials	Use and or storage of materials, fuels and chemicals which could potentially leak into the ground must be controlled.	Contractor, ECO	Monthly
	Any hazardous substances must be stored at least 50m from any of the watercourses on site in a bunded area.	Contractor, ECO	Monthly
	The Contractor must ensure that potentially harmful materials are properly stored in a dry, secure, ventilated environment, with concrete or sealed flooring and a means of preventing unauthorised entry. Such materials may also be temporarily stored on drip-trays.	Contractor, ECO	Monthly
	Contaminated wastewater must be managed by the Contractor to ensure existing water resources on the site are not contaminated. All wastewater from general activities in the camp must be collected and removed from the site for appropriate disposal at a licenced waste disposal facility or sewage works.	Contractor, ECO	Monthly
	All storage tanks containing hazardous materials must be placed in bunded containment areas with sealed surfaces. The bund wall must be high enough to contain 110% of the total volume of the stored hazardous material. Such bunded areas must be regularly emptied of accumulated rainwater. Wastewater from such emptying, if contaminated, must be disposed at an appropriately licenced waste disposal facility or sewage works.	Contractor, ECO	Monthly
	In the event of a spill, the Contractor must take prompt action to clear polluted areas and prevent spreading of the pollutants. The Contractor will be liable to arrange for professional service providers to clear affected areas, if required.	Contractor, ECO	As required
	Proper facilities for the storage of oils, paints, grease, fuels, chemicals and any hazardous materials to be used must be provided to prevent the migration of spillage into the ground and groundwater. These pollution prevention measures for storage must include a bunded containment area with a wall high enough to contain at least 110% of any stored volume. This containment area must be sited at least 50m away from any drainage line, in a site approved by the ECO.	Contractor, ECO	Monthly
	Cement storage and batching must only take place in a bunded area, and any runoff		

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
	Any spillage, which may occur, must be investigated and immediate action must be taken. This must be reported to the ECO and to the relevant authorities if so required by the ECO.	Contractor, ECO	As required
23. Cement and concrete batching	Concrete must not be mixed on the ground, but in a bunded area with any runoff captured for disposal as hazardous wastewater.	Contractor, ECO	Continuous
	The batching area is to be located in an area of low environmental sensitivity, as approved by the ECO.	Contractor, ECO	Once-off
	Cement bags must only be stored in a covered, bunded area and not directly on the ground. Used cement bags must be disposed of as hazardous waste.	Contractor, ECO	Weekly
24. Hydrology 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
25. General materials handling, use and storage	Choice of location for storage areas must take into account prevailing winds, distances to the seasonal watercourses (50m minimum), general onsite topography and water erosion potential of the soil. Impervious surfaces must be provided where necessary.	Contractor, ECO, Health and Safety Officer	Once-off
	Storage areas must be designated, demarcated and fenced. Storage areas must be secure so as to minimize the risk of crime. They must also be safe from access by unauthorised persons. Fire prevention facilities must be present at all storage facilities.	Contractor, ECO	Monthly
	Material Safety Data Sheets (MSDSs) must be readily available on site for all chemicals and hazardous substances to be used on site. Where possible, the available MSDSs should include information on ecological impacts and measures to minimise negative environmental impacts during accidental spills.	Contractor, ECO, Health and Safety Officer	Once-off, as required
	Clear signage must be placed at all storage areas containing hazardous substances / materials.	Contractor, ECO, Health and Safety Officer	Once-off
	The Contractor must be responsible for the training and education of all personnel on site who will be handling the hazardous material about its proper use, handling and disposal. The Contractor must ensure that information on the management of spill and accidental ingestion is kept on site. Staff dealing with these materials / substances must be aware of their potential impacts and follow the appropriate safety measures.	Contractor, Health and Safety Officer	Once-off
	The provisions of the Hazardous Chemical Substances Regulations promulgated in terms of the Occupational Health and Safety Act 85 of 1993 and the SABS Code of Practice must be adhered to. This applies to solvents and other chemicals possibly used in the construction time.	Contractor, Health and Safety Officer	Continuous
	The Contractor must ensure that its staff is made aware of the health risks associated with any hazardous substances used and has been provided with the appropriate protective	Contractor, Health and Safety Officer	Continuous

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
	clothing/equipment in case of spillages or accidents and have received the necessary training.		
	All excess cement and concrete mixes must be contained on the construction site prior to disposal off site.	Contractor, ECO	Monthly
	Hazardous substances must be stored at least 50m away from any water bodies on site to avoid pollution.	Contractor, ECO	Monthly
26. Fuel storage	Topsoil and subsoil to be protected from contamination.	Contractor, ECO	Monthly
	Fuel and material storage must be away from stockpiles and the seasonal pan on site in appropriate containers in a bunded area.	Contractor, ECO	Twice monthly
	Chemicals must be mixed on an impermeable surface and provisions must be made to contain spillages or overflows into the soil.	Contractor, ECO	Monthly
	Any storage tanks containing hazardous materials must be placed in bunded containment areas with sealed surfaces. The bund walls must be high enough to contain 110% of the total volume of the stored hazardous material. Drip trays may be used for temporary storage of such materials.	Contractor, ECO	Monthly
	Contaminated soil must be contained and disposed of off-site at an approved hazardous waste disposal site.	Contractor, ECO	Monthly
27. Transportation	Material must be appropriately secured to ensure safe passage between destinations during transportation. Loads must have appropriate cover to prevent them spilling from the vehicle during transit. The Contractor must be responsible for any clean-up resulting from the failure by his employees or suppliers to properly secure transported materials.	Contractor, ECO, Health and Safety Officer	Monthly
28. 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
	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 wastes 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
29. Hazardous management	waste The waste, resulting from the use of hazardous materials, must be disposed of at a registered hazardous waste disposal site by a certified waste disposal Contractor as approved by the ECO. A	Contractor, ECO	As required

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
	disposal certificate must be obtained from the disposal Contractor.		
	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
30. 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
31. Worker health and safety	Safety measures, work procedures and first aid must be implemented on site.	Contractor, , Health and Safety Officer	Monthly
	A Health and Safety Plan in terms of the Occupational Health and Safety Act (Act No. 85 of 1993) must be drawn up to ensure worker safety.	Contractor, Health and Safety Officer	Once-off
	Workers must be thoroughly trained in using potentially dangerous equipment.	Contractor, Health and Safety Officer	As required
	Contractors must ensure that all equipment is maintained in a safe operating condition.	Contractor	Monthly
	A safety officer must be appointed.	Contractor	Once-off
	A record of health and safety incidents must be kept on site.	Contractor, , Health and Safety Officer	Monthly
	Any health and safety incidents must be reported to the project manager immediately.	Contractor, , Health and Safety Officer	As required

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
	First aid facilities must be available on site at all times. All incidents requiring first aid occurring on site must be recorded in the incidents book on site.	Contractor, , Health and Safety Officer	Monthly
	A record must be kept of medication administered or precautions taken and the time and dates when this was done. This can then be used as evidence in court should any claims be instituted against the Contractor.	Contractor, , Health and Safety Officer	Monthly
	Material stockpiles or stacks must be stable and well secured to avoid collapse and possible injury to site workers / local residents.	Contractor, ECO, Health and Safety Officer	Monthly
32. Personal Equipment	Protective Personal Protective Equipment (PPE) must be made available to all construction staff and must be compulsory. Hard hats and safety shoes must be worn at all times and other PPE worn were necessary i.e. dust masks, ear plugs etc.	Contractor, ECO, Health and Safety Officer	Monthly
	No person is to enter the portion of the site where construction activities are being undertaken without the necessary PPE.	Contractor, ECO, Health and Safety Officer	Monthly
	SABS Standards and specifications governing dangerous processes such as welding must be strictly applied, with a view to proper protection of the public and workers.	Contractor, ECO, Health and Safety Officer	As required
33. Fauna and Flora	Implement the eradication programme for invasive species in terms of the Conservation of Agricultural Resources Act (Act No. 43 of 1983).	Contractor, ECO	Monthly
	Institute the rehabilitation of areas as soon as construction activity allows it.	Contractor, ECO	As required
	No disturbance, capture or injury of any fauna will be permitted. Should any fauna be found on site it must be removed from site by the ECO or a suitably qualified person.	Contractor, ECO	Continuous

12. MONITORING, AUDITING AND REPORTING

The Applicant (***Gamagara Local Municipality***) is responsible for ensuring that all environmental management measures prescribed in this EMP 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.

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.