

ENVIRONMENTAL IMPACT ASSESSMENT
DRAFT ENVIRONMENTAL IMPACT
ASSESSMENT REPORT
LEEUFONTEIN X24 PROJECT
GAUT: 002/16-17/E0160

JANUARY 2017



LEEUFONTEIN X 24 DRAFT EIA REPORT
GAUT: 002/16-17/E0160

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Acronyms

BID	Background Information Document
BT	Biodiversity Threshold
CARA	Conservation Act of Agricultural Resources Act, 1983 (Act 43 of 1983).
CBA	Critical Biodiversity Area
CBNRM	Community Based Natural Resource Management
CMA	Catchment Management Agencies
CoT	City of Tshwane
C-Plan	Conservation Plan
CR	Critically Endangered
DMR	Department of Mineral Resources
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
ECA	Environment Conservation Act, 1989 (Act No. 73 of 1989)
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMPr	Environmental Management Programme
EN	Endangered
ESA	Ecological Support Area
FSR	Final Scoping Report
GAPA	Gauteng Agricultural Potential Atlas
GDARD	Gauteng Department of Agriculture and Rural Development
IDP	Integrated Development Plan
HGM	Hydrogeomorphic
HIA	Heritage Impact Assessment
I&APs	Interested and Affected Parties
IBA	Important Bird Areas
IEM	Integrated Environmental Management
KLM	Kungwini Local Municipality
LT	Least Threatened

MPRDA	Mineral and Petroleum Resources Development Act (Act No. 28 of 2002)
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEMWA	National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
NEMAQA	National Environment Management: Air Quality Act (No.39 of 2004)
NEMPAA	National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
NFEPA	National Fresh Water Ecosystem Priority Areas
NLM	Nokeng Tsa Taemane Local Municipality
NPAES	National Protected Areas Expansion Strategy
NWA	National Water Act (Act 36 of 1998)
PDA	Primary Drainage Area
PES	Present Ecological State
PPP	Public Participation Process
PoS	EIA Plan of Study for Environmental Impact Assessment
QDA	Quaternary Drainage Areas
QDS	Quarter Degree Square
REMC	Recommended Ecological Management Class
SDF	Spatial Development Framework
SR	Scoping Report
SAHRA	South African Heritage Resources Agency
SWSA	Strategic Water Source Areas of South Africa
VU	Vulnerable
WMA	Water Management Areas

Glossary of Terms

Activity (Development) – an action either planned or existing that may result in environmental impacts through pollution or resource use.

Alternative – a possible course of action, in place of another, of achieving the same desired goal of the proposed project. Alternatives can refer to any of the following but are not limited to: site alternatives, site layout alternatives, design or technology alternatives, process alternatives or a no-go alternative. All reasonable alternatives must be rigorously explored and objectively evaluated.

Applicant – the project proponent or developer responsible for submitting an environmental application to the relevant environmental authority for environmental authorisation.

Biodiversity – the diversity of animals, plants and other organisms found within and between ecosystems, habitats, and the ecological complexes.

Construction – means the building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity but excludes any modification, alteration or expansion of such a facility, structure or infrastructure and excluding the reconstruction of the same facility in the same location, with the same capacity and footprint.

Cumulative Impacts – impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities to produce a greater impact or different impacts.

Direct impacts – impacts that are caused directly by the activity and generally occur at the same time and at the same place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally quantifiable.

Ecosystem – a dynamic system of plant, animal (including humans) and micro-organism communities and their non-living physical environment interacting as a functional unit. The basic structural unit of the biosphere, ecosystems are characterised by interdependent interaction between the component species and their physical surroundings. Each ecosystem occupies a space in which macro-scale conditions and interactions are relatively homogenous.

Environment – In terms of the National Environmental Management Act (NEMA) (Act No 107 of 1998) (as amended), “Environment” means the surroundings within which humans exist and that are made up of:

- a) the land, water and atmosphere of the earth;
- b) micro-organisms, plants and animal life;
- c) any part or combination of (i) of (ii) and the interrelationships among and between them; and
- d) the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing.

Environmental Assessment (EA) – the generic term for all forms of environmental assessment for projects, plans, programmes or policies and includes methodologies or tools such as environmental impact assessments, strategic environmental assessments and risk assessments.

Environmental Authorisation – an authorisation issued by the competent authority in respect of a listed activity, or an activity which takes place within a sensitive environment.

Environmental Assessment Practitioner – the individual responsible for planning, management and coordination of environmental impact assessments, strategic environmental assessments, environmental management programmes or any other appropriate environmental instrument introduced through the EIA Regulations.

Environmental Impact – a change to the environment (biophysical, social and/ or economic), whether adverse or beneficial, wholly or partially, resulting from an organisations, activities, products or services.

Environmental Impact Assessment (EIA) – the process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made.

Environmental Issue – a concern raised by a stakeholder, interested or affected parties about an existing or perceived environmental impact of an activity.

Environmental Management - ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

Environmental Management Programme - A detailed plan of action prepared to ensure that recommendations for enhancing or ensuring positive impacts and limiting or preventing negative environmental impacts are implemented during the life cycle of a project. This EMP focuses on the construction phase, operation (maintenance) phase and decommissioning phase of the proposed project.

Expansion - means the modification, extension, alteration or upgrading of a facility, structure or infrastructure at which an activity takes place in such a manner that the capacity of the facility or the footprint of the activity is increased.

Fatal Flaw – issue or conflict (real or perceived) that could result in developments being rejected or stopped.

General Waste – household water, construction rubble, garden waste and certain dry industrial and commercial waste which does not pose an immediate threat to man or the environment.

Hazardous Waste – waste that may cause ill health or increase mortality in humans, flora and fauna.

Indirect impacts – indirect or induced changes that may occur as a result of the activity. These types of impacts include all of the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.

Integrated Environmental Management – a philosophy that prescribes a code of practice for ensuring that environmental considerations are fully integrated into all stages of the development and decision-making process. The IEM philosophy (and principles) is interpreted as applying to the planning, assessment, implementation and management of any proposal (project, plan, programme or policy) or activity – at local, national and international level - that has a potentially significant effect on the environment. Implementation of this philosophy relies on the selection and application of appropriate tools for a particular proposal or activity. These may include environmental assessment tools (such as strategic environmental assessment and risk assessment), environmental management tools (such as monitoring, auditing and reporting) and decision-making tools (such as multi-criteria decision support systems or advisory councils).

Mitigate – the implementation of practical measures designed to avoid, reduce or remedy adverse impacts or enhance beneficial impacts of an action.

No-Go Option – in this instance the proposed activity would not take place, and the resulting environmental effects from taking no action are compared with the effects of permitting the proposed activity to go forward.

Open Space – environmentally sensitive areas which are not suitable for development and consist of watercourses, buffers, floodplains, steep slopes, sensitive biodiversity and/or areas of cultural or heritage significance.

Registered interested and affected party – in relation to an application, means an interested and affected party whose name is recorded in the register opened for that application in terms of regulation 42 of the 2014 EIA Regulations.

Rehabilitation – a measure aimed at reinstating an ecosystem to its original function and state (or as close as possible to its original function and state) following activities that have disrupted those functions.

Scoping – the process of determining the spatial and temporal boundaries (i.e. extent) and key issues to be addressed in an environmental assessment. The main purpose of scoping is to focus the environmental assessment on a manageable number of important questions. Scoping should also ensure that only significant issues and reasonable alternatives are examined.

Sensitive environment – any environment identified as being sensitive to the impacts of the development.

Significance – significance can be differentiated into impact magnitude and impact significance. Impact magnitude is the measurable change (i.e. magnitude, intensity, duration and likelihood). Impact significance is the value placed on the change by different affected parties (i.e. level of significance and acceptability). It is an anthropocentric concept, which makes use of value judgments and science-based criteria (i.e. biophysical, social and economic).

Stakeholder engagement – the process of engagement between stakeholders (the proponent, authorities and I&APs) during the planning, assessment, implementation and/or management of proposals or activities.

Sustainable Development – development which meets the needs of current generations without hindering future generations from meeting their own needs.

Watercourse – means:

a) a river or spring;

- b) a natural channel or depression in which water flows regularly or intermittently;
- c) a wetland, lake or dam into which, or from which, water flows; and
- d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse as defined in the National Water Act, 1998 (Act No. 36 of 1998) and a reference to a watercourse includes, where relevant, its bed and banks.

Wetland – means land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.

1 Introduction

1.1 Background

MR Aust Sandwerke CC (the applicant) proposes the establishment of a mixed-use development on **Portions 47, 49 & 50 of the farm Nooitgedacht 333 JR (the study area)** to be known as **Leeuwfontein X 24**. The study area is approximately 142 ha in extent and falls within the City of Tshwane Metropolitan Municipality, Gauteng Province. Access to the site will be obtained from the Moloto road (K54/R573) situated on the western boundary of the site. The proposed access road traverses Portion 46 of the farm Nooitgedacht 333 JR.

The study area is currently being utilized for the mining of sand, hard rock and clay. There was an existing old order mining license for the mining of sand on the property in the name of MR Aust Sandwerke CC. An application for the conversion to a new order mining right was submitted to the Department of Mineral Resources (DMR) but no feedback had been received to date.

The applicant appointed **Texture Environmental Consultants (Texture)** as the independent Environmental Assessment Practitioner (EAP) to undertake the Environmental Impact Assessment (EIA) for the proposed Leeuwfontein X 24 project.

Texture submitted an application for environmental authorisation to the approving authority (the Gauteng Department of Agriculture and Rural Development (GDARD)) on 6 October 2016. GDARD acknowledged receipt of this application on 7 October 2016 and issued the reference number for the project: **GAUT: 002/16-17/E0160**.

1.2 Approach to the Environmental Impact Assessment Process

The environmental impacts associated with the proposed project require investigation in compliance with the Environmental Impact Assessment Regulations (2014) published in Government Notice No. R. 982, R. 983, R. 984 and R. 985 read with Section 24 (5) of the National Environmental Management Act (NEMA Act No 107 of 1998) (as amended).

GDARD is the lead authority for this Environmental Impact Assessment (EIA) process and the development needs to be authorised by this Department in accordance with the National Environmental Management Act 107 of 1998 (NEMA) (as amended).

The required environmental process to be followed is being undertaken in two phases:

- **Phase 1: Scoping Phase (Completed)**
Scoping Report (SR) including Plan of Study for EIA
- **Phase 2: EIA Phase**
Environmental Impact Assessment Report (EIAR) and Environmental Management Programme (EMPr).

1.2.1 Scoping Phase (Completed)

The SR provided a description of the receiving environment and how the environment may be affected by the proposed development. Desktop studies making use of existing information were used to highlight and assist in the identification of potential significant impacts (both biophysical and social) associated with the proposed project.

Additional issues for consideration were extracted from feedback from the public participation process, which commenced at the beginning of the Scoping Phase, and will continue throughout the duration of the project. All issues identified during this phase of the study were documented within the SR. Thus, the SR provided a record of all issues identified as well as any fatal flaws, in order to make recommendations regarding the project and further studies required to be undertaken within the EIA phase of the proposed project.

The Final Scoping Report (FSR) was approved by GDARD on 10 November 2016. The letter of acceptance authorised the applicant to proceed with undertaking the EIA for the proposed Leeufontein X 24 development, in accordance with the tasks outlined in the Plan of Study for Environmental Impact Assessment. Specific additional conditions were listed in the acceptance letter.

GDARD requested the following amendments to the Plan of Study for EIA:

1. Land use alternatives and the No-Go alternative were investigated in the FSR. The alternative layout plans, designs and energy uses must also be investigated in the Draft EIAR.
Refer to Section 7.2 and 7.3.
2. The proposed and alternate layout plans must be printed in colour and overlaid with a sensitivity map; layout plans must be of acceptable paper size and scale.
Refer to Figures 22 & 23.
3. The layout plans must show the position of services, electricity supply cables (indicate above or underground), water supply pipelines, boreholes, sewage pipelines, septic tanks, storm water infrastructure (where possible), including servitudes indicating the purpose of the servitude.
Refer to Figure 5.
4. The layout plans must include all sensitive environmental elements on and within 100m of the site or sites (including the relevant buffers as described by the competent authority) including (but not limited thereto):
 - Rivers and wetlands
 - The 1:100 and 1:50 year flood line (where applicable)
 - Cultural and historical features (where applicable)
 - A buffer of 200m from the Class 2 Ridge on the site
Refer to Figures 22 & 23
5. There are several graves present on the proposed site. More information needs to be provided regarding the plan of action, whether the graves would be conserved or relocated.
Refer to Section 6.3.2
6. Social consultations need to be conducted with the surrounding residents to determine a way forward with the graves on site.
Refer to Section 6.3.2
7. Comments from the South African Heritage Resource Agency must be included in the Draft EIAR.
We are still awaiting comments from SAHRA
8. The entire site is located within the Dinokeng Nature Reserve; hence comments from Premier Game Park Management Team must be included in the Draft EIAR. The comments must address the potential impacts the proposed development will have on the Premier Game Park and the recommended buffer from the Game park.
Refer to Appendix E3 and E3b.
9. A 200m buffer must be kept from the Class 2 Ridge and must be displayed on the layout plan.

Refer to Section 62.

10. More information is required as to what is going to happen to the slime dams and the rainwater collecting dams on site. Comments from the Department of Water Affairs must be included in the Draft EIAR, as to assess the impacts on the watercourses.

Refer to Section 6.1.

We are still awaiting comments from DWS.

11. The following studies must be included in the Draft EIAR:
- A Biodiversity Specialist Assessment
 - A Wetland and Riparian Delineation Assessment
 - A Heritage Impact Assessment
 - A Geotechnical Study
 - A Traffic Impact Assessment
 - An Engineering Civil Services Study

Refer to Appendix D

12. The health risks of living on land previously used for mining must be assessed and included in the Draft EIAR.

Refer to Section 9.3

13. Inclusion of a comments and response report in the Draft EIAR which addresses all issues mentioned by all the Interested and Affected Parties.

Refer to Appendix E3

14. A comprehensive surface runoff and storm water management plan (SWMP) indicating how all surface runoff generated as a result of the residential development (during both the construction and operational phases) will be managed.

Refer to Section 3.4, Civil Services Report (Appendix D3) and EMPr (Appendix F)

15. A comprehensive Environmental Management Program (EMPr) for various phases of the proposed activity (construction and operational phases) must be developed and form part of the Draft EIAR. The EMPr must include a discussion on mitigation measures for all potential impacts as well as the persons responsible for implementing such measures. The EMPr must be practical, site specific and easily enforceable. Therefore you are requested to include site and activity specific mitigation measures in the EMPr.

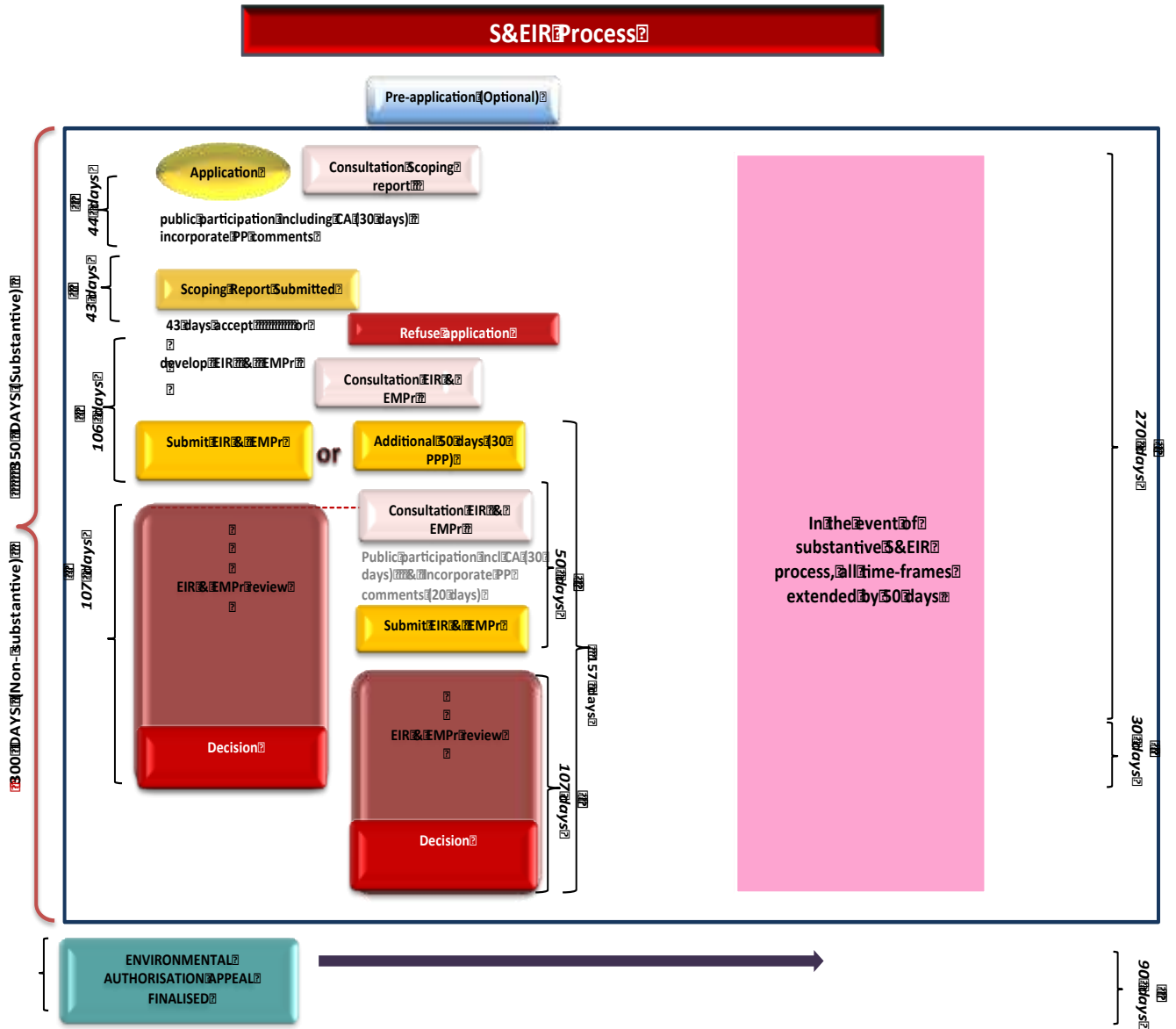
Refer to Appendix F

1.2.2 Environmental Impact Assessment Phase

The EIAR has aimed to achieve the following:

- to provide an overall assessment of the biophysical and social environments of the affected area;
- to undertake a detailed assessment of the preferred site/alternatives in terms of environmental criteria including the rating of significant impacts;
- to identify and recommend appropriate mitigation measures (to be included in an EMPr) for potentially significant environmental impacts; and
- to undertake a fully inclusive public participation process to ensure that I&AP issues and concerns are recorded and commented on and addressed in the EIA process.

The EIA process is represented diagrammatically in the Schedule below:



1.3 Content and Structure of the EIA Report

This report represents the Draft EIAR and was compiled in accordance with Section 23(3) of NEMA's 2014 EIA Regulations (GN R. 982), and contains the following:

- Details of the EAP who compiled the report and their expertise to carry out an EIA;
- Detailed description of the activity(ies);
- A description of the environment that might be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity;
- Details of the public participation process conducted during the scoping phase and the on-going consultation during the EIA phase;
- Description of the need and desirability of the activity including advantages and disadvantages that the activity may have on the environment and the community that may be affected by the activity;
- An indication of the methodology used in determining the significance of potential environmental impacts;
- A summary of the findings and recommendations of any specialist report or report on a specialised process;
- A description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures;
- An assessment of each identified potentially significant impact, including cumulative impacts, the nature of the impact, the extent and duration of the impact, the probability of the impact occurring, the degree to which the impact can be reversed, the degree to which the impact may cause irreplaceable loss of resources and the degree to which the impact can be mitigated;
- A description of any assumptions, uncertainties and gaps in knowledge;
- An opinion as to whether the activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;
- An environmental impact statement which contains a summary of the key findings of the environmental impact assessment; and a comparative assessment of the positive and negative implications of the activity.
- A draft Environmental Management Programme (EMPr) and
- Copies of any specialist reports and reports on specialised processes.

The report has been structured to comply with the format required by the NEMA. The contents are as follows:

TABLE 1: REPORT STRUCTURE

SECTION	CONTENT
SECTION 1 Introduction	Introduction and background to the project.
SECTION 2 Details of EAP	Presents information regarding the EAP involved in the proposed project.
SECTION 3 Locality and nature of the project	Provides detailed information regarding the proposed project and associated required infrastructure.
SECTION 4 Project motivation	Presents the need and desirability of the proposed project.
SECTION 5 Legal framework	Includes an explanation on all applicable legislation.
SECTION 6 Receiving environment	Provides the baseline information of the biophysical and social environments being impacted by the development proposal. Key findings of the specialist studies conducted.

SECTION 7 Project Alternatives	Consideration of alternatives (locality, land use, layout, designs, energy uses and No-Go) for the project.
SECTION 8 Public participation process	Provides an overview of the Public Participation Process conducted to date.
SECTION 9 Environmental Impact Assessment	The impacts identified are rated by significance.
SECTION 10 Environmental Impact Statement	Conclusions and recommendations of the Environmental Impact Assessment.

2 Details of Environmental Assessment Practitioner

As per the requirements of the National Environmental Management Act: NEMA, 1998 (Act No. 107 of 1998), (NEMA) and the EIA Regulations, December 2014, the following information is pertinent with regards to the Environmental Assessment Practitioner (EAP) that has been appointed for the Environmental Assessment Phase, for the proposed Leeuwfontein X 24 development.

Texture Environmental Consultants (Texture) is a specialist-consulting organisation focusing on key and pressing issues related to the environment. Texture has been in operation since 2006 and has successfully completed dozens of projects on behalf of numerous clients.

As an organisation Texture can either deliver one set of specialist services or deliver a broader solution that encompasses a number of specialist disciplines. Since 2006 we have built core competencies in a number of areas drawing on expertise our people have developed over the past 20 years. Our ability to synthesize various specialist disciplines into well-integrated analyses and findings forms the basis of our value proposition. As a consulting entity we often provide our clients with an end-to-end set of services that significantly mitigate the delivery and operational risk.

The multi-disciplinary structure of Texture engenders a sound holistic approach to environmental management and sustainability, which keeps abreast of the latest trends in the global environmental arena through personal development initiatives.

In order for the company to meet the emerging environmental challenges, Texture has assembled a team of professionals, consisting of a core of environmental experts with extensive experience in environmental assessments. The team includes environmentalists, various specialists, and public participation experts. A range of township developments as well as linear projects including water pipelines and power lines have been successfully completed over the years. **Refer to Company Profile attached as Appendix G and Table 2 for the EAP Details.**

TABLE 2: EAP DETAILS

Detail	Texture Environmental Consultants (Pty) Ltd	
Contact Persons	Ria Pretorius	Mientjie Coetzee
Postal Address	PO Box 36593 MENLOPARK Pretoria 0102	PO Box 36593 MENLOPARK Pretoria 0102
Telephone	082 568 6344	083 253 2246
Facsimile	086 689 1515	086 689 1515
E-mail	ria@peopletexture.co.za	mientjie@peopletexture.co.za
Qualification	Masters in Research Psychology (Environmental) Member IAIAAsa, Environmental Law Society	Master of Science Member IAIAAsa
Experience	Ria Pretorius is a career professional	Mientjie Coetzee has 14 years experience in

	Environmental Specialist with 30 years subject matter expertise in researching, consulting and managing interventions in Environmental Management and Sciences. Since 2004 she has specialized in Environmental Impact assessments and has successfully completed multiple projects for numerous clients. She has extensive experience in the conducting of Environmental impact assessments, inclusive of the required public participation, EMPs etc. A range of township development as well as linear projects including water pipelines and power lines have been successfully completed over the years.	the Environmental Sector and has gained experience as Environmental Consultant and Project Manager working on a wide range of projects including residential, mixed land-use, industrial, roads and filling stations. Her primary skills include Environmental Screening Assessments, Environmental Impact Assessments (EIAs), Waste Management License Applications, Public Participation and Environmental Management Programmes (EMPs).
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Texture Environmental Consultants has no vested interest in the proposed Leeuwfontein X 24 development and hereby declares its independence as required by the EIA Regulations.

3 Locality and Nature of Activity

3.1 Project Locality and Extent

The proposed development is situated in the eastern development areas of Tshwane – Region 5.

The study area is located north of Road K14 (Cullinan Road), directly east of Road K54 towards Moloto and directly south and abutting the proposed PWV 2 Road alignment. It is located in close proximity to established and newly development areas of Gem Valley townships, Glen Way Estate townships, Ramagopa Heights townships as well as approved townships Bloemendal Estates. **Please see Figure 1: Locality Map and Figure 2: Aerial Map.**

The proposed township is located **within the urban edge** in an area that is experiencing growth and has been identified as a priority area for Tshwane Human Settlements.

One existing access point on the K54 (traversing Portion 46 of the farm Nooitgedacht 333 JR) is initially planned with a future access on the K54 towards the south at the northern boundary of the approved township Ramagopa Heights. All these access points have been provided for on the basic planning of Gautrans on the road K54.

The applicable farm portions are indicated as follows:

TABLE 3: DESCRIPTION OF FARM PORTIONS

Description	Extent (ha)	SG Diagram No
Portion 47 of the farm Nooitgedacht 333 JR	95.41	T0JR00000000033300047
Portion 49 of the farm Nooitgedacht 333 JR	23.98	T0JR00000000033300049
Portion 50 of the farm Nooitgedacht 333 JR	23.40	T0JR00000000033300050
Total	142.79	

GPS coordinates of the centre of the site: 25°40'25.10" S; 28°26'19.59" E.

Please note: Enlargements of the Figures are included as Appendix A.

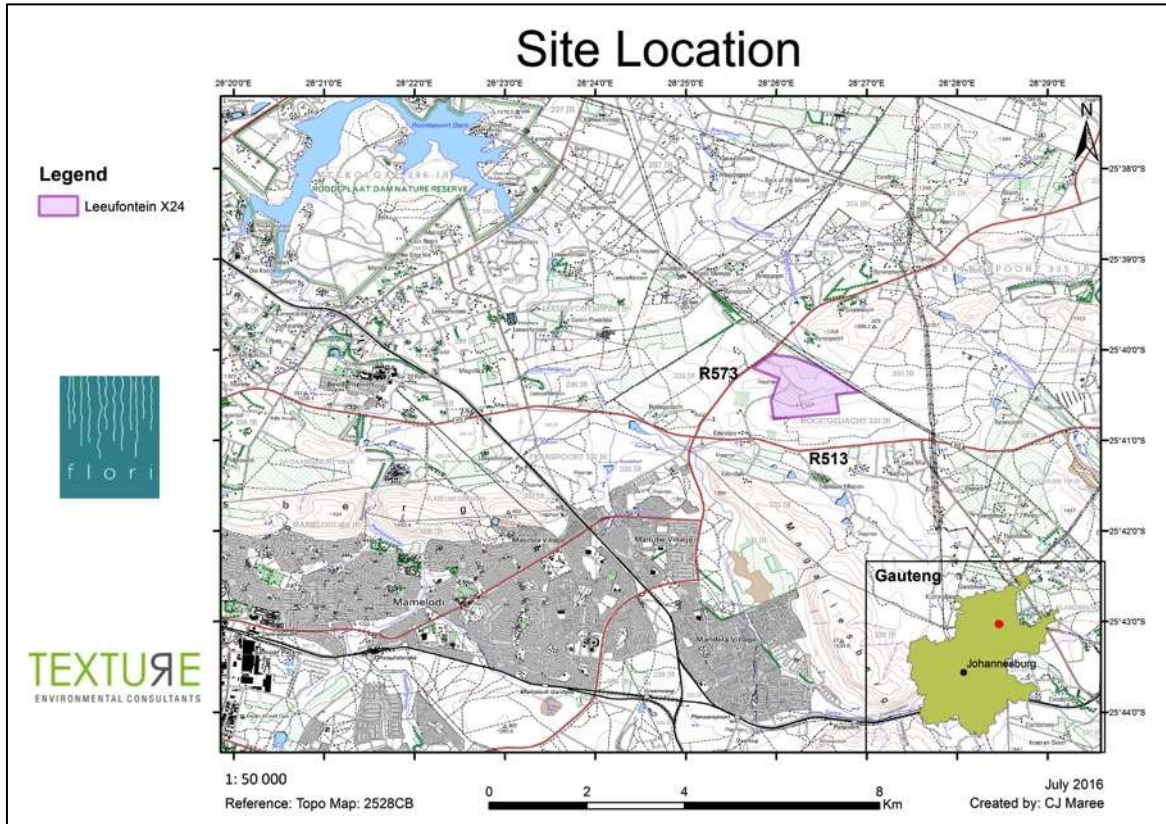


Figure 1: Locality Map



Figure 2: Aerial Map

3.2 Existing Land Use and Surrounding Land Uses

3.2.1 Existing Land Use

The study area is currently being utilized for the mining of sand, hard rock and clay. An old order mining license for the mining of sand was approved on 7 May 2003 under the name of MR Aust Sandwerke CC with reference number ML10/2003. The mining right was for the Remaining extent of Portion 1 of the farm Nooitgedacht 333-JR in the Cullinan District, which is now subdivided into 15 smaller portions and includes Portions 47, 49 and 50 of the farm Nooitgedacht 333-JR. The mineral that was initially applied for is Sand (General) only. A Section 102 Application in terms of the Mineral and Petroleum Resources Development Act (Act No. 28 of 2002) (MPRDA) was made for an increase in the mining area to include portions of Portions 49 and 50 and to include Hard Rock and Clay. The mining area would increase to 142,7981 hectares. Not all of this area will be mined though and some has already been rehabilitated while others will be conserved as open space. An application for the conversion to a new order mining right was submitted to the DMR but no feedback had been received to date. The Environmental Management Plan (EMP) submitted for the converted new order mining right was completed and approved by the DMR on 21 January 2013. An application will be made for the closure of the mine, which will include the decommissioning and rehabilitation of the mine.

The existing mine infrastructure include fixed and mobile screens, a processing plant, workshops, stores, general office buildings and staff accommodation.

Portions of the study area are used for agricultural purposes (crops and cattle). A Telkom mast is situated on the ridge situated on the southern boundary.

Refer to **Appendix B** for images of the study area illustrating views and existing land uses.

Existing Zoning

The farm portions are currently zoned "**Undetermined**" in terms of the TSHWANE Town Planning Scheme 2008 (Revised 2014). The purposes for which "Undetermined" zoned land may be used (and buildings may be erected) as prescribed by the town planning scheme, include **dwelling houses** and **agricultural buildings**

3.2.2 Surrounding Land Uses

The surrounding land uses are Residential (approved townships) and vacant land. **Refer to Figures 3 and 4.** The Cullinan Mine Premier Game Park is situated on the north-eastern boundary abutting the proposed PWV 2 road alignment.

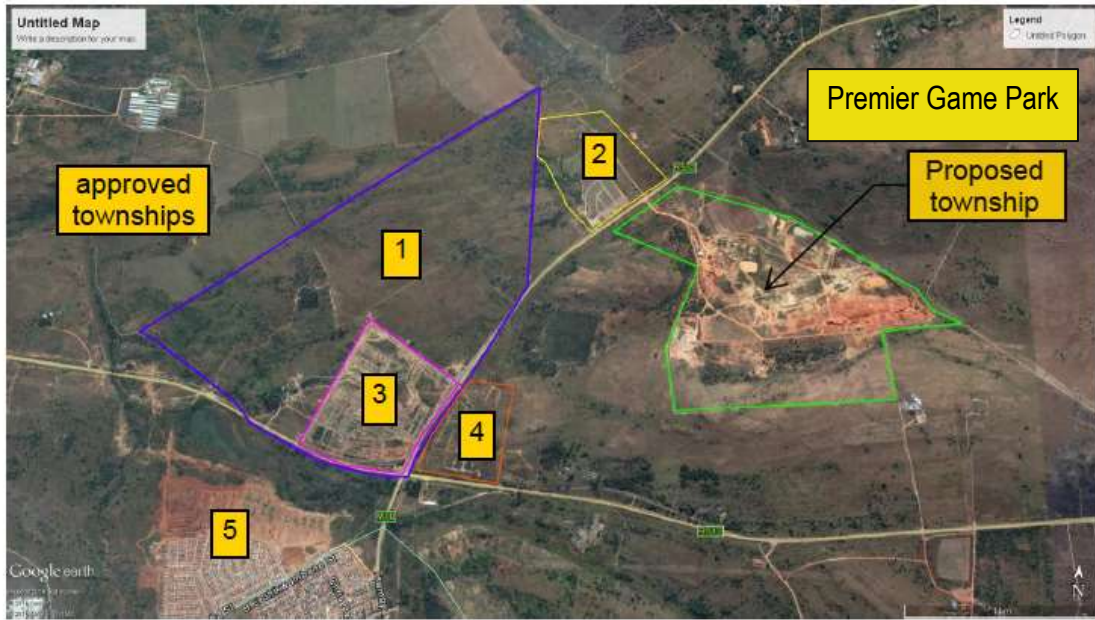


Figure 3: Surrounding Land Uses



Figure 4: Surrounding Land Uses (within 1.5km radius)

3.3 Project Description

The applicant proposes the establishment of a mixed use township consisting of the following land uses: Special mixed uses (commercial, business, light industrial); Residential 2 (30 units/ha); Residential 3 (60 units/ha); Community Facilities and Private Open Space; and Special for road/access. The township will be known as Leeuwfontein X 24. **Refer to Figure 5: Layout Plan.**

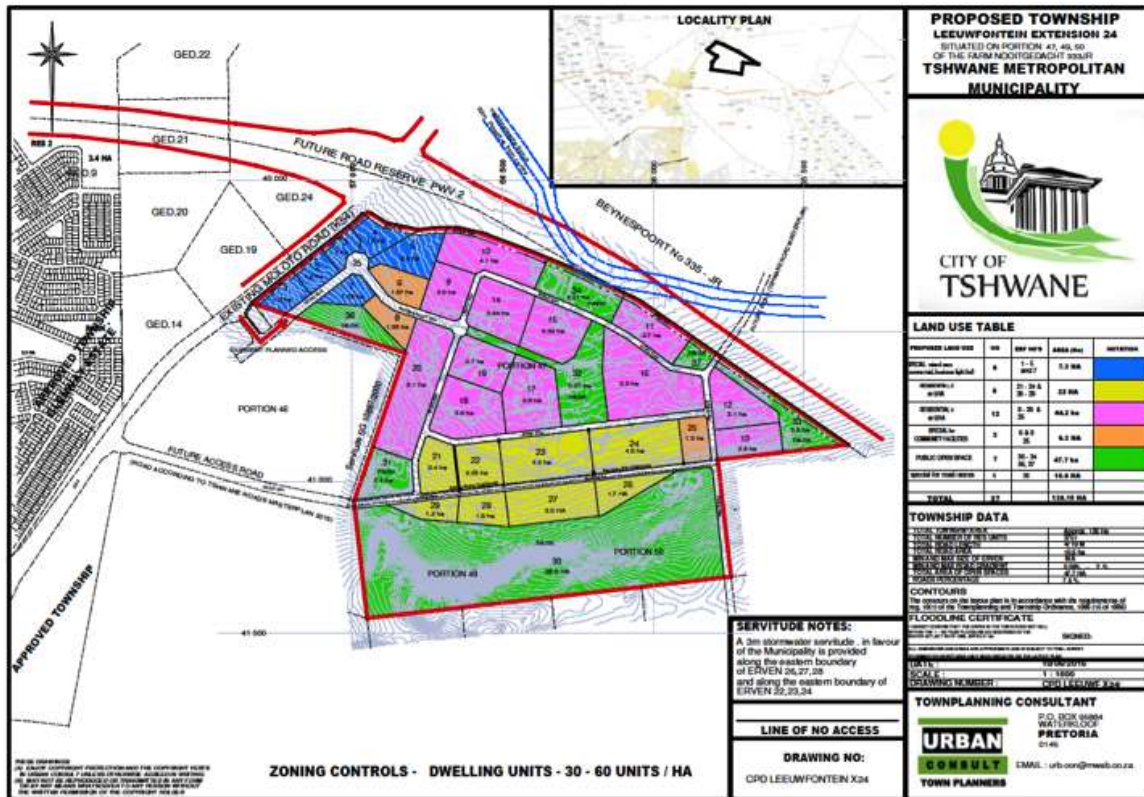


Figure 5: Layout Plan

Urban Consult Town Planners had been appointed for the establishment of the township in terms of Section 16(4) of the City of Tshwane Land Use Management By-Laws, 2016.

The proposal includes the construction of a mixed-use development consisting of the following land uses:

TABLE 4: LAND USE TABLE

Proposed Land Use	No of erven	Erf No's	Area
Special for mix use (commercial, business, light industrial)	6	1- 5 & 7	7.30 ha
Residential 2 (30 units/ha)	8	21 – 24 & 26 - 29	22.00 ha
Residential 3 (60 units/ha)	12	9 - 20	44.20 ha
Educational	3	6 & 8 & 25	6.30 ha
Public Open Space	7	30 – 34 & 36 & 37	47.70 ha
Special for road/access	1	35	10.60
Total	37		138.15 ha

TABLE 5: TOWNSHIP DATA

Total Township Area	Approximately 138 ha
Total Number of Residential Units	3751
Total Road length	4719m
Min and max size of erven	N/A
Min and Max road gradient	0,59% - 2%
Total Area of Open Spaces	42.7 ha
Roads percentage	7.6%

Refer to **Appendix C** for illustrations of the development concept.

3.4 Civil Services and Infrastructure (See **Appendix D.3 for the Civil Services Report**)

Encotech Consulting Engineers and Project Managers were appointed to undertake a civil services investigation in order to service the site. Present available input regarding service provision for the site is as follows:

3.4.1 Water Supply

Water Demand

The Average Daily Water Demand is estimated as 1 980.6 liter/day.
The expected peak flow is 124 liter/s excluding fire flow.

Bulk Supply

The bulk water supply arrangements described below are in accordance with the City of Tshwane's Water Master Plan, however, cognizance should be taken of the fact that the arrangements may change to suit the planning at the implementation.

The study area falls within the so-called Franspoort Reservoir Zone which will have to be constructed in the near future to cater for other developments within the region as well. According to current planning the Franspoort Reservoir will be supplied via a Rand Water Connection. A bulk supply pipeline will be laid from the Franspoort reservoir to the township. Interim arrangements could be made to supply from the Baviaanspoort Reservoir Zone (boosted supply). **Refer to Figure 6.**

Internal Water Supply

The water will be received from the City of Tshwane Municipality at a metered connection point described above from where it will be distributed within the township. Each erf will receive a metered water connection from the water reticulation system.

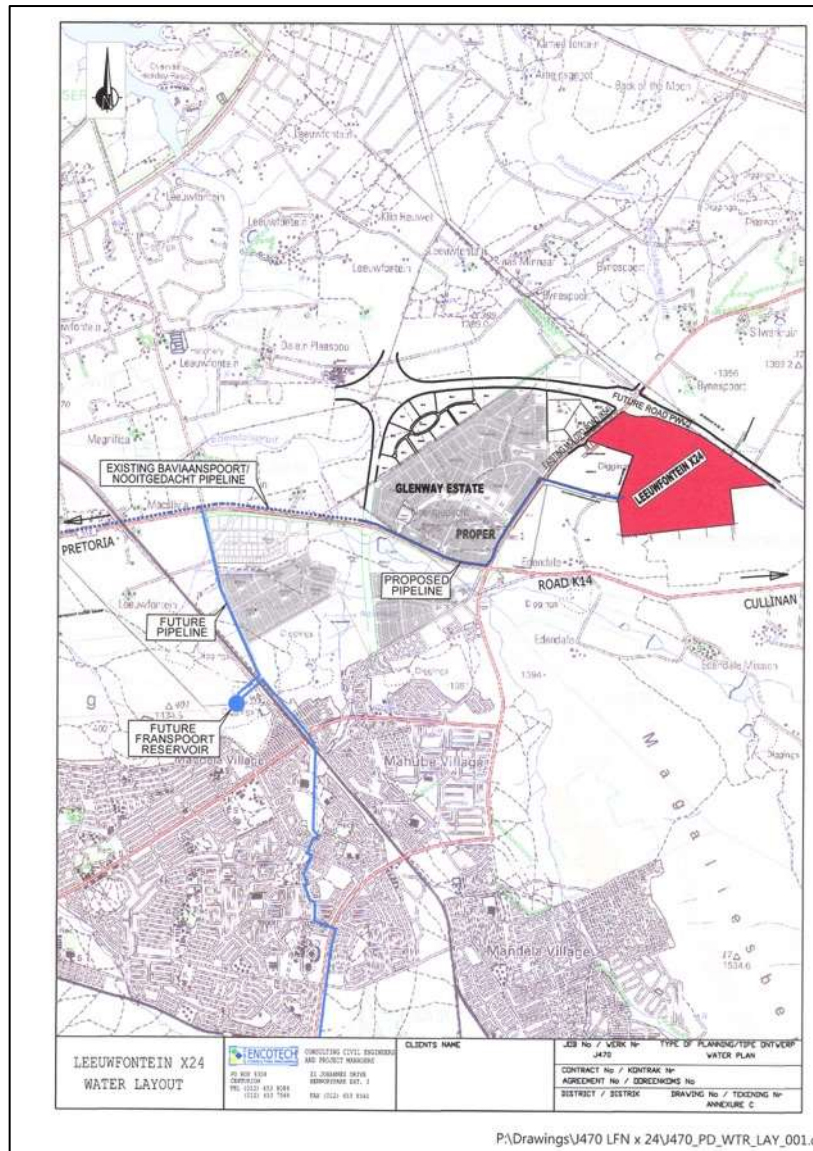


Figure 6: Bulk Water Layout

3.4.2 Sanitation

Township Contribution

The Average Daily Dry Weather Flow is estimated as 2 522.6 kl/day.
A peak flow of 73 l/s is expected.

Bulk Sanitation

The existing CoT Leeuwfontein outfall sewer is located to the west of the township. The outfall sewer will be extended to the east (Road K54/K14 Junction) and the entire township will connect to this sewer via its own internal system. The CoT Leeuwfontein outfall sewer delivers sewage to the existing Leeuwfontein Pumpstation from where it is pumped to the existing Baviaanspoort Sewage Purification Works. **Refer to Figure 7.**

Internal Sanitation

A collection system comprising conventional water borne sewers with manhole will be installed and each dwelling unit will receive a collection point. The collection system will deliver to a pump station and sewage will be pumped to a stilling chamber that connects to the main outfall sewer as shown on Plan. **Refer to Figure 7.**

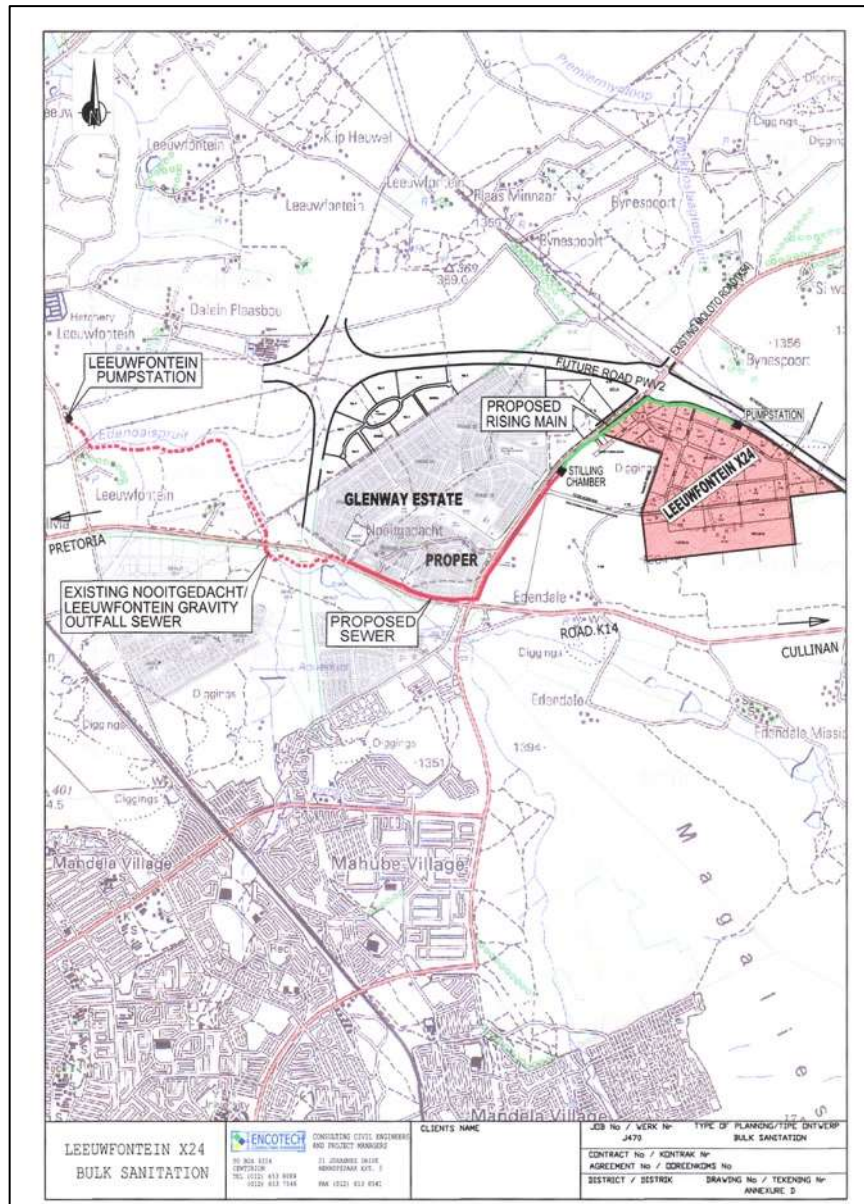


Figure 7: Bulk Sanitation

3.4.3 Stormwater

External Stormwater

The natural drainage is to the north of the township. The Melkboslaagte Spruit, a tributary of the Premierrynloop is to the north of the township and all stormwater emanating from the township will be discharged into this water course. **Refer to Figure 8.**

An external stormwater system will have to be installed according to the City of Tshwane’s Stormwater Master Plan. The distance to the water course is very short and external works will be influenced by the future road PWV2. Details will emerge at the time of the preliminary design stage.

Internal Stormwater

Stormwater from within the township will be collected via the internal streets and kerb inlets for discharge into an underground piped system. The system will be designed to the City of Tshwane’s standards. The internal system will connect to the external system described above.

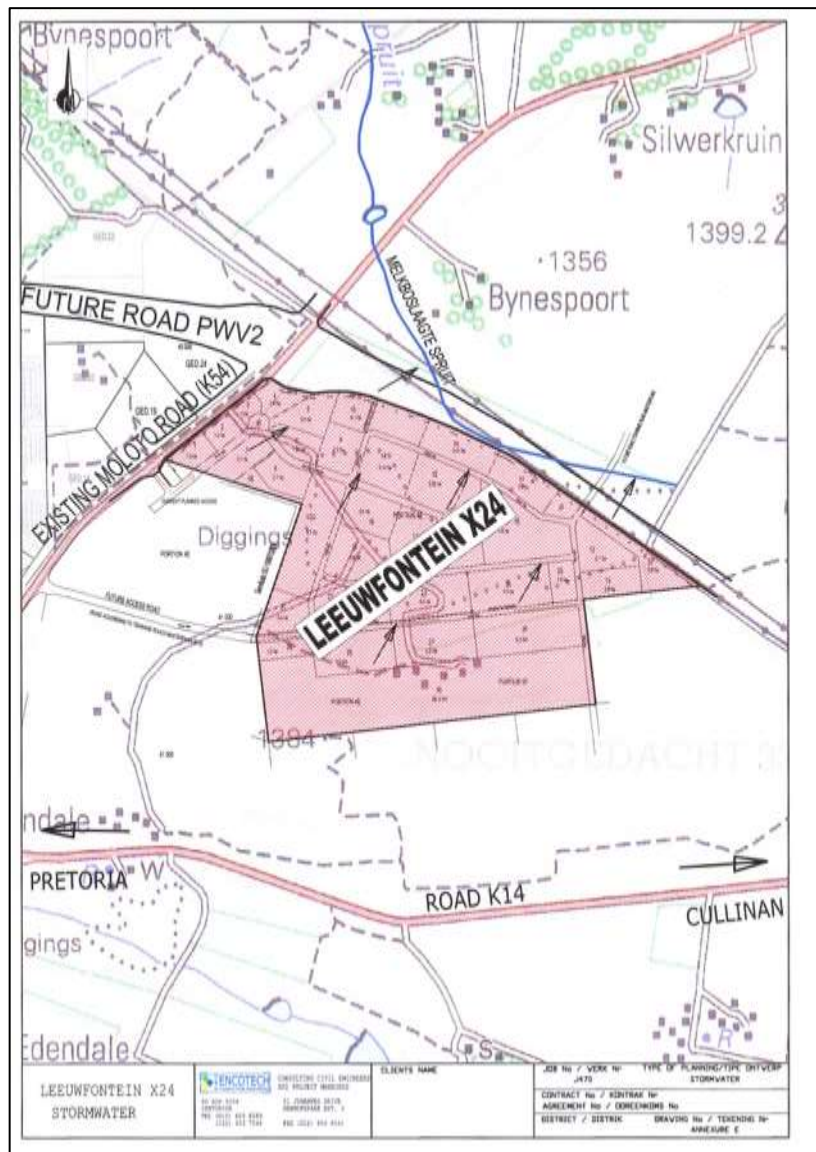


Figure 8: Stormwater Management Plan

3.4.4 Roads

Access

Access to the township will be obtained from the existing Road K54. The position of the access will be approved by Gautrans. **Refer to Figure 9.** The level of access will result from the findings of the Traffic Impact Study and the specifications and standards of Gautrans will be adhered to.

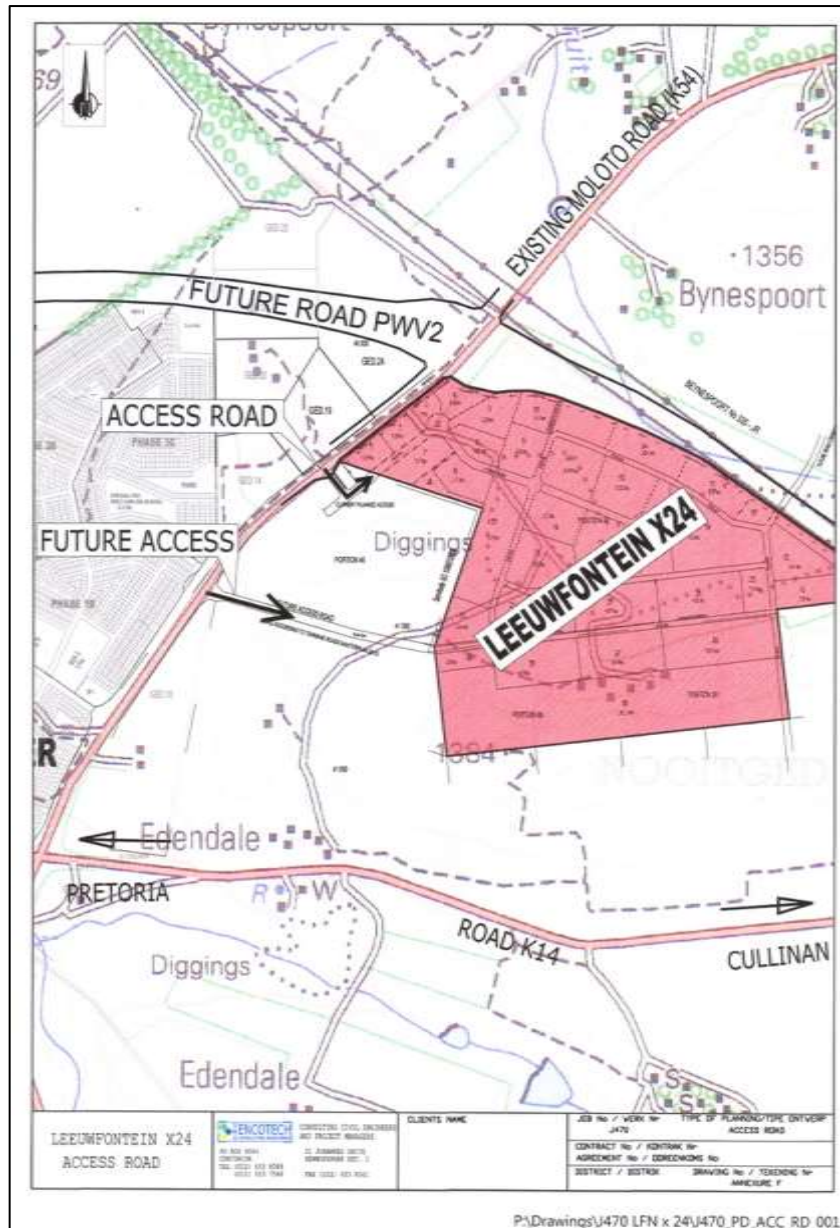


Figure 9: Access Road

3.4.4 Floodline

The property is affected by a 1:100 year floodline and its position will be determined at a later stage.

3.4.5 Design

Professionally registered persons will design all services and the installations of the services will take place under their supervision. The Design Guidelines of the City of Tshwane Municipality will be used in the planning of the services.

3.4.6 Bulk Contributions

The Developer will pay bulk contributions to the CoT. The details of this will be available after the Conditions of Establishment and Final Services Reports have been approved.

3.5 Traffic and Road infrastructure

Pieter Wilken was appointed to assess the impact the proposed development will have on the existing road infrastructure. (See Appendix D.4, Traffic Impact Assessment Report).

Conclusions and recommendations

It is concluded from the results of the traffic analysis that the proposed development would have a significant impact on the current road network when developed to its full potential. The existing road network direct adjacent to the site provides sufficient capacity for low-volume trip generators. However, the major traffic intersections between the P207-1 (K54) route and P2-5 route do not have spare capacity available which implies that road upgrades will have to be provided by the developer(s) of this proposed township together with other developers in the region.

The future road network, Strategic Road Network, could be a valuable asset with regard to the provision of capacity in the region and an improvement of the accessibility of the development. There is however not clarity with regard to certain issues regarding the implementation of the Strategic Road Network as well as implementation of the Tshwane Roads Master Plan. Sufficient access capacity will however be available if these routes are implemented timeously.

Access to the site should be provided via the existing planned access points along P207-1 (future K54) as shown on the site layout plan. The developer(s) will have to provide the upgrades required for the existing P207-1 at the access intersection to ensure that sufficient capacity is available to accommodate the expected traffic to be generated – this should be addressed in separate studies that are to be conducted for each implementation phase.

Traffic control measures at intersections along the main roads will have to be changed once more development occurs in the region.

The developer must note that a bulk services contribution with regards to roads and stormwater will be payable before promulgation of the township. The applicable amount increases annually at a minimum rate of 6% and may change completely if the policy of the City of Tshwane with regard to bulk services contributions is to be changed for whatsoever reason. The City of Tshwane should consider the application of the contributions to provide the necessary road infrastructure in the region to improve accessibility in the region.

It is therefore the recommendation from the involved traffic engineer that the application for the proposed township development is approved in principle subject to the recommendations and notifications contained in the Traffic Impact Assessment Report.

4 Legal Framework

4.1 The Constitution of South Africa

Section 24 of the Constitution of South Africa (No. 108 of 1996) states that "...everyone has the right – (a) to an environment that is not harmful to their health or well-being; and ... (b) to have the environment protected,

for the benefit of present and future generations through reasonable legislative and other measures that (c) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.”

This protection encompasses preventing pollution and promoting conservation and environmentally sustainable development. These principles are embraced in the National Environmental Management Act (Act No. 107 of 1998) (as amended) and given further expression.

4.2 National Legislation and Regulations

The national legislations and regulations listed here are applicable to the proposed development and the requirements and obligations therein have been considered during the EIA process:

4.2.1 National Environmental Management Act, Act 107 of 1998 and EIA Regulations 2014

National Environmental Management Act, Act 107 of 1998: The Environmental Impact Assessment Regulations 2014: The NEMA EIA 2014 regulations and the listing notices thereto are relevant.

In terms of the EIA Regulations (GN R. 983, 984 and 985) of December 2014, a number of listed activities that may be triggered by the proposed project, and which will subsequently require environmental authorisation from GDARD, were identified during the scoping phase (*refer to Table 6*). The listed activities were confirmed during the EIA Phase (*refer to Table 7*).

Table 6: Possible Listed activities for the proposed Leeuwfontein X 24

Relative Notice	Activity No	Description (Verbatim and applicability to the project)
GN R983/2014	9	The development of infrastructure exceeding 1000 metres in length for the bulk transportation of water or storm water- (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where- (a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve; or (b) where such development will occur within an urban area. <i>Applicability</i> <i>Not applicable – within the urban edge</i>
GN R983/2014	10	The development and related operation of infrastructure exceeding 1000 metres in length for the bulk transportation of sewage, effluent, processwater, waste water, return water, industrial discharge or slimes (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where- (a) such infrastructure is for bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes inside a road reserve; or (b) where such development will occur within an urban area. <i>Applicability</i> <i>Not applicable – within the urban edge</i>
GN R983/2014	19	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from – (i) a watercourse; (ii) the seashore; or (iii) the littoral active zone, an estuary or a distance of 100 metres

		<p>inland of the high-water mark of the sea or an estuary, whichever is the greater –</p> <p>but excluding where such infilling, depositing, dredging, excavation, removal or moving –</p> <p>(a) will occur behind a development setback;</p> <p>(b) is for maintenance purposes undertaken in accordance with a maintenance management plan; or falls within the ambit of activity 21 of this Notice, in which case that activity applies.</p> <p><i>Applicability</i> <i>Not applicable – none of the above-mentioned activities applicable</i></p>
GN R983/2014	22	<p>The decommissioning of any activity requiring -</p> <p>(i) a closure certificate in terms of section 43 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002); or</p> <p>(ii) a prospecting right, mining right, mining permit, production right or exploration right, where the throughput of the activity has reduced by 90% or more over a period of 5 years excluding where the competent authority has in writing agreed that such reduction in throughput does not constitute closure.</p> <p><i>Applicability</i> <i>Not applicable – a separate EIA application will be submitted for the decommissioning of the mining activities</i></p>
GN R983/2014	24	<p>The development of-</p> <p>(i) a road for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or</p> <p>(ii) a road with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres; but excluding-</p> <p>(a) roads which are identified and included in activity 27 in Listing Notice 2 of 2014; or</p> <p>(b) roads where the entire road falls within an urban area.</p> <p><i>Applicability</i> <i>Not applicable – access roads and internal roads fall within the urban edge</i></p>
GN R983/2014	25	<p>The development and related operation of facilities or infrastructure for the treatment of effluent, wastewater or sewage with a daily throughput capacity of more than 2000 cubic metres but less than 15000 cubic metres.</p> <p><i>Applicability</i> <i>Not applicable – development will connect to the City of Tshwane Leeuwfontein Outfall Sewer</i></p>
GN R983/2014	26	<p>Residential, retail, recreational, tourism, commercial or institutional developments of 1000 square metres or more, on land previously used for mining or heavy industrial purposes;</p> <p>- excluding -</p> <p>(i) where such land has been remediated in terms of part 8 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; or</p> <p>(ii) where an environmental authorisation has been obtained for the decommissioning of such a mine or industry in terms of this Notice or any previous NEMA notice; or</p> <p>(iii) where a closure certificate has been issued in terms of section 43 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) for such land.</p>

		<p>Applicability Applicable - the proposed development will take place on land previously used for sand mining</p>
GN R983/2014	27	<p>The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for –</p> <p>(i) the undertaking of a linear activity; or</p> <p>(ii) maintenance purposes undertaken in accordance with a maintenance management plan.</p> <p><i>Applicability</i> <i>Not applicable – more than 20ha of indigenous vegetation will be cleared</i></p>
GN R983/2014	28	<p>Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 01 April 1998 and where such development:</p> <p>(i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or</p> <p>(ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;</p> <p>excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.</p> <p><i>Applicability</i> Applicable - a portion of the study area (larger than 5 ha) is being used for agriculture</p>
GN 984/2014	15	<p>The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for-</p> <p>(i) the undertaking of a linear activity; or</p> <p>(ii) maintenance purposes undertaken in accordance with a maintenance management plan.</p> <p><i>Applicability</i> Applicable – more than 20ha of indigenous vegetation will be cleared</p>
GN 985/2014	1	<p>The development of billboards exceeding 18 square metres in size outside urban areas, mining areas or industrial complexes</p> <p>(c) In Gauteng:</p> <p>i. A protected area identified in terms of NEMPAA, excluding conservancies;</p> <p>ii. National Protected Area Expansion Strategy Focus Areas;</p> <p>iii. Gauteng Protected Area Expansion Priority Areas;</p> <p>iv. Sites identified as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans;</p> <p>v. Sites identified within threatened ecosystems listed in terms of the National Environmental Management Act: Biodiversity Act (Act No. 10 of 2004);</p> <p>vi. Important Bird and Biodiversity Areas (IBA);</p> <p>vii. Sensitive areas identified in an environmental management framework adopted by relevant environmental authority;</p> <p>viii. Sites or areas identified in terms of an International Convention</p> <p>ix. Sites managed as protected areas by provincial authorities, or declared as nature reserves in terms of the Nature Conservation Ordinance (Ordinance 12 of 1983) or the National Environmental Management: Protected Areas Act (Act No. 57 of 2003);</p> <p>x. Sites designated as nature reserves within municipal SDFs; or</p> <p>xi. Sites zoned for conservation or public open space or equivalent zoning.</p>

		<p><i>Applicability</i> <i>Not applicable – development falls outside the urban edge</i></p>
GN 985/2014	4	<p>The development of a road wider than 4 metres with a reserve less than 13,5 metres.</p> <p>(c) In Gauteng:</p> <ul style="list-style-type: none"> i. A protected area identified in terms of NEMPAA, excluding conservancies; ii. National Protected Area Expansion Strategy Focus Areas; iii. Gauteng Protected Area Expansion Priority Areas; iv. Sites identified as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans; v. Sites identified within threatened ecosystems listed in terms of the National Environmental Management Act: Biodiversity Act (Act No.10 of 2004); vi. Sensitive areas identified in an environmental management framework adopted by relevant environmental authority; vii. Sites identified as high potential agricultural land in terms of Gauteng Agricultural Potential Atlas; viii. Important Bird and Biodiversity Area (IBA); ix. Sites or areas identified in terms of an International Convention; x. Sites managed as protected areas by provincial authorities, or declared as nature reserves in terms of the Nature Conservation Ordinance (Ordinance 12 of 1983) or the National Environmental Management: Protected Areas Act (Act No. 57 of 2003); xi. Sites designated as nature reserves within municipal SDFs; or xii. Sites zoned for a conservation or public open space or equivalent zoning. <p><i>Applicability</i> <i>Applicable – the access and internal roads fall within the above-mentioned thresholds</i></p>
GN 985/2014	12	<p>The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.</p> <p>(a) In Eastern Cape, Free State, Gauteng, Limpopo, North West and Western Cape provinces:</p> <ul style="list-style-type: none"> i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; ii. Within critical biodiversity areas identified in bioregional plans; iii. Within the littoral active zone or 100 metres inland from high water mark of the sea or an estuarine functional zone, whichever distance is the greater, excluding where such removal will occur behind the development setback line on erven in urban areas; or iv. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning. <p><i>Applicability</i> <i>Not applicable – site not located within any CBA's etc.</i></p>

Table 7: Final Listed activities for the proposed Leeuwfontein X 24

Relative Notice	Activity No	Description (Verbatim and applicability to the project)
GN R983/2014	26	Residential, retail, recreational, tourism, commercial or institutional developments of 1000 square metres or more, on land previously used for mining or heavy industrial purposes; - excluding - (i) where such land has been remediated in terms of part 8 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; or (ii) where an environmental authorisation has been obtained for the decommissioning of such a mine or industry in terms of this Notice or any previous NEMA notice; or (iii) where a closure certificate has been issued in terms of section 43 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) for such land. <i>Applicability</i> <i>The proposed development will take place on land previously used for sand mining</i>
GN R983/2014	28	Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 01 April 1998 and where such development: (i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare; excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes. <i>Applicability</i> <i>A portion of the study area (larger than 5 ha) is being used for agriculture</i>
GN 984/2014	15	The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for- (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan. <i>Applicability</i> <i>More than 20ha of indigenous vegetation will be cleared</i>
GN 985/2014	4	The development of a road wider than 4 metres with a reserve less than 13,5 metres. (c) In Gauteng: i. A protected area identified in terms of NEMPAA, excluding conservancies; ii. National Protected Area Expansion Strategy Focus Areas; iii. Gauteng Protected Area Expansion Priority Areas; iv. Sites identified as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans; v. Sites identified within threatened ecosystems listed in terms of the National Environmental Management Act: Biodiversity Act (Act No.10 of 2004); vi. Sensitive areas identified in an environmental management framework adopted by relevant environmental authority; vii. Sites identified as high potential agricultural land in terms of Gauteng Agricultural Potential Atlas;

	<p>viii. Important Bird and Biodiversity Area (IBA); ix. Sites or areas identified in terms of an International Convention; x. Sites managed as protected areas by provincial authorities, or declared as nature reserves in terms of the Nature Conservation Ordinance (Ordinance 12 of 1983) or the National Environmental Management: Protected Areas Act (Act No. 57 of 2003); xi. Sites designated as nature reserves within municipal SDFs; or xii. Sites zoned for a conservation or public open space or equivalent zoning.</p> <p><i>Applicability</i> <i>The access and internal roads fall within the above-mentioned thresholds</i></p>
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Implications for development

In terms of the EIA Regulations (GN R. 983, 984 and 985) of December 2014, a number of listed activities will be triggered by the proposed project, and which will subsequently require environmental authorisation from GDARD.

4.2.2 National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)

The purpose of the Biodiversity Act is to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA and the protection of species and ecosystems that warrant national protection. As part of its implementation strategy, the National Spatial Biodiversity Assessment was developed. In terms of the Biodiversity Act, the developer has a responsibility for:

- The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations).
- Application of appropriate environmental management tools in order to ensure integrated environmental management of activities thereby ensuring that all developments within the area are in line with ecological sustainable development and protection of biodiversity.
- Limit further loss of biodiversity and conserve endangered ecosystems.
- National Spatial Biodiversity Assessment, The National Spatial Biodiversity Assessment (NSBA) classifies areas as worthy of protection based on its biophysical characteristics, which are ranked according to priority levels.

Implications for development

An ecological specialist was appointed to undertake the flora and fauna biodiversity assessment, with specific attention to Red Data Listed species, habitats and biodiversity. The specialist study is aligned to requirements of this act. The proposed development aligns to the purpose of this Act and the above-mentioned specialist report.

The sustainable utilisation of indigenous biological resources, i.e. indigenous vegetation species will be reintroduced to the newly created urban open spaces as far as possible, thereby resulting in an ecological urban regeneration strategy.

4.2.3 National Environmental Management: Protected Areas Act (Act No. 57 of 2003)

This Act (NEMPAA) aims to provide for a national system of protected areas in South Africa as a part of a strategy to manage and conserve its biodiversity. The Protected Areas Act tries to ensure protection of the entire range of biodiversity, referring to natural landscapes and seascapes.

The Act makes express reference to the need to move towards Community Based Natural Resource Management (CBNRM) as its objectives include promoting the participation of local communities in the management of protected areas.

The purpose of the Act is:

- To protect ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes and their ecological integrity;
- To conserve biodiversity in those areas;
- To protect South Africa's rare species;
- To protect vulnerable or ecologically sensitive areas;
- To assist in ensuring the sustained supply of environmental goods and services;
- To provide for the sustainable use of natural and biological resources;
- To create or augment destinations for nature-based tourism;
- To manage the interrelationship between natural environmental biodiversity, human settlement and economic development;
- To contribute to human, social, cultural, spiritual and economic development; and
- To rehabilitate and restore degraded ecosystems and promote the recovery of endangered and vulnerable species.

This Act further stipulates various criteria which must be met before an area can be declared as a special nature reserve, national park, nature reserve and protected environment. It also prescribes a range of procedures, including consultation and public participation procedures, which must be followed before any of the kinds of protected areas are declared.

Implications for development

The Biodiversity Assessment Study took the NEMPAA into consideration. The study area does not fall within any national priority areas.

4.2.4 National Environmental Management Waste Act (NEMWA), 2008 (Act No. 59 of 2008) (as amended)

The NEM: Waste Act (NEMWA) was accented to on 10 March 2009 and came into effect on 01 July 2009. This Act repeals the sections in the Environment Conservation Act, Act 73 of 1989. The Act was established to regulate waste management for the protection of human health and the environment.

NEMWA seeks to reform the law on waste management by making provision for various measures for the prevention of pollution and ecological degradation, as well as ecologically sustainable development in order to protect health and the environment through waste management. The objectives of NEMWA include minimising the consumption of natural resources; avoiding and minimising the generation of waste; reducing, re-using, recycling and recovering waste; treating and safely disposing of waste as a last resort; promoting and ensuring the effective delivery of waste services; remediating land where contamination presents or may present a significant risk of harm to health or the environment; and achieving integrated waste management reporting and planning.

National Waste Act, 2008 (Act No. 59 of 2008): National Domestic Waste Collection Standards.

This legislation aims to enforce an integrated approach to waste management, with emphasis on prevention and reduction of waste at source and, where this is not possible, to encourage reuse and recycling in preference to disposal.

Implications for development

The proposed development does not include an activity listed under NEMWA, and therefore does not require a waste management license.

4.2.5 National Water Act, 1998, Act 36 of 1998

The act defines certain environmental elements, such as water courses and riparian habitats, and activities, such as waste. It also states that any act or omission, which pollutes or is likely to pollute a water resource is an offence and it indicates what activities are also subject to license applications that must be considered during the environmental authorisation process.

Section 21 of the National Water Act, 1998 (Act 36 of 1998) lists activities that require a license or registration if permissible under General Authorisation.

Section 19 of the National Water Act, Act 36 of 1998 and Section 28 of the National Environmental Management Act, Act 107 of 1998 imposes a duty of care on all responsible persons whose operations has the potential to cause water pollution or environmental degradation to take reasonable measures to prevent it from occurring, continuing or recurring.

The Act requires that (where applicable) the 1:50 and 1:100 year flood line be indicated on all the development drawings that are being submitted for approval.

Implications for development

The study area is affected by a 1:100 year flood line. The proposed stormwater discharge into the Melkboslaagte Spruit will require a General Authorisation or Water Use License Application in terms of the National Water Act.

4.2.6 National Environmental Management: Air Quality Act, Act 39 of 2004

The National Environment Management: Air Quality Act (No.39 of 2004) provides the basis for the management of air pollution in South Africa. The remaining provisions of NEMAQA came into effect on 1 April 2010 in terms of GN 220 of 26 March 2010. Section 21 of the Act enables the Minister to publish a list of activities which result in atmospheric emissions for which an atmospheric emission license is required. Such a list and associated emissions standards have been published in GN 248 (in GG 33075) also commenced with effect from 01 April 2010.

The emission of dust is addressed in Government Notice No.1210 (in GG 32816), which sets National Ambient Air Quality Standards in terms of Section 9(1) of the Air Quality Act. Dust is addressed in terms of the standards set for the emission of particulate matter (PM10) in Regulation 3.1 of GN1210.

Part 6 of the Air Quality Act addresses measures in respect of dust. Section 32 enables the Minister to prescribe measures for the control of dust in specified places or areas.

Implications for development

The proposed development does not require an atmospheric emission license.

4.2.7 National Heritage Resources, Act, 1999, Act 25 of 1999

The Act sets requirements for assessment of impacts on the cultural and heritage assets, the processes to be followed in notifying the competent authority and the elements of a report on the assessment. The

protection of archaeological and palaeontological resources is the responsibility of a provincial heritage resources authority and all archaeological objects, palaeontological material and meteorites are the property of the State. "Any person who discovers archaeological or palaeontological objects or material or a meteorite in the course of development must immediately report the find to the responsible heritage resources authority, or to the nearest local authority offices or museum, which must immediately notify such heritage resources authority".

A Heritage Impact Assessment must be done under the following circumstances:

- a. Any development or other activity that will change the character of a site and exceed 5 000m² or involve three or more existing erven or subdivisions thereof
- b. Re-zoning of a site exceeding 10 000 m²

Implications for development

The size of this site qualifies for a Heritage Impact Assessment (HIA). A Cultural Heritage Consultant was appointed to conduct a HIA. Refer to Appendix D.2

4.2.9 The Conservation of Agricultural Resources Act, 1983 (No. 43 of 1983)

According to this Act all declared alien weeds and declared invader plants must be effectively controlled by the landowner.

Implications for development

The considerations of the Act were incorporated into the EMPr. Refer to Appendix F

4.2.10 Occupational Health and Safety Act, 1993, Act 85 of 1993

The objective of this Act is to provide for the health and safety of persons at work.

Implications for development

The considerations of the Act were incorporated into the construction phase EMPr. Refer to Appendix F

4.2.11 Sustainable Development

The principle of Sustainable Development has been established in the Constitution of the Republic of South Africa (Act No. 108 of 1996) and given effect by NEMA. Section 1(29) of NEMA states that sustainable development means the integration of social, economic and environmental factors into the planning, implementation and decision-making process so as to ensure that development serves present and future generations.

Therefore, Sustainable Development requires that:

- The disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
- That pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
- The disturbance of landscapes and sites that constitute the nation's cultural heritage is avoided, or where it cannot be altogether avoided, is minimised and remedied;
- Waste is avoided, or where it cannot be altogether avoided, minimised and re-used or recycled where possible and otherwise disposed of in a responsible manner;
- A risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions; and

- Negative impacts on the environment and on people's environmental rights be anticipated; and, prevented and where they cannot altogether be prevented, are minimised and remedied.

Implications for development

The proposed development will incorporate sustainable design principles.

4.3 Provincial Policies

The provincial policies and guidelines listed here are applicable to the proposed development and the requirements and obligations therein have been considered during the EIA process:

4.3.1 Gauteng Conservation-Plan 3.3 (2011)

According to the Gauteng Conservation Plan (C-Plan) version 3.3, the study area is outside of any Critical Biodiversity Areas (CBAs), but with Ecological Support Areas (ESAs) in the south and west. These demarcated ESAs are ridges.

Implications for development

The Gauteng C-Plan 3.3 (2011) was taken into consideration in the layout of the proposed development.

4.3.2 Gauteng Draft Ridges Policy

The quartzite ridges of Gauteng are one of the most important natural assets in the northern provinces of South Africa. This is because these ridges, and the area immediately surrounding the ridges, provide habitat for a wide variety of fauna and flora, some of which are Red List, rare or endemic species or, in the case of certain of the plant species, are found nowhere else in South Africa or the world. The ridges also fulfill functions that are necessary for the sustainability of ecosystems such as the recharging of groundwater, wetlands and rivers, wildlife dispersal and providing essential habitat for pollinators. Ridges also have a socio-cultural role in that they provide aesthetically pleasing environments that are valued by residents, tourists and recreational users. Human activities such as urbanisation, mining and the planting of alien vegetation may undermine the contribution that ridges make to the environment. The conservation of ridges falls within the ambit of the environmental right and this policy comprises one of the measures that GDARD has taken to give effect to the environmental right in respect of ridges, therefore ensuring that:

- The use of ridges is sustainable;
- Members of the public are able to make informed decisions regarding proposals for development on ridges and the use of ridges;
- Officials make consistent decisions in respect of planning and environmental applications that involve negative impacts on ridges; and
- The Department's responsibility in respect of the protection of the environment is carried out in an efficient and considered manner.

Implications for development

Two ridges were identified on the study area. According to the Tshwane Open Space Framework the two ridges in the study area would be classified as Class 2 ridges. The Gauteng Draft Ridges Policy was taken into consideration in the layout of the proposed development. Refer to Section 6.2.3

4.3.3 The Gauteng Draft Red Data Policy

The primary purpose of the Draft Red Data Policy is to protect red data plant species in Gauteng Province. The Red Data plant policy is based on the following basic principles:

- Species endemic to the province of Gauteng must be afforded the utmost protection, as they occur nowhere else in the world. As the relevant provincial agency, this Department's responsibility towards Gauteng endemics is absolute;
- Conservation of only one population essentially ignores the lowest level of biodiversity that is genetic diversity. It is therefore imperative that all populations of Red Data plant species are protected;
- In situ conservation is preferable to ex situ conservation. Removing a population from its natural habitat and placing it under artificial conditions results in the erosion of the inherent genetic diversity and characteristics of that species;
- In order to ensure the persistence of a population, it is imperative that the ecological processes maintaining that population persist;
- In order to ensure the persistence of a plant population, it is vital that pollinators are conserved. To conserve pollinators, the habitat must be managed to provide appropriate nest sites for pollinators and a seasonal succession of suitable forage and host plants. Pollinators must be protected from herbicide and pesticide application and soil disturbance must be prevented;
- Translocation of Red Data species is an unacceptable conservation measure since the translocated species may have undesirable ecological effects;
- Rural parts of the province should be protected from insensitive developments and urban sprawl/encroachment should be discouraged. Policy guiding developments should therefore be less lenient in rural areas;
- Red Data plant species historically recorded on a site, but not located during searches within species flowering seasons may be dormant (as a seed bank or subterranean structures such as bulbs/tubers/etc.) due to unfavourable environmental conditions;
- Suitable habitat adjacent to known populations of Red Data plant species has a high probability of being colonized;
- In order to protect a plant population that occurs in a fragmented landscape from edge effects, it is necessary to protect it with a buffer zone that extends from the edge of the population; and
- The transformation of natural vegetation to crops is considered as permanent as urbanization and may cause the extinction of Red Data plant populations and their pollinators.

Implications for development

No red data fauna or flora species were identified on the site during the Biodiversity Assessment Study. Refer to Appendix D.1

4.3.4 Protection of Agricultural Land in Gauteng Revised Policy (June 2006)

The purpose of this policy is to protect land that has been identified as high agricultural potential from development, for the exclusive use of agricultural production to:

- Feed the nation;
- Provide upcoming farmers with access to productive land; and
- Meet national targets set in this regard.

Land with high agricultural potential is a scarce non-renewable resource and the need to protect it is a high priority for GDARD. GDARD applies a risk averse and cautious approach when development of such land for purposes other than agricultural production is proposed. The risk averse and cautious approach should be the basis of decision-making on the transformation of high potential agricultural land and land deemed as irreplaceable in terms of meeting Agri-BBBEE and national food security targets and thus legally protected

from transformation. GDARD is not in support of development on high potential agricultural land that resides outside the urban edge. Seven agricultural hubs have been identified in the Gauteng Province. All the hubs are located outside the urban edge. The hubs are regarded as areas with a large amount of high agricultural potential land that should be preserved for agricultural use and will accordingly be planned and managed as a holistic agricultural unit. Each of the hubs will be developed to align with its agricultural potential and preferred land use and will be supported by current economic indicators.

Implications for development

The study area is not situated within any Agricultural Hub or any area with high agricultural potential according to the Gauteng Agricultural Potential Atlas (GAPA) Version 4.

4.4 Local Policies

4.4.1 City of Tshwane Open Space Framework

According to the Tshwane Open Space Framework the study area is situated within and in close proximity to the following typologies:

- **A Blue Way, namely drainage line**
- **A Blue Node, namely dense vegetation surrounding the drainage line**

Blue ways are the most important elements in the provisioning of environmental goods and services, the protection of biodiversity, endangered species and ecological system as well as eco-based activity. Blue nodes have secondary socio-economic and place-making function. Blue ways and nodes must therefore be conserved.

- **A Green Way namely Class 2 ridge**

Green ways are the most important elements in the provisioning of environmental goods and services, the protection of biodiversity, endangered species and ecological system as well as eco-based activity. Green ways must be protected for conservation purposes.

Implications for development

The City of Tshwane Open Space Framework is applicable to the proposed development and the requirements and obligations therein have been considered during the EIA process.

4.4.2 City of Tshwane Regional Spatial Development Framework (2014)

The City of Tshwane Regional Spatial Development Framework (2014) for Region 5 is applicable to the proposed development and the requirements and obligations therein have been considered during the EIA process.

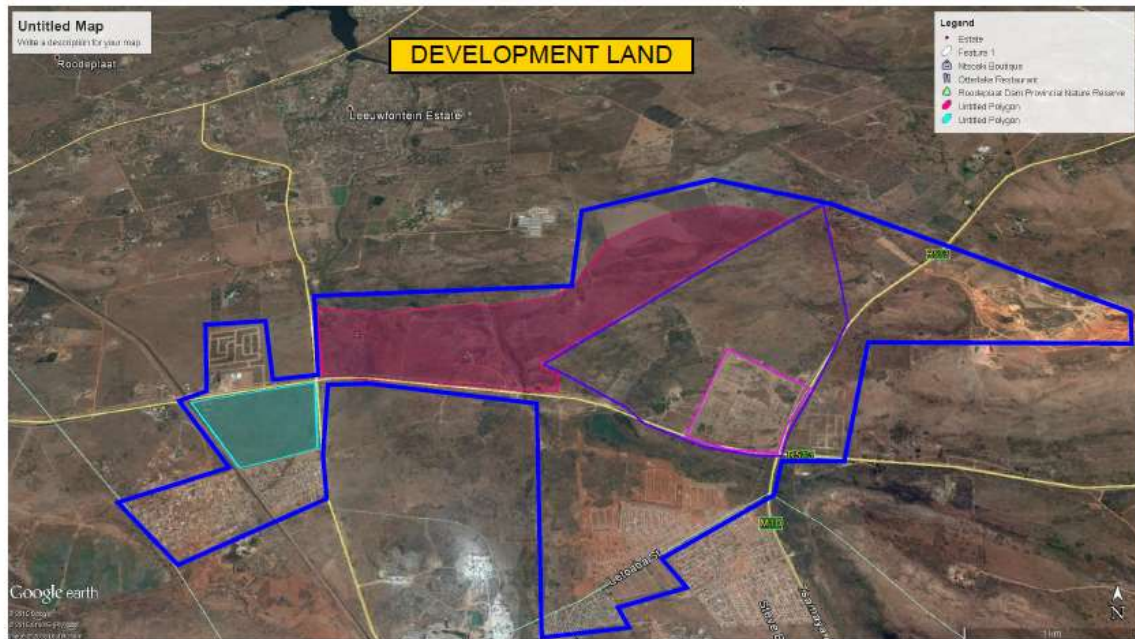
Implications for development

The study area falls within an area earmarked for Future Township Residential development and mixed land uses abutting the mobility spines (K54).

5 Need and Desirability

The following motivation was provided by **Urban Consult Town Planners (refer to Appendix D.5, Town Planning Memorandum)**.

The Leeuwfontein/Nooitgedacht area has been earmarked as a residential / mixed use area with existing, residential developments as well as commercial uses. A total of 14 new township applications have been approved in the direct vicinity of the township (refer to aerial photo of approved townships) and new Township being planned.



One of the largest townships in the direct vicinity i.e. Glen Way Estate (refer to blue outline area on aerial photo), contains approximately 6000 residential erven of which the first phase of 729 erven has been proclaimed in January 2016 by the City of Tshwane. The development is being funded by one of the largest funding mechanisms of housing development i.e. The Housing Impact fund of South Africa (HIFSA). This indicates the investment potential in the area by the private sector.

The development of this area is holding tremendous benefits for Rural inhabitants of the former Kwandabele/Kwamhlanga and Moloto areas, that are currently working in Tshwane and therefore looking for residential opportunities to re-locate closer to employment. The K54 Road is carrying large traffic volumes every day to these former areas. Affording people the opportunity to relocate closer and save tremendous amount on transport cost, makes this area a present and future zone of Choice.

The area has been prioritized for lower income housing developments to specifically cater for the relocation of people closer to their areas of employment.

The Gauteng Department of Human Settlements is in the Process of prioritizing the area as part of the Mega City Project Localities.

Due to major road links of this area to the N1, K14, K54 and future PWV2 and PWV 7 the area will be excellently located for higher density residential mixed developments.

According to the Tshwane approved RSDF of 2014 the following opportunities for the area exist:

- The area is strategically located in relation to some of the major activity nodes in the City of Tshwane, i.e. Tshwane Inner City, the N1 highway, Industrial areas of Silverton, Waltloo, Koedoespoort and Eerste Fabrieke.
- The area hold enormous development potential by way of densification and intensification of land uses.

- Market forces are very active in the area and the market for residential development, including entry level and middle income bonded houses are very high.

The development conforms and adhere to spatial development principles, these include:

- Spatial Integration;
- Diversity of Land Uses;
- Discouragement of Sprawl;
- Environmentally sustainable land development practices;
- Spatially coordinated sectorial activities;
- Discourage land invasions;
- Equitable access to land; and tenure security.

Apart from the above, the goals and objectives for this area are also identified, which include:

- **Economic Development**

The goals and objectives identified in relation to economic development includes the facilitation of the diversification of the formal economic sector as well as community economic development programmes and to market this area.

- **Civil Services**

The significant gaps in services needs to be reduced in the next five years by providing services to the whole community at acceptable standards. The adjacent developments have already had a huge impact in the construction of Bulk services for the area.

- **Movement**

To ensure and maintain good access and movement throughout the Leeuwnfontein/ Nooitgedacht area, and to facilitate the development and operation of a good public transport systems.

The K54 is classified as a mobility road and the advantages of the application site next to it should be maintained.

- **Housing**

To develop all vacant, developable pockets of land for residential infill purposes in line with the Breaking New Ground Principles.

- **Community Services**

Provide a robust primary health care service to the community.

- **Environmental Goals**

To ensure the sustainability of both the natural and built environment of the Municipality and to preserve the ecological areas within the area.

Motivation for development desirability

- **Liveability**

The proposed Leeuwfontein X 24 will be a settlement that is created in which people live their lives in a way that is worthy of human beings, that enables contentment, personal growth and healthy social interaction.

The development will bring more people closer to greater number of opportunities in the area surrounding areas.

The development of Leeuwfontein X 24 will contribute to people's sense of personal and collective wellbeing and to their sense of satisfaction in being the residents of that particular settlement.

- **Concentration**

The proposed development will and must focus on the creation of agglomeration economies and clustering seeing that within a radius of 1km, numerous township applications have been approved which will ultimately in the medium terms be developed.

These developments including the proposed township must optimize the utilization of existing infrastructure and social amenities and needs to contribute to the upgrading of it when so requested.

This development will also allow for public investment in and around the site and by means of transport facilities etc.

- **Connectivity**

The proposed development will easily be connected between nodes from the surrounding areas due to its locality and access point on the K54 mobility Road and the proximity of the K14 which links. These roads links up with the N4 to the south and N1 to the west where major employment zones are located.

The development will also contribute to public transport investment along the key roads to link various nodes.

The development will contribute to recognize secondary towns /nodes as part of the overall settlement and economic network of the province with functional road linkages.

- **Diversity**

The proposed development allow for various types of environments that are linked to spatial characteristics of this particular geographic location. All areas in Tshwane are not the same. Different zones would be suitable for different types of development and housing types, which in turn will be able to accommodate different income groups and lifestyles.

The proposed development will create (1.) locational choice where residence and the economy establish themselves within the Tshwane Space economy and (2) destination choices where people decide where they want to be employed, establish a business or recreational choice.

- **Viability**

The development as proposed when fully developed will maximize the residents access to goods and services and opportunities within the region and ensure the optimal use of available land within the Urban Boundary.

The development will be in a way cost effective for government to implement and manage due to the already capital involvement of private sector in the area. Presently, only the private sector is providing funding and development capital for the bigger area.

The proposed development will have a positive contribution to a viable and efficient public transport system seeing that more users can be linked to it.

The proposed development will facilitate and support economic growth in the area. The word wide principle of how to grow an economy - **to develop infrastructure** – will be achieved.

6 Description of Receiving Environment

This chapter provides a description of the receiving environment within the study area. Three components to the environment are recognised:

- Physical Environment;
- Biological Environment; and
- Socio-Economic Environment.

6.1 Physical Environment

6.1.1 Climate

The region is characterized by summer rainfall with thunderstorms, with annual rainfall figures of 706 mm (Pretoria – Onderstepoort weather station) recorded at the closest weather station to the site. Winters are dry and frost is common. The warmest months are normally December and January and the coldest months are June and July.

According to the contour map of Weinert's climatic N-Value, the value for Pretoria is 2,5. Thus, chemical decomposition of rocks will be dominant over mechanical disintegration, and deep soil horizons are expected in areas of poor drainage. The involved geotechnical engineer advised that stormwater drainage and road pavement design must make provision for these climatic conditions.

Implications for development

No specific development implications have been identified.

6.1.2 Topography

The site is located at an approximate height of between 1302 and 1376m above mean sea level. The regional slope is gentle but steep towards the ridge, towards the south. A poorly defined drainage channel borders the site northwards, and drainage on site mainly takes place through sheet wash. The site currently has a development sand quarry with some mined areas filled with water.

Implications for development

The quarries and areas filled with water need to be rehabilitated prior to construction. The ridges will be excluded from the development.

6.1.3 Geology and Soils

*The following information has been extracted from the Engineering Geological Investigation Report undertaken by Geoset CC Consulting Environmental and Engineering Geologists. **Refer to Appendix D.6***

The purpose of this investigation was to identify any possible engineering geological problems as well as evaluation of the soil properties to determine suitable foundation solutions.

According to the 1:50 000 scale Geological map the site is underlain by quartzite, shale and greywacke of the Silverton Formation, Pretoria Group, Transvaal Supergroup, and Smelterskop Shale Formation, Pretoria Group, Transvaal Supergroup with some intrusive hybrid syenite and dolerite sills. The site itself is covered with recent sand and gravel. No dolomite occurs in the area and no stability investigation is required.

The mechanical properties of the soil layers were determined by means of laboratory tests performed on disturbed samples taken during the profiling of trial pits. The obtained site information was evaluated with regard to the development of masonry structures by the application of standard evaluation techniques. Provisional development zonation for township development according to the NHBRC and SAIEG were done, indicating the expected geotechnical conditions prevailing on the site with appropriate foundation solutions.

No shallow groundwater was encountered in any of the test pits, but the presence of ferricrete nodules indicates a fluctuating water table. Many small and larger quarries and dams are filled with water and this should be rehabilitated. The clayey nature of the soil will also limit the seepage of storm water into the ground and surface drainage will mostly take place. Good site drainage should therefore be ensured and damp proof installed in all buildings.

The involved geotechnical engineers initially classified the site as follows:

Refer to Figure 10: Engineering Geology Zone Map

Normal Development with precaution or risk

- **Site Class CHR/1A1C2F:**

This zone is underlain by a thin layer of slightly collapsible and expansive soil, and shallow quartzite, shale or syenite rock, outcrop and sub outcrop or talus. Some excavatability problems due to core stones and sub outcrop are foreseen for service excavations deeper than a depth of 1,5m, and a competent TLB or pneumatic tools and even blasting may be required to reach installation depths for services, with related increased cost. Normal foundations will be adequate including proper compaction with a wacker compactor of in situ soils below individual footings with soil near optimum moisture content, combined with good site drainage with a concrete apron of 1,0m around all structures and plumbing and service precautions are advised. It is classified as CHR in terms of the NHBRC (1995) or SAICE (1995) Code of practice and 1A1C2F with the classification for urban development (Partridge, Wood & Brink).

Land not Ideally Suitable for development

- **Site Class PR:**

Excavation problems regarding quartzite outcrop and sub outcrop will hamper placement of services. A competent TLB or pneumatic tools and even blasting will be required to reach installation depths for services.

- **Site Class PQ:**

Quarried areas within this zone need rehabilitation by replacement with a controlled backfilling before commencement of any construction. Alternatively can the filling be removed and then be replaced by a controlled filling or rather be used as basement of a shopping complex as parking area during cut and fill operations. Soil replacement by an engineered fill soil raft by removing all or part of the filling horizon to 1,0m beyond the perimeter of the structure and replacing with inert backfill, compacted to 93% MOD ASSHTO

6.1.4 Hydrology

6.1.4.1 Surface Water

Refer to Figure 11.

No major perennial or non-perennial rivers or streams are present on the study area. The only naturally occurring watercourse is a small semi-perennial stream, Melkboslaagte Spruit, outside of the northern boundary of the study area.

There are no natural watercourses on the study site, including wetlands and pans. A number of man made dams are present on the study site.

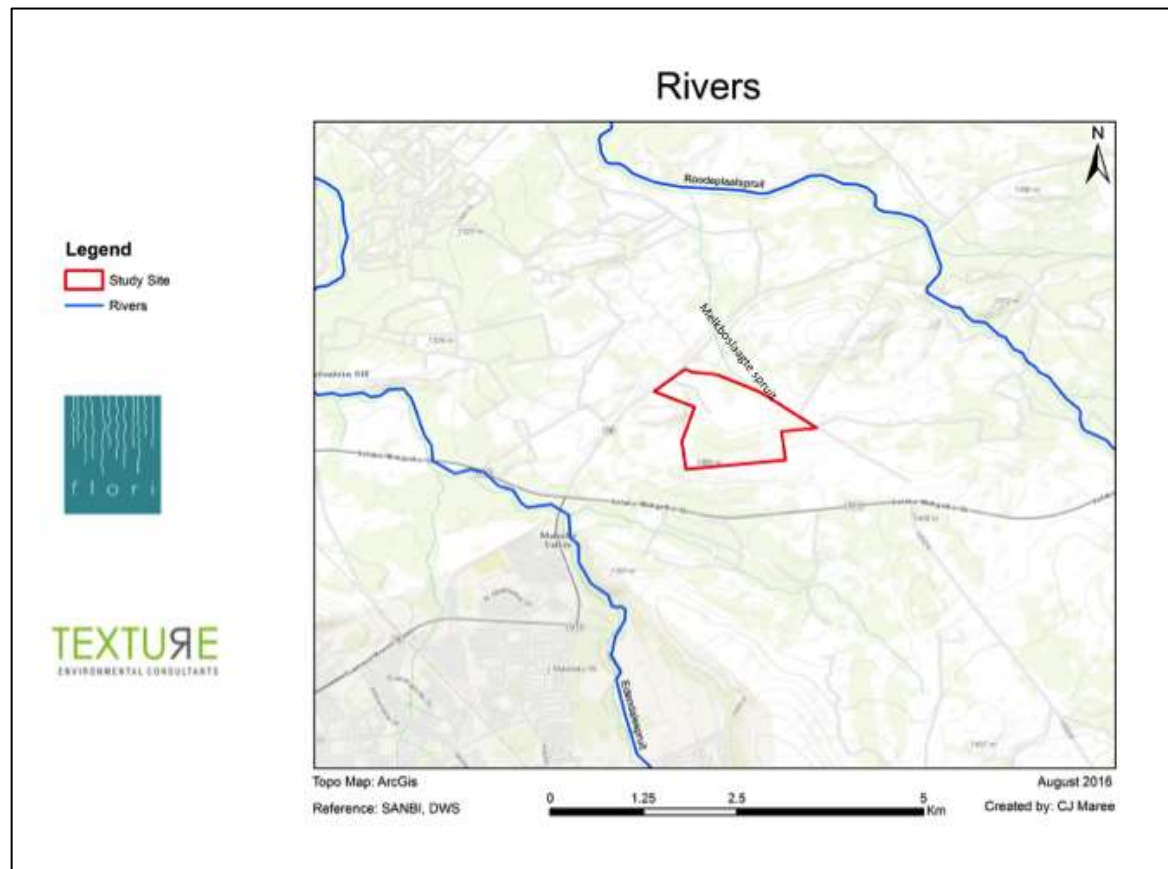


Figure 11: Hydrology Map

Implications for development

No development should take place within the 1:100 year floodline of the Melkboslaagte Spruit. Some of the man made dams will be incorporated in parks within the development. Public safety is very important and mitigation measures in this regard must be implemented. The remainder of the dams must be filled and rehabilitated according to engineering specifications. Refer to the EMP, Appendix F.

6.1.4.2 Ground Water

According to the depth of the boreholes registered with the Department of Water Affairs, the regional water table is expected to be in the order of 30 to 40m below surface.

The site is underlied by Quartzite, which is a poor aquifer and in general has a low groundwater potential and requires geophysical techniques to locate potentially high yielding boreholes. According to the DWA database, boreholes are expected to yield less than 1 litre /second.

Sand mining uses no chemicals when mining or processing that have the ability to pollute groundwater resources. In 2007, two samples were taken from dams on the property, the first in the western and the second in the central portion. The low electrical conductivity and neutral pH indicated that the water encountered at the mine has its origin directly as rainwater.

The sample results indicated that the manganese concentration of one of the samples exceeded the Class 1 (Acceptable) limit but still made the Class 2 (Maximum Allowable) limits of the standard. At this concentration manganese will cause increasingly severe staining and taste problems, but will not have any adverse health effects on people drinking the water.

In general, however, the quality of the surface water at the sand mine was good. Overall the water has a low salt load.

Implications for development

The sand mining operations did not result in pollution of the groundwater resources.

6.1.5 Agricultural Potential

Agriculture is (and was) a prominent, although not dominant, landuse in the region. There are still numerous small patches of cultivated lands and grazing lands across the area. However, the area is not an important, or dominant, agricultural area of Gauteng or South Africa.

The true agricultural potential of a small study area is difficult to gauge accurately, as it is qualitative in nature rather than quantitative. Soil form and depth and chemical analyses need to be conducted to firstly determine the true potential of the soils.

A small area in the north of the study area is presently being used for dryland maize production. The soils in this area are medium/low to medium in terms of agricultural potential.

Crop production

The topography of the area, low-nutrient sandy soils and rockiness of many of the soils are not ideal for high-yield, commercial crop production. The study site has now for many years being mined for its clay and sandy soils. There is no to little quality topsoil left in the area, therefore, even after rehabilitation the area will not be ideal for cultivation (crop production).

The soils presently found on the site are of medium to low agricultural potential (in terms of dryland and irrigated cropping) due to a number of reasons. These are:

- The soils are generally sandy and nutrient-poor. Which is the reason it is an ideal sand works area.
- The lack of naturally good cultivation soils, within a small area, makes the agricultural potential of the study site, in terms of crop-yields and economic value low.
- Most of the area has been extremely degraded and transformed with all topsoils removed during mining. Even after rehabilitation the area will not be ideal for cultivation.

Cattle production

The study area large is enough to carry low numbers of cattle or sheep, but too small for any meaningful commercial livestock production in terms of grazing lands. Areas in the south and west of the study site are rocky slopes and ridges with difficult terrain for livestock, not to mention the very low carrying capacity in terms of fodder.

Implications for development

The study area does not have natural water sources for livestock such as streams, rivers or ponds. Borehole water is an option, however, the strength and extent of the underground water in the area is not known. The study area as a single unit has medium/low to low agricultural potential. Nearly all of the land in the study site has been calculated as being of '**low potential arable land**' due to the low richness of the soils, nature of the present mining activities and rocky ridges. The agricultural potential in terms of cattle farming is therefore '**low potential grazing land**'.

In addition, the study area does not fall within an agricultural hub or within an area of high agricultural potential soils according to GAPA 4.

6.2 Biological Environment

The following information has been extracted from the Biodiversity Assessment Report undertaken by Texture Environmental Consultants. **Refer to Appendix F.**

6.2.1 Terrestrial Ecology**6.2.1.1 Vegetation**

The study area and the surrounding region fall within the Savanna Biome, which is also known as the Bushveld Biome. Savanna vegetation types (veldtypes) tend to have a mix of a lower grassy layer, middle shrub layer and an upper woody layer. The mix and ratio of the three layers varies from veldtype to veldtype within the Savanna Biome.

The Savanna Biome is subdivided into six bioregions, namely, Central Bushveld; Mopane; Lowveld; Sub-Escarpment Savanna; Eastern Kalahari Bushveld; and Kalahari Duneveld. The study site is situated within the Central Bushveld Bioregion.

According to the vegetation classification of Mucina & Rutherford (2006) the study site is situated within Marikana Thornveld and Gold Reef Mountain Bushveld. The study area is predominantly Marikana Thornveld, which tends to be in the lower, valley areas of the site, while the granite ridges in the south and west of the study area are Gold Reef Mountain Bushveld.

Vegetation of the study site

The vegetation in most of the study area is badly disturbed or totally transformed, especially in the central area where the vegetation has been totally removed during excavation operations of the sand works. On the outlying areas of the study area are more intact patches of Marikana Thornveld, with the typical Acacia-dominated veld. The Acacia thornveld is predominantly present in the lowlands and valleys of the site.

The vegetation on the ridges in the south and west of the study area is typical of Gold Reef Mountain Bushveld found on the quartzite ridges in the region. The upper tree layer is more that of mixed broad-leaved vegetation, while that of the lowlands is fine-leaved vegetation. The dominant, upper layer (woody) vegetation on the ridges is that of *Combretum – Protea* in some areas and *Combretum – Searsia – Celtis* in other areas, often depending on the depth of soil, rockiness and slope orientation.

The thornveld vegetation in the lowlands is highly disturbed, but the broad-leaved vegetation on the ridges is still in fairly pristine condition. **Refer to Figure 12, Land Cover Map.**



Figure 12: Land Cover

Priority Floral Species

No red data (endangered & threatened) species were observed during field investigations. According to the SANBI database, no red data species have been collected or recorded in the greater area of the study site. This however, is not to say for certain that none occur. The summaries of priority floral species per Quarter Degree Square (QDS) grid reference are tabled below. Most of the priority floral species listed in Table 8 are succulents and most occur in rocky areas and ridges. These plants are predominantly found along slopes or on ridges.

Most of the study area is lowland, sandy and clayey soil. It is highly unlikely that any of these species are present in the lowland sandy areas. But is highly likely that some of these species are found on the ridges in the study area

TABLE 8: PRIORITY FLORAL SPECIES PER 1:50 000 GRID REFERENCE

Grid reference & Priority Category	No. of species	Name of species
2528CB		
Critically endangered (CR)	0	-
Endangered (EN)	0	-
Vulnerable (VU)	4	<i>Kalanchoe longiflora</i> , <i>Leucadendron cinereum</i> , <i>Erica nematophylla</i> , <i>Bowiea volubilis</i>
Near threatened (NT)	8	<i>Searsia gracillima</i> <i>Habenaria kraenzliniana</i> <i>Stenostelma umbelluliferum</i> <i>Trachyandra erythrorrhiza</i> <i>Adromischus umbraticola</i> <i>Argyrobium campicola</i> <i>Argyrobium megarrhizum</i> <i>Lithops leslei</i>

Conservation status

The conservation status of the two vegetation units (veldtypes) that occur on site are summarised in Table 9 below. Marikana Thornveld is endangered. Although Gold Reef Mountain Bushveld is not endangered, the veldtype is restricted to ridges, which in Gauteng are viewed as sensitive and in need of protection.

TABLE 9: VELDTYPE STATUS

Veldtype	Status	Info
Marikana Thornveld	EN	Less than 1% is statutorily conserved in areas such as Magaliesberg Nature Area. More conserved in addition in other reserves, mainly in De Onderstepoort Nature Reserve. Considerably impacted, with 48%+ transformed, mainly through cultivated and urbanised areas. Most agricultural development is in the western regions of the veldtype towards Rustenburg, while in the east (near Pretoria) industrial development is a greater threat of land transformation.
Gold Reef Mountain Bushveld	LT	Approximately 22% is statutorily conserved, mainly in the Magaliesberg Nature Area and much smaller proportions in the Rustenburg, Wonderboom and Suikerbosrand Nature Reserves. At least an additional 1% is conserved in other reserves. About 15% transformed mainly by cultivation and urbanisation.

The study area is situated within vulnerable, threatened ecosystems or veldtypes.

The Biodiversity Act (Act 10 of 2004) provides for listing of threatened or protected ecosystems, in one of four categories: Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or protected. The main purpose for the listing of threatened ecosystems is an attempt to reduce the rate of ecosystem and species destruction and habitat loss, leading to extinction. This includes preventing further degradation and loss of structure, function and composition of threatened ecosystems (SANBI).

TABLE 10: ECOSYSTEM STATUS: SIMPLIFIED EXPLANATION OF CATEGORIES USED

STATUS	% Transformed	Effect on Ecosystem
Least Threatened (LT)	0-20% (<20% loss)	No significant disruption of ecosystem functions
Vulnerable (VU)	20-40% (>20% loss)	Can result in some ecosystem functions being altered
Endangered (EN)	40-60% (>40% loss)	Partial loss of ecosystem functions
Critically Endangered (CR)	>60% or BT Index for that specific veldtype	Species loss. Remaining habitat is less than is required to represent 75% of species diversity

Source: South African National Spatial Biodiversity Assessment Technical Report. Volume 1: Terrestrial Component. 2004. SANBI. Mucina & Rutherford (eds) (2010).

Note: BT stands for the Biodiversity Threshold and is an index value that differs for each veldtype. In other words, because the composition, recovery rate, etc. differs for each veldtype there will be a different threshold (in this case percentage transformed) at which species become extinct and ecosystems breakdown. That is, at which point the veldtype is critically endangered. For the grassland vegetation units discussed the index value (BT) is broadly given as 60% and greater.

Plants identified during field investigations

The dominant plant species identified during field investigations are listed in the appendices. Field investigations were limited to a few days only and plants lists are not comprehensive.

No red data species were observed during field investigations. None are expected to occur in the thornveld lowlands and sand works areas, but it is highly likely that some occur on the ridges to the south and west.

Alien plants identified in the Study Area

There are a number of alien plants in the study area. The herbaceous plants are especially prevalent in disturbed areas. Tree species such as syringa are also present. Alien plant species, some of which are invasive, occur scattered throughout the area, especially in disturbed areas. The alien plant species encountered in the study area are recorded, along with their category rating, in Table 11. The categories are as set out in the Conservation Act of Agricultural Resources Act, 1983 (CARA) (Act 43 of 1983).

TABLE 11: ALIEN PLANTS IDENTIFIED IN THE STUDY AREA

Botanical Name	Common Name	Category
<i>Acacia mearnsii</i>	Blackwattle	2
<i>Argemone ochroleuca</i>	White-flowered Mexican poppy	1
<i>Bidens pilosa</i>	Blackjacks	-
<i>Cereus jamacaru</i>	Queen-of-the-night	1
<i>Conyza canadensis</i>	Horseweed fleabane	-
<i>Datura ferox</i>	Large thorn-apple	1
<i>Eucalyptus</i> spp & cultivars	Gum trees; Eucalyptus	2
<i>Lantana camara</i>	Lantana	1
<i>Macfadyena unguiscati</i>	Cat's claw creeper	1
<i>Melia azedarach</i>	Syringa	3
<i>Opuntia ficus-indica</i>	Prickly pear	1
<i>Solanum elaeagnifolium</i>	Silverleaf bitter apple	1
<i>Tagetes minuta</i>	Khakibos, kahki weed	-

Protected tree species identified in the study area

No nationally or provincially protected tree species were observed within the study area during field investigations.

6.2.1.2 Fauna

No large- or medium-sized mammals or other wild faunal species were observed during field investigations, except for red rock rabbits in the ridges to the south. Most of the study area is an active, mining operation, which not only seriously limits ideal habitat, but the continual noise and movement of people and vehicles also means that most wild animals tend to avoid the area. The most ideal habitats are found within the ridges, but this type of habitat is not suited to all faunal species.

Red Data faunal species most likely to traverse the area occasionally are listed below in Table 12. However, due to the amount of human activity and general urbanisation, their presence will be very limited.

The habitats present in the study area are not ideal for most of the species listed in Table 12, except for the riparian and watercourse areas.

TABLE 12: RED DATA FAUNAL SPECIES LIKELY TO OCCUR IN THE AREA

Species	Common Name	Red Data Status	Preferred Habitat	Habitat Restrictions	Present in Study area?
Frogs					

<i>Pyxicephalus adspersus</i>	Giant bullfrog	Threatened	Grassland; savanna	Temporary floodplains, pans	Highly likely
Mammals					
<i>Atelerix frontalis</i>	SA hedgehog	Near threatened	Most, broad	Broad	Highly likely
<i>Manis temmincki</i>	Pangolin (Scaly anteater)	Vulnerable	Grassland, savanna	Woody savanna, ants, termites	Possibly
<i>Mellivora capensis</i>	Honey badger (Ratel)	Near threatened	Most, broad	Broad	Possibly
<i>Cloeotis percivali</i>	Short-eared trident bat	Critically endangered	Savanna	Caves and subterranean habitat	Not likely
<i>Pipistrellus rusticus</i>	Rusty bat	Near threatened	Most, broad	Woody savanna, large trees	Not likely
Snakes					
<i>Python natalensis</i>	Southern African python	Vulnerable	Ridges, wetlands	Rocky areas; open water	Highly likely

6.2.2 Aquatic Ecology

The aquatic ecology focuses on the open waterbodies found within the study area. These watercourses include rivers, streams, wetlands, pans, lakes and manmade dams. In reality, a pan is actually a type of wetland and must be approached as such. The focus is to delineate watercourses and limit any impact the project might have on these watercourses.

Wetlands

'Wetland' is a broad term and for the purposes of this study it is defined according the parameters as set out by the Department of Water & Sanitation (DWS) in their guideline (A practical field procedure for identification and delineation of wetlands and riparian areas, 2005).

According to the DWS document and the National Water Act (NWA) a wetland is defined as, "*land which is transitional between terrestrial and aquatic systems where the water table is usually at or near surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.*"

Furthermore, the guidelines stipulate that wetlands must have one or more of the following defining attributes:

- Wetland (hydromorphic) soils that display characteristics resulting from prolonged saturation;
- The presence, at least occasionally, of water loving plants (hydrophytes); and
- A high water table that results in saturation at or near surface, leading to anaerobic conditions developing in the top 50cm of the soil.

During the site investigations the following indicators were used to determine whether an area needed to be defined as a wetland or not, namely:

- Terrain unit indicator;
- Soil form indicator;
- Soil wetness indicator; and
- Vegetation indicator.

Riparian Zones

Riparian vegetation is typically zonal vegetation closely associated with the course of a river or stream and found in the alluvial soils of the floodplain. According to the National Water Act (NWA) riparian habitat is

defined as including “*The physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas.*”

It is important to note that the NWA states that the riparian zone has a floral composition distinct from those of adjacent areas. The NWA also defines riparian zones as areas that “*commonly reflect the high-energy conditions associated with the water flowing in a water channel, whereas wetlands display more diffuse flow and are lower energy environments.*”

Rivers and streams

A stream or river is a watercourse that is characterised by a very distinct channel. Most, but not all streams and rivers have an associated floodplain and / or riparian zone. Although wetlands and rivers are both watercourses, the legal implications differ in terms of development, buffer zones, etc.

Watercourses in the study area

No major perennial or non-perennial rivers or streams are present on the study area.

There are no natural watercourses on the study site, including wetlands and pans. A pan is a type of wetland, but is often differentiated in the literature. A number of dams are present on the study site.

Classification of watercourses in the study area

Watercourses observed during field investigations are classified along different hydrogeomorphic (HGM) types or units, up to Level 4, in terms of various levels as refined for South Africa by Kleynhans, *et. al.* (2005) and used in the Classification System for Wetlands user manual – SANBI Series 22 (Ollis *et. al.*, 2013).

There are however, no watercourses within the study area including rivers, streams, distinct drainage lines or wetlands (including pans). A number of manmade impoundments are present. These are water retention dams and settling ponds that are used during the sand washing process at the sand works. The excavated sand needs to be washed to rinse out mud and other impurities. This water and mud or silt, flows into a settling pond (or dam). After which, the water is released to gravity-flow into another dam, out of which the ‘cleaned’ water is reused to wash more sand.

Water in the dams originates from underground water pumped into the dams, as well as surface and sub-surface stormwater run-off that flow into the dams. Just outside of the northern boundary of the study area are a small valley bottom wetland and a small semi-perennial stream.

Drainage regions

South Africa is divided up into a number of naturally occurring primary and quaternary drainage areas (QDA) or regions. The different regions fall under the authority of different water management areas (WMA) and Catchment Management Agencies (CMA).

The study area is situated within the primary drainage area (PDA) of A, and the quaternary drainage areas (QDAs) of A23A and A23B.

The study area is within the Crocodile (West) & Marico West Management Area (WMA 3) and under the jurisdiction of the newly proposed Limpopo Catchment Management Agency (CMA 1). Currently not all CMAs are operational.

The study area is within the Wetland Vegetation Ecoregion of Central Bushveld Group 2. Wetland vegetation ecoregions are similar to terrestrial bioregions, but with the focus on the water environment and catchment areas.

Strategic Water Source Areas of South Africa (SWSA)

Strategic Water Source Areas (SWSA) are those areas that supply a disproportionate amount of mean annual runoff to a geographical region of interest. These areas are important because they have the potential to contribute significantly to overall water quality and supply, supporting growth and development needs that are often a far distance away (SANBI). These areas make up 8% of the land area across South Africa, Lesotho and Swaziland but provide 50% of the water in these countries.

At a national level, Strategic Water Source Areas form the foundational ecological infrastructure on which a great deal of built infrastructure for water services depends. Investing in Strategic Water Source Areas is also an important mechanism for long-term adaptation to the effects on climate change on water provision growth and development (SANBI). The study area falls outside of any SWSA strategic water areas. This been said, it is still important to realise that all water environments need to be viewed as sensitive and need to be well managed.

Delineation of watercourses in the study area

All watercourses within the study area were delineated during field investigations (*refer to Figure 13*). The only naturally occurring watercourse is a small semi-perennial stream outside of the northern boundary of the study area. Linked to this little stream is a small valley bottom wetland at the upper source of the stream. There were no watercourses within the study area to delineate. However, the numerous dams (manmade impoundments) on the site were identified and delineated. Some of these dams are just quarries that have collected rainwater and surface stormwater runoff over the years. Most of these quarries and dams will disappear during the mine-closure, rehabilitation process.

All watercourses, no matter how degraded, are viewed as sensitive and must be treated as such. It is recommended that the demarcated areas (in blue) in the map below be completely avoided and protected (*Figure 13*).

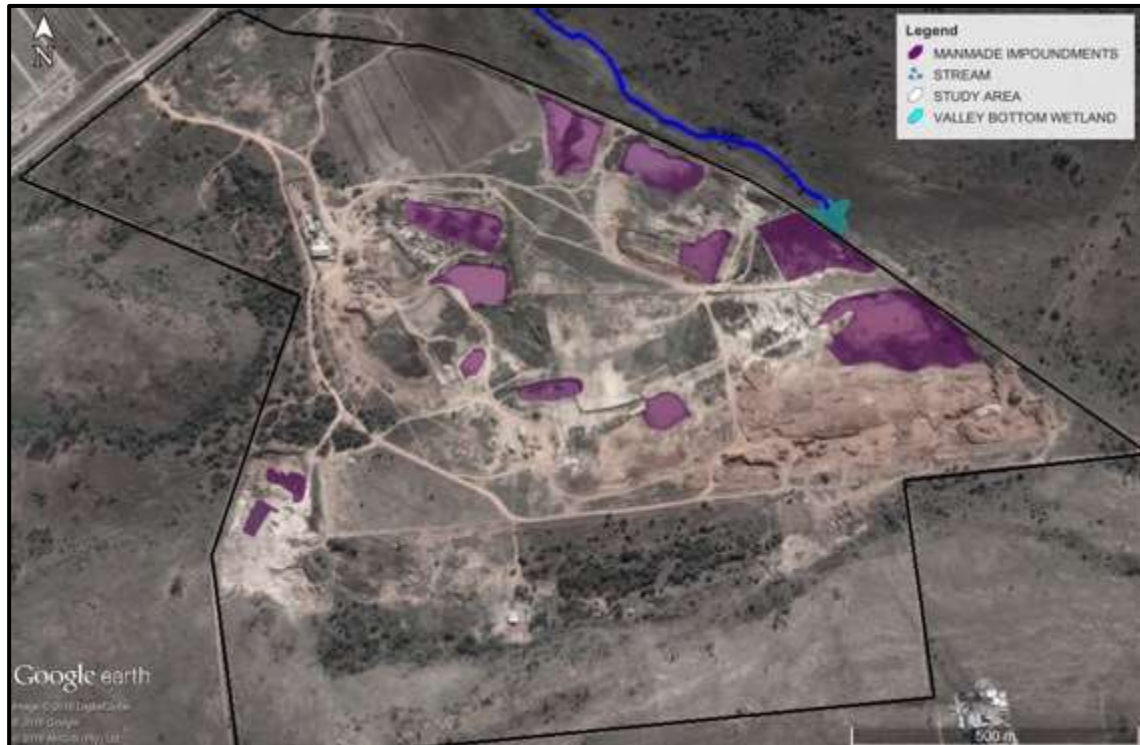


Figure 13: Delineated Water Courses

Methodology (PES)

The Present Ecological State (PES) is the current (present) ecological condition (state) in which the watercourse is found, prior to any further developments or impacts from the proposed project. The PES of watercourses found in the study area is just as important to determine, as are the potential impacts of the proposed development. The PES of a watercourse is assessed relative to the deviation from the Reference State (also known as the Reference Condition).

The reference state is the original, natural or pre-impacted condition of the system. The reference state is not a static condition, but refers to the natural dynamics (range and rates of change or flux) prior to development. The PES Method (DWA, 2005) was used to establish the present state (integrity) of the unnamed drainage line in the study area. The methodology is based on the modified Habitat Integrity approach of Kleynhans (1996, 1999).

PES and EIS of watercourses in the study area

The assessment criteria and structure to determine the PES of watercourses is based on the modified Habitat Integrity approach of Kleynhans (1996, 1999). The PES is calculated by looking at the hydrology, geomorphology, water quality and biota of each watercourse. Of importance is the overall PES of the system. **There are no naturally occurring watercourses in the study area.** The dams and ponds cannot be assessed either. The small semi-perennial stream and wetland just outside of the study area were assessed although not completely relevant to the project.

The PES values of the watercourses were determined to be High (Category - B), due to their fairly pristine state, however their associated EIS values were determined to be Moderate (Category - C). The recommended ecological management class for both watercourses (REMC) or (REC) is recommended as Class B. They are largely natural, with few negative impacts and disturbances. It is important to ensure that activities on the study site do not have any negative impact on these watercourses.

6.2.3 Sensitivity Assessment

The sensitivity assessment identifies those areas and habitats within the study site that have a high conservation value and that may be sensitive to disturbance. All watercourses, including seasonal streams and drainage lines are always deemed to be sensitive, even if they are badly degraded. Areas or habitats have a higher conservation value (or sensitivity) based on threatened ecosystems, ideal habitat for priority species (including red data species), etc.

Most of the central area of the study area is a sand works operation, while acacia-dominated thornveld is found in patches or on the outer skirts. A large, long ridge is present in the south and a small rounded ridge present in the west. The distinctive habitats within the study area consist of thornveld, ridges and sand works. The floral and faunal sensitivity analyses are shown in the tables 13 and 14 below.

TABLE 13: FLORISTIC SENSITIVITY ANALYSIS

Criteria	Distinctive habitats in the study area		
	Thornveld	Ridges	Sand Works
Red Data Species	4	8	1
Habitat Sensitivity	5	8	1
Floristic Status	5	7	1
Floristic Diversity	5	7	1
Ecological Fragmentation	6	7	5
Sensitivity Index	50%	74%	18%
Sensitivity Level	Medium	Medium/High	Low
Development Go Ahead	Go-But	Go-But	Go

TABLE 14: FAUNAL SENSITIVITY ANALYSIS

Criteria	Distinctive habitats in the study area		
	Thornveld	Ridges	Sand Works
Red Data Species	3	7	2
Habitat Sensitivity	5	8	1
Floristic Status	5	6	2
Floristic Diversity	5	6	1
Ecological Fragmentation	6	8	4
Sensitivity Index	48%	70%	20%
Sensitivity Level	Medium	Medium/High	Low
Development Go Ahead	Go-But	Go-But	Go

Ecological Sensitivity Analysis

The ecological sensitivity of the study area is determined by combining the sensitivity analyses of both the floral and faunal components. The highest calculated sensitivity unit of the two categories is taken to represent the sensitivity of that ecological unit, whether it is floristic or faunal in nature (Table 15).

TABLE 15: ECOLOGICAL SENSITIVITY ANALYSIS

Ecological community	Floristic sensitivity	Faunal sensitivity	Ecological sensitivity	Development Go-ahead
Thornveld	Medium	Medium	Medium	Go-But
Ridges	Medium/High	Medium/High	Medium/High	Go-But
Sand Works	Low	Low	Low	Go

According to the analyses of the floristic, faunal and overall ecological sensitivities there are no high sensitivity areas or habitats. In other words, there are no 'No-Go' areas within the study area.

Eventhough the sensitivity of the ridges were only calculated to be Medium/High, the sensitivity should be raised to High sensitivity. The ridges on the study site are in fairly pristine condition, furthermore, all ridges in Gauteng Province are considered by the provincial authorities to be sensitive and important areas.

Priority areas

The study area does not fall within any national priority areas. These priority areas include formal and informal protected areas (nature reserves); important bird areas (IBAs); RAMSAR sites; National fresh water ecosystem priority areas (NFEPA) and National protected areas expansion strategy (NPAES) focus areas.

Sensitive areas identified during field investigations

During field investigations sensitive areas were identified. As previously mentioned, most of the central area of the study site is a highly disturbed, transformed sand works mine and processing plant. However, in the south and west are two ridge formations that are considered to be sensitive (**Figure 14**). The ridges and their vegetation / ecosystems are fairly pristine, with little disturbances or weed infestations.

Ridges within the Gauteng Province create unique, islands of biodiversity. These ridges are often bushveld type ecosystems within a grassland biome. The unique ecosystems are not just in terms of plant communities, but also in terms of faunal communities. These ridges are home to numerous lizards, snakes and invertebrate species, many of which are priority species of conservation concern.

The following extract is taken from GDARD’s policies and guidelines regarding ridges (Pfab, 2001):
 “In the light of the motivations presented in section 3 of this document and due to the extremely limited distribution, rarity and threatened status of the ridges in Gauteng, it is imperative that the Department adopts a strict no-go or low impact development policy for these systems. However, this policy, by necessity, will have to be adapted according to the current transformed status of some of these ridges.”

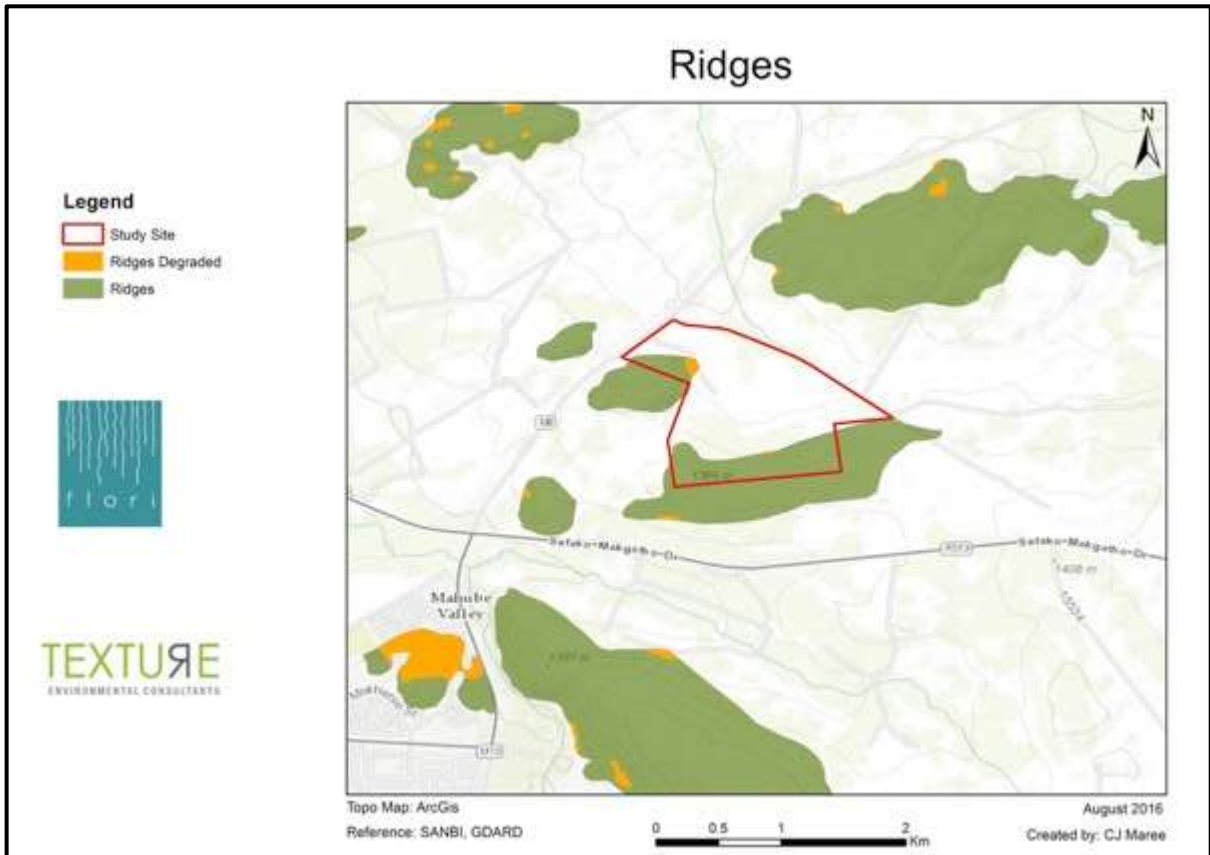


Figure 14: GDARD Ridges

Table 16 gives a description of the various class categories for ridges in Gauteng. According to the Tshwane Open Space Framework the two ridges in the study area would be classified as **Class 2 ridges**.

TABLE 16: CLASSIFICATION OF RIDGES IN GAUTENG PROVINCE

Category	Transformed	Description
Class 1	< 5%	Ridges of which 5% or less of their surface area has been converted to urban development, quarries and/or alien vegetation. (Approximately 51% of ridges currently fall within Class 1, including the Suikerbosrand and parts of the Magaliesberg.)
Class 2	> 5% but < 35%	Ridges of which more than 5%, but less than 35% , of their surface area has been converted to urban development, quarries and/or alien vegetation. (Approximately 28% of ridges currently fall within Class 2, including parts of the Magaliesberg, ridges falling within the Cradle of Humankind World Heritage Site, the Klipriviersberg, the Bronberg and the Skurweberg.)
Class 3	> 35% but < 65%	Ridges of which 35% or more, but less than 65% , of their surface area has been converted to urban development, quarries and/or alien vegetation. (Approximately 9% of ridges currently fall within

		Class 3, including the ridge that traverses the Northcliff, Roodepoort and Krugersdorp areas).
Class 4	65% +	Ridges of which 65% or more of their surface area has been converted to urban development, quarries and/or alien vegetation. (Approximately 11% of ridges currently fall within Class 4, including the Melville Koppies and the Linksfield Ridge).

It is however, the opinion of the Specialist that the ridges, as demarcated in Figure 14 by GDARD, are over-extended. In reality, the ridges do not protrude as far into the study area as highlighted in the map. The extent of the ridges, according to field investigations, are demarcated in the ridges map below (**refer to Figure 15**).

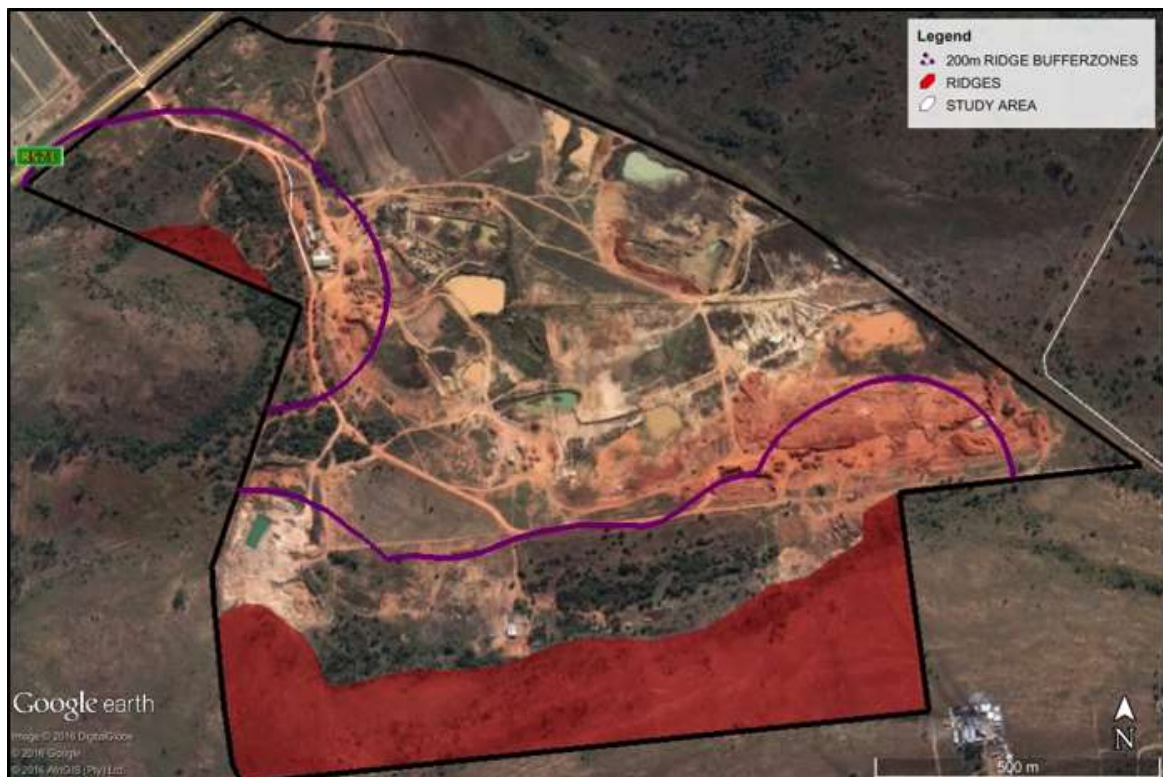


Figure 15: Delineated Ridges

The ridges in the study area have been delineated. A 200m buffer zone has also been demarcated and drawn around the ridges, as shown in Figure 15. There are already a lot of mining activity as well as housing within these buffer zones. As per the GDARD's development guidelines for ridges (Pfab, 2001), low level development is permitted within these buffer zones. It is recommended that planned housing development (which is relatively low development) be allowed within the 200m buffer zones, but **not within the 50m buffer zones (refer to Figures 16 & 17)**. Furthermore, that the ridges be declared '**no-go**' zones for any development. However, what is recommended is that well-planned recreation and green zones for the ridges be allowed. This could include a few picnic spots as well as walking trails. In this manner, allowing controlled, local use of the ridges will in fact encourage and assist in management, conservation and protection of the ridges. In the areas within the buffer zones where totally transformation has taken place due to mining activities, it is recommended that higher levels of development may occur there.

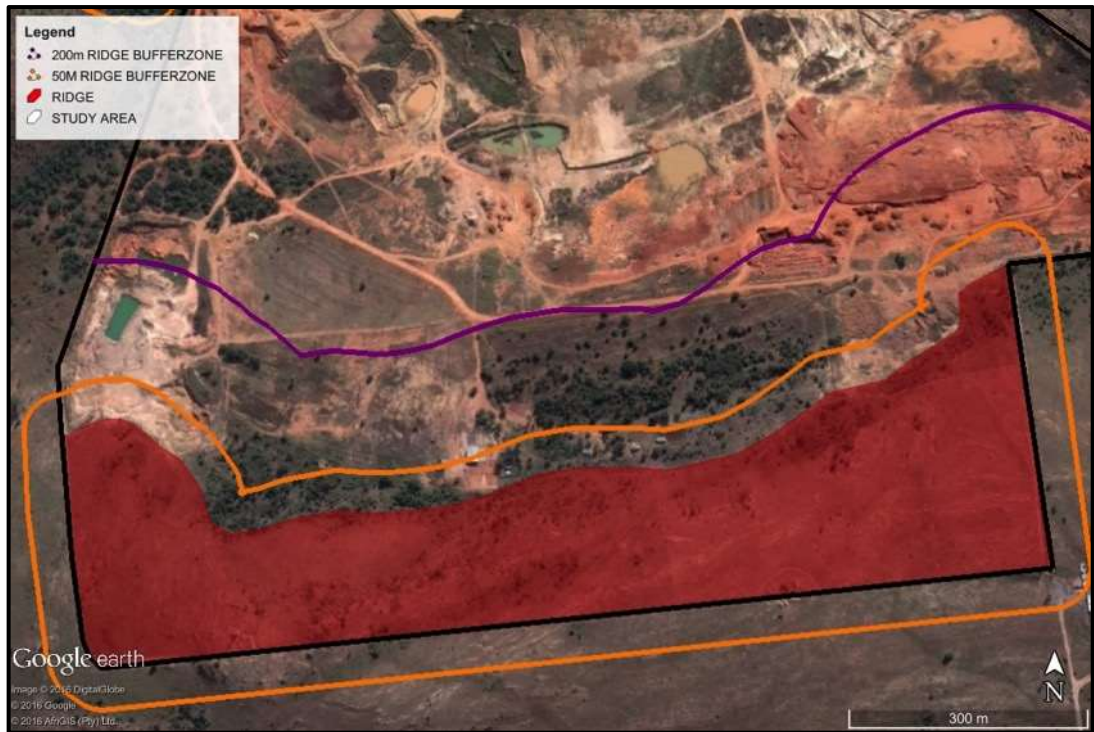


Figure 16: Buffer zones around large ridge in the south

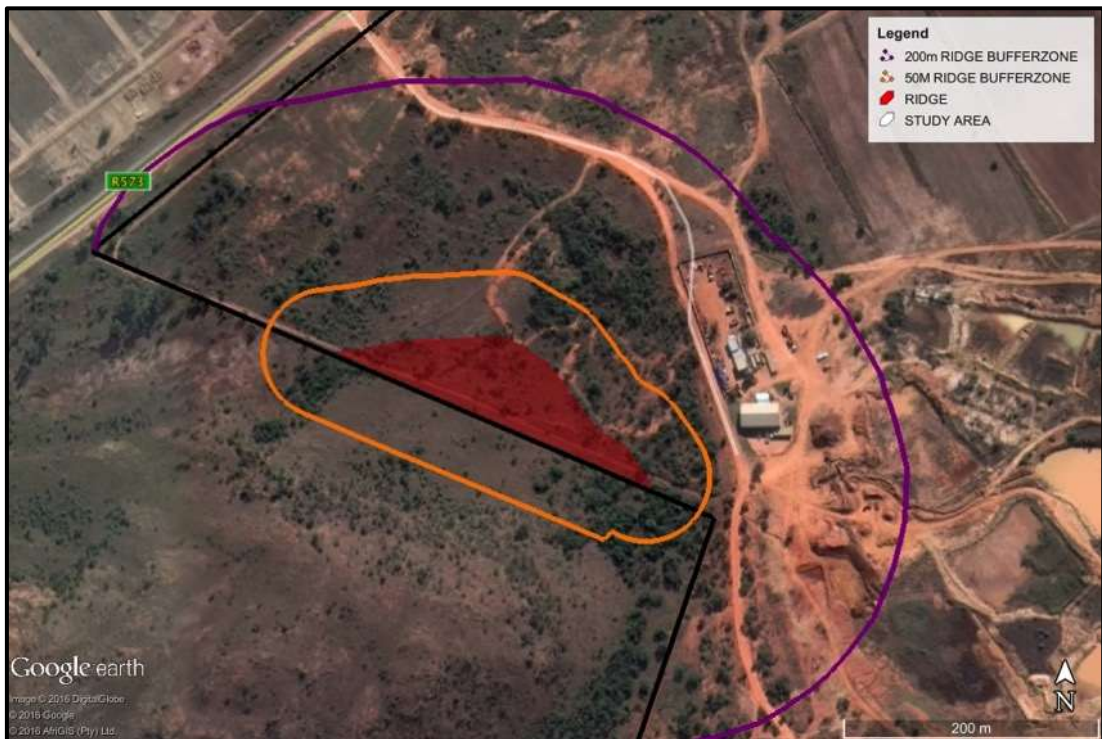


Figure 17: Buffer zones around small ridge in the west

Gauteng Conservation Plan (C-Plan v.3.3)

According to the Gauteng Conservation Plan (C-Plan) version 3.3, the study area is outside of any Critical Biodiversity Areas (CBAs), but with Ecological Support Areas (ESAs) in the south and west. These demarcated ESAs, as shown in the map below, are ridges (*refer to Figure 18*). It is the opinion of the specialist that these ridges should actually be demarcated as CBAs.

Critical biodiversity areas (CBAs) are terrestrial and aquatic features in the landscape that are critical for retaining biodiversity and supporting continued ecosystem functioning and services (SANBI, 2007).

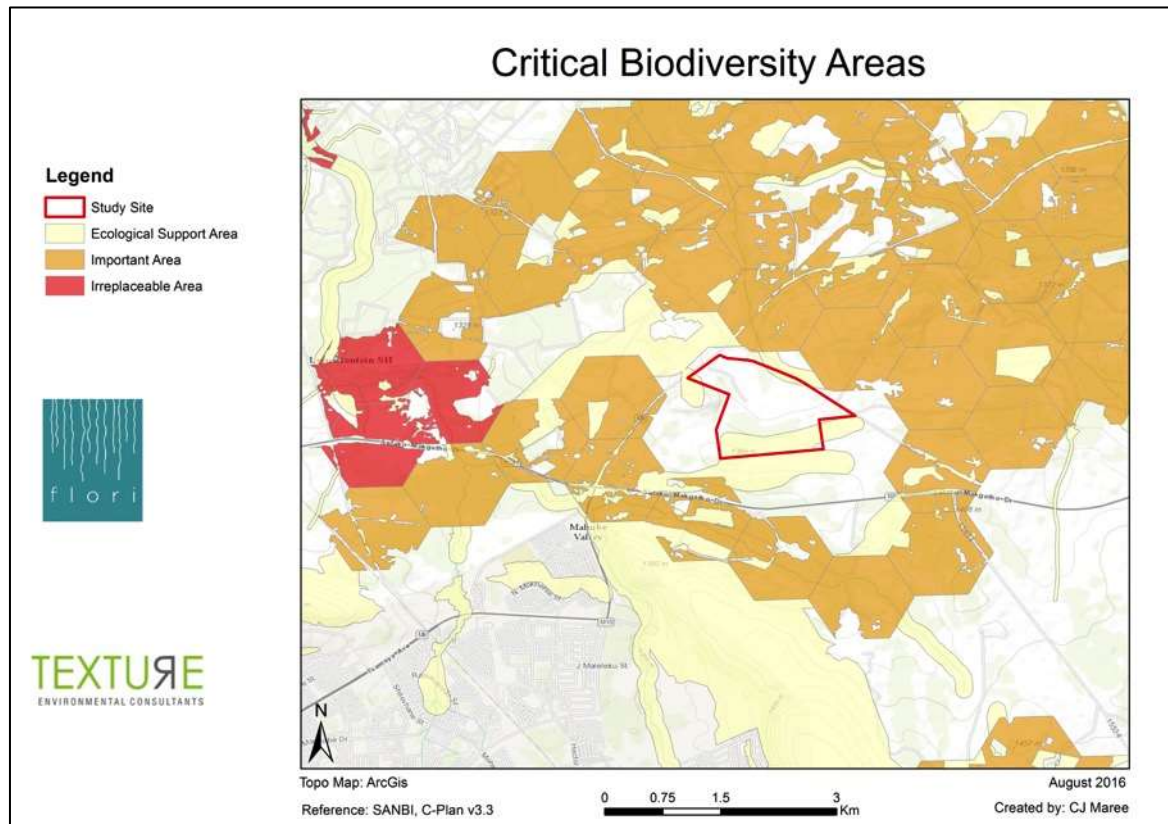


Figure 18: Critical Biodiversity Areas (CBAs)

Figure 19 below is the sensitivity map for the study area. The map takes into account field investigations, national priority areas, CBAs, ESAs, ridges, watercourses and the sensitivity analyses. Stone walling and grave yards from the Heritage Assessment Report for the project (*refer to Appendix D2*) have also been demarcated on the sensitivity map.

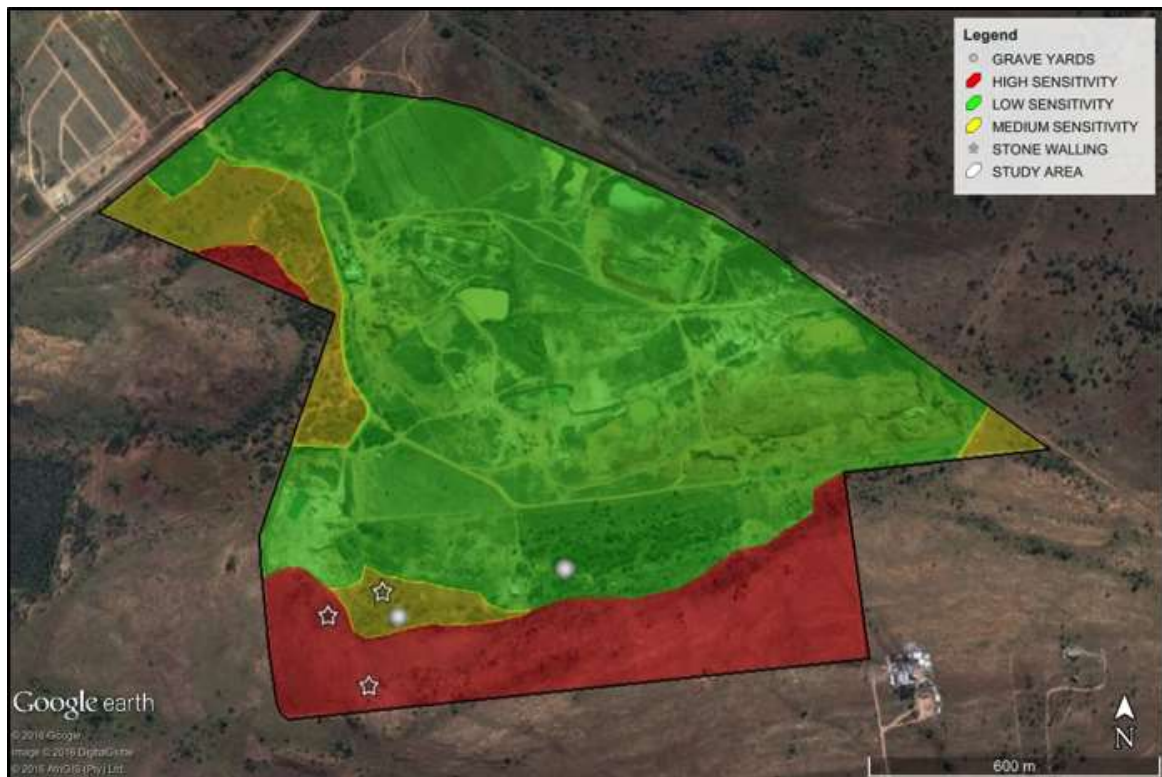


Figure 19: Sensitivity Map

The Go, No-Go option

Classification criteria

The term '**fatal flaw**' is used in the pre-application planning and screening phases of a project to evaluate whether or not an impact would have a 'no-go' implication for the project. In the scoping and impact assessment stages, this term is not used. Rather impacts are described in terms of their potential significance.

A potential fatal flaw (or flaws) from a biodiversity perspective is seen as an impact that could have a 'No-Go' implication for the project. A 'No-Go' situation could arise if residual negative impacts (i.e. those impacts that still remain after implementation of all practical mitigatory procedures/actions) associated with the proposed project were to:

- a) Conflict with international conventions, treaties or protocols (e.g. irreversible impact on a World Heritage Site or Ramsar Site);
- b) Conflict with relevant laws (e.g. clearly inconsistent with NEMA principles, or regulations in terms of the Biodiversity Act, etc.);
- c) Make it impossible to meet national or regional biodiversity conservation objectives or targets in terms of the National Biodiversity Strategy and Action Plan (BSAP) or other relevant plans and strategies (e.g. transformation of a 'critically endangered' ecosystem);
- d) Lead to loss of areas protected for biodiversity conservation;
- e) Lead to the loss of fixed, or the sole option for flexible, national or regional corridors for persistence of ecological or evolutionary processes;
- f) Result in loss of ecosystem services that would have a significant negative effect on lives (e.g. loss of a wetland on which local communities rely for water);
- g) Exceed legislated standards (e.g. water quality), resulting in the necessary licences/approvals not being issued by the authorities (eg. WULA);

h) Be considered by the majority of key stakeholders to be unacceptable in terms of biodiversity value or cultural ecosystem services.

Potential Fatal Flaws for the Project

There are no issues with regard to the criteria listed above (a to h), as far as the proposed project is concerned. There are no specific fatal flaws and the project may go ahead. However, the ridges within the study area are determined to be 'No-Go' zones and need to be avoided completely in terms of proposed developments as per the project's designs and layouts. Mitigating measures must also be implemented.

Mitigation of Impacts

The following mitigating measures are recommended to help reduce the negative impacts that the project might have on the natural environment. The implementation of recommended mitigating measures are necessary if the conclusions and assessments of the report are to remain pertinent.

Construction Phase

- No temporary facilities, temporary accommodation or temporary storage sites to be erected within 50m of any watercourse.
- No portable toilets to be positioned within a 50m bufferzone of any watercourse.
- Only existing roads to be used by heavy vehicles during construction as far as possible.
- Ensure stormwater runoff is probably diverted and channelled.
- No excess imported soils or stone (if used during the construction phase) may be left behind. These materials to be removed immediately on completion of the project or activity.
- Disturbed surface areas in the construction phase to be rehabilitated. No open trenches to be left. No mounds of soils created during construction to be left.
- All hazardous materials such as but not limited to paint, turpentine and thinners must be stored appropriately to prevent these contaminants from entering the terrestrial and water environments.
- All construction material, equipment and any foreign objects brought into the area by contractors and staff to be removed immediately after completion of construction.
- Removal of all waste construction material to an approved waste disposal site.
- Proper rubbish/waste bins to be provided. These to be emptied weekly and the waste to be removed to an official waste disposal site.
- All vehicle and machinery tracks and disturbed areas to be rehabilitated immediately after the construction phase.
- Ensure a proper Stormwater Management Plan is compiled and implemented.
- Ensure as small as possible footprint during construction phase.
- Avoid and minimise the removal of any indigenous trees.
- Access roads for heavy vehicles to be limited.
- No movement of construction workers or vehicles outside of study area boundaries.
- Dust control to be implemented during the construction phase.
- Ridges are 'No-Go' zones for development and also during the construction phase. The ridges need to be totally off-limits to all construction personnel as well as vehicles, materials, etc.
- A 50m buffer zone should be demarcated in which no, or very limited development is allowed. Signs should be erected showing the 50m buffer zone and saying that it is sensitive and that access is limited or not allowed. These can be removed once construction is completed.
- Heavy vehicles, materials, equipment and movement of contractors must be prohibited or at least limited and controlled within the 50m buffer zones of the ridges. These mitigating measures go a long way to limit impact on the ridges as well as shown attempts by developers to protect and respect the natural environment.

Maintenance Phase

- Mechanical control and monitoring of alien plants around disturbed areas and developed areas to be implemented.

- No chemical control (herbicides) of alien plants to be used within 100m of watercourses. Herbicides could get into the water system and will have a detrimental effect on the environment.
- Potential erosion areas to be inspected and corrected where necessary.
- Stormwater culverts, channels, etc. to be inspected and maintained on an ongoing basis.
- No declared invasive weed alien plant species allowed to be used in gardens and landscaping.
- Rubbish must be routinely cleaned up from public access areas to the ridges.

Implications for development

*The two ridges are regarded as sensitive and must be excluded from the development. The existing sand mining activities and associated infrastructure have already encroached the 200m buffer zones of both ridges significantly, as illustrated in **Figures 16 and 17**. A **50m buffer zone** along the ridges are recommended. Mitigation measures are included in the EMP, Appendix F.*

6.3 Social Environment

6.3.1 Socio-Economic Environment

Population Demographics

The following information was obtained from the Integrated Development Plan (IDP) for the City of Tshwane (CoT) for the period 2011 – 2016.

According to the Stats SA 2007 Community Survey, the population in CoT has since 2001 grown by 18.3, whilst the CoT's Household Survey 2008 indicates a growth of 3.4% between 2007 and 2008.¹⁰³ The number of households has also increased with approximately 22% since 2001.¹⁰⁴ The population of Kungwini Local Municipality (KLM) has been growing at an estimated 4,5% per annum. According to the Demarcation Board's Capacity Assessment Report Nokeng Tsa Taemane Local Municipality (NLM) had a decrease in population of 7,8% in the past six years.¹⁰⁵ After the incorporation of KLM and NLM the CoT will have a population of approximately 2,5 million. The city is characterised by a rapidly growing population (a projected annual growth of 4,1%). The situation is exacerbated by immigration, resulting in an increase of informal settlements and an estimated 26.8% of all households residing in informal housing. The population of the municipalities is scattered all over with the highest density of people to be found within the previously disadvantaged areas, such as Atteridgeville, Mamelodi, Olievenhoutbosch, Soshanguve, Garankuwa in CoT, Ekangala, Zithobeni and Rethabiseng in KLM and Refilwe, Onverwacht and Jakaranda Park in NLM.

Employment

A large number of residents in the Kungwini area are currently employed outside the area. This implies that economic activities within the area are limited. The unemployment figures of each municipality are as follows:

TABLE 17: UNEMPLOYMENT FIGURES OF MUNICIPALITIES

Municipality	Unemployment	Earn less than R1 600 pm	Households on Indigent Register
CoT	20%	18%	Households on Indigent Register
KLM	19%		1 587(± 4 309 households underreported)
NLM	12%	56%	870

In order to assist those households that are not able to pay for municipal services, all three municipalities adopted a social package policy, known as the Indigent Policy, which allows for citizens to register as indigents. According to the principles set out in the Indigent Policy the first 50 units of electricity and 6kl of water will be provided free of charge to all registered indigent consumers. CoT has subsequently provided the first 100 units of electricity and 12kl of water free to registered indigent consumers.

Implications for development

The proposed development could supply in the need for housing and job opportunities in the area.

6.3.2 Heritage and Cultural Value

The following information has been extracted from the Cultural Heritage Impact Assessment Report undertaken by Archaetnos Culture and Cultural Resource Consultants. **Refer to Appendix D.2.**

According to the cultural heritage consultant five sites of cultural heritage significance were located in the study area.

Site No 1: Historical/ Late Iron Age stone walling

GPS: 25.67705°S; 28.43484°E

The site consists of low circular stone packed walling and terraces. It seems as if walls have been robbed and accordingly the site is in a very poor state (Photo 1). No middens or cultural artefacts were identified.

It therefore has medium cultural significance and receives a field rating of General protection B (IV B). This means that the site should be recorded after which it may be demolished. Recording would consist of complete photographic recording and drawing a site plan.



Photo 1: Section of stone walling at Site no. 1.

Site No 2: Grave Yard

GPS: 25.67751°S; 28.43517°E

The site consists of at least 6 graves with stone dressings. No headstones are found (Photo 2). Therefore, no surnames or dates or death could be identified. This means that the graves are unknown, which has to be handled similar to heritage graves (older than 60 years).

Graves always are regarded as having a high cultural significance and receives a field rating of Local Grade IIIB. It should be included in the heritage register, but may be mitigated.

Two possibilities exist. The first option would be to fence the graves in and have a management plan drafted for the sustainable preservation thereof. This should be written by a heritage expert. This usually is done when the graves are in no danger of being damaged, but where there will be a secondary impact due to the activities of the proposed development.

The second option is to exhume the mortal remains and then to have it relocated. This usually is done when the graves are in the area to be directly affected by the mining activities. For this a specific procedure should be followed which includes social consultation. For graves younger than 60 years only an undertaker is needed. For those older than 60 years and unknown graves an undertaker and archaeologist is needed. Permits should be obtained from the Burial Grounds and Graves unit of SAHRA. This procedure is quite lengthy and involves social consultation.



Photo 2: Some of the graves at Site no. 2.

The graves are outside of the area of direct impact. This means that the graves will be impacted on indirectly as dust from groundwork activities and blasting may have an effect on them. Access for descendants also may be an issue.

Site No 3: Grave Yard

GPS: 25.67663°S; 28.43859°E

The site consists of at least 5 graves with stone dressings. No headstones are found (Photo 3). Therefore, no surnames or dates or death could be identified. This means that the graves are unknown, which has to be handled similar to heritage graves (older than 60 years).

Graves always are regarded as having a high cultural significance and receives a field rating of Local Grade IIIB. It should be included in the heritage register, but may be mitigated.

The graves are outside of the area of direct impact. This means that the graves will be impacted on indirectly as dust from groundwork activities and blasting may have an effect on them.

Two possibilities exist. The first option would be to fence the graves in and have a management plan drafted for the sustainable preservation thereof. This should be written by a heritage expert. This usually is done when the graves are in no danger of being damaged, but where there will be a secondary impact due to the activities of the proposed development.

The second option is to exhume the mortal remains and then to have it relocated. This usually is done when the graves are in the area to be directly affected by the mining activities. For this a specific procedure should be followed which includes social consultation. For graves younger than 60 years only an undertaker is needed. For those older than 60 years and unknown graves an undertaker and archaeologist is needed. Permits should be obtained from the Burial Grounds and Graves unit of SAHRA. This procedure is quite lengthy and involves social consultation.



Photo 3: Some of the graves at Site no. 3.

Site No.4: Historical military stone walling

GPS: 25.67879°S; 28.43456°E

This is a stone wall which had a military origin, dating to the Anglo-Boer War (1899-1902). It can be linked to the Battle of Diamond Hill and is a defensive fortification wall (Photo 4). A survey done in 2007 also identified the site as well as .303 ammunition from this period (Van Druten 2007: 74). Van Vollenhoven (1995 & 2010) has described various such cartridges and fortifications.

The site is regarded as having a high cultural significance. It receives a field rating of Local Grade IIIA. It should be included in the heritage register and may not be mitigated.

There will be no direct impact from the development on the site, but since residential units will be erected nearby there will definitely be an indirect impact. Therefore, the site needs to be protected. A cultural management plan should be drafted and implemented to preserve and protect the site. The plan should also include measures for the sustainable utilization of the structure (e.g. walking trails and information panels). The body corporate of the new development will have to assume responsibility for the implementation of the plan in the future. Such a plan should be drafted by a heritage expert and should be completed before the development may commence.



Photo 4: Military stone walling at site no. 4.

Site No. 5: Historical military stone walling

GPS: 25.67749°S; 28.43372°E

This is a low stone wall which had a military origin, dating to the Anglo-Boer War (1899-1902). It can be linked to the Battle of Diamond Hill and is a defensive fortification wall (Photo 5).

The site is regarded as having a high cultural significance. It receives a field rating of Local Grade IIIA. It should be included in the heritage register and may not be mitigated.

There will be no direct impact from the development on the site, but since residential units will be erected nearby there will definitely be an indirect impact. Therefore, the site needs to be protected. A cultural management plan should be drafted and implemented to preserve and protect the site. The plan should also include measures for the sustainable utilization of the structure (e.g. walking trails and information panels). The body corporate of the new development will have to assume responsibility for the implementation of the plan in the future. Such a plan should be drafted by a heritage expert and should be completed before the development may commence.



Photo 5: Military stone walling at site no. 5.

The location of the five identified sites are indicated in **Figure 20** below.



Figure 20: Cultural Sites

Conclusions and Recommendations

Five sites of heritage significance were identified.

The following is recommended by the Heritage Consultant:

- Site no. 1 (Historical/ Late Iron Age stone walling) has medium cultural significance. The site should be recorded after which it may be demolished. Recording would consist of complete photographic recording and drawing a site plan. However, note that demolition should only be permitted if the site is directly impacted on, which seem to be the case here.
- Graves always are regarded as having a high cultural significance and receive a field rating of Local Grade IIIB. It should be included in the heritage register, but may be mitigated.
- Two possibilities exist. The first option would be to fence the graves in and have a management plan drafted for the sustainable preservation thereof. This should be written by a heritage expert. This usually is done when the graves are in no danger of being damaged, but where there will be a secondary impact due to the activities of the development.
- The second option is to exhume the mortal remains and then to have it relocated. This usually is done when the graves are in the area to be directly affected by the development activities. For this a specific procedure should be followed which includes social consultation. For graves younger than 60 years only an undertaker is needed. For those older than 60 years and unknown graves an undertaker and archaeologist is needed. Permits should be obtained from the Burial Grounds and Graves unit of SAHRA. This procedure is quite lengthy and involves social consultation.
- The graves seem to be inside of the area of direct impact. However, since the development proposal is a preliminary one, it may still be possible to change it so that the impact is indirect. In such a case Option 1 is recommended. This includes the writing of a site preservation management plan and fencing in of the site. Access to descendants also should be granted.
- **However, should it not be possible to change the layout, option 2 will have to be implemented. This needs to be done via the processes described in the report.**
- Sites no. 4 & 5 are historical military stone walling (fortifications) dating to the Anglo-Boer War (1899-1902) and linked to the Battle of Diamond Hill. Both sites are regarded as having a high cultural significance. It may not be mitigated and must be preserved.
- Although there will be no direct impact from the development on the sites, residential units will be erected nearby which will definitely create an indirect impact since the sites will be easily accessible. Therefore the sites need to be protected.
- A cultural management plan should be drafted and implemented to preserve and protect the sites. The plan should also include measures for the sustainable utilization of the structure (e.g. walking trails and information panels). The body corporate of the new development will have to assume responsibility for the implementation of the plan in the future.
- Such a plan should be drafted by a heritage expert and should be completed before the development may commence.
- Only after implementation of the above-indicated mitigatory measures, the proposed development may continue.
- It should also be noted that the subterranean presence of archaeological and/or historical sites, features or artefacts is always a distinct possibility. Care should therefore be taken when development commences that if any of these are discovered, a qualified archaeologist be called in to investigate the occurrence.

Implications for development

The two historical military stone walling (fortifications) sites dating to the Anglo-Boer War (1899-1902) and linked to the Battle of Diamond Hill (Sites no. 4 & 5) will be preserved.

The graves will be fenced in and be preserved. Should the need arise for the graves to be relocated, the correct procedure will be followed. Mitigation measures are included in the EMP, Appendix F.

6.3.3 Visual aspects

The proposed development site lies in a macro area where the visual quality of the macro area could be rated as medium as a result of the pleasant rural character of the surrounding areas.

The visual environment of the wider area in which the development is proposed consists of a mix of natural and anthropogenic components, which means that the area will be likely to be visually influenced by differing visual factors. The site is currently used for sand mining. The visual character of the wider area to the south west can be described as largely urban in nature, but this reflects a recently changing baseline from a much more rural visual character that previously existed in the area.

The visual character of the area to the west and south west of the site has changed in the last number of years due to residential developments. The landscape has not completely changed, however, and there are significant parts of the landscape in the vicinity of the site that are natural in character – i.e. open grasslands typical of this part of Gauteng to the east of site.

Large areas surrounding the site are still undeveloped, engendering the area with a partly natural visual component. However a number of residential developments are currently taking place in the surrounding area to the west, south-west and north of the site.

The terrain in the wider study area is undulating in nature, consisting of broad valleys. The presence of sloping ground typically entails that aspect is important in determining the viewshed that is visible to a viewer located at a certain point within the landscape.

The visual impact of the loss of open space must be considered in context with the existing land use that is sand mining. The change in land use to residential would be significant; however, it should be noted that this would involve significant rehabilitation of the site (especially the mined areas) to its natural habitat.

The loss of open space must also be considered in context with the conservation status of the site. As described in the ecological assessment the site is not a pristine portion of land anymore.

Implications for development

The proposed development will be able to blend in with the surrounding environment and will not look out of place due to the occurrence of relatively similar land uses in the surrounding area (to the west, south-west and north).

The architectural and landscape architectural guidelines for the proposed development will be developed to allow for a positive aesthetic influence on the surrounding environment. The guidelines will include aspects of finishes, lights pollution, colours to blend into the surrounding colours, heights of buildings, and roof finishes. Aesthetics and contextual appropriateness is to be a major aspect of these guidelines. Mitigation measures are included in the EMP, Appendix F.

6.3.4 Air Pollution

Air Quality may be divided into physical and chemical aspects. The physical aspect comprises particulates, such as dust and smoke, blown from or released into the atmosphere by an activity. Chemical aspects comprise volatile and non-volatile chemical compounds (including odours) emitted into the atmosphere by activities or processes.

During construction dust from site preparation and platform shaping activities will be blown into surrounding areas. Mitigation will be through the implementation of dust suppression measures, as addressed in the draft EMP.

Odour nuisance from uncollected wastes emanating from the retail and business facilities, may negatively affect neighbouring residents. Mitigation measures include:

- Ensuring that waste handling, storage and collection is undertaken in accordance with the relevant health and municipal legislation, practices and procedures; and
- Managing the development in compliance with the relevant environmental, water, and health legislation.

Waste Management includes the management of both solid and liquid waste, or effluent, produced by a facility or an activity. Litter blown from the development may accumulate in the residential area. The following measures will aid in mitigation of this potential impact:

- Ensuring that the design of the development includes adequate facilities for the temporary storage of waste, in terms of volume, location and enclosure;
- Ensuring that waste handling, storage and collection is undertaken in accordance with the relevant health and municipal legislation, practices and procedures;
- Provision of adequate numbers of litter bins throughout the development; and
- Implementation of an appropriate collection and disposal strategy to ensure regular removal of waste to a permitted waste disposal facility.
- Promoting the recycling of waste, with specialist service providers appointed to remove the waste from site.

Refer to Appendix F for the EMPr, which details Solid Waste Management for the site.

Implications for development

Mitigation measures will be included in the EMPr (refer to Appendix F).

6.3.5 Noise

Currently, noise is generated on site due to the sand mining activities. Potential Noise sources created by the new development will be:

Construction Noise: During construction activities, people are often exposed to different levels of pounding, roaring, beeping and other loud noises from construction work. Construction noise abatement measures have been provided in the EMPr, to ensure that the construction activities are not a source of excessive noise to the surrounding residents.

Operational Noise: Commercial operators commonly generate noise from their ventilation systems. Trades and industries can reduce noise pollution from their operation through proper selection and maintenance of their equipment and ensuring compliance with legal requirements. Traffic noise generated from the new development.

Implications for development

Mitigation measures will be included in the EMPr (refer to Appendix F).

7 Project Alternatives

In terms of the EIA Regulations, Section.28 (1) (c) feasible alternatives are required to be considered as part of the environmental investigations. In addition, the obligation that alternatives are investigated is also a requirement of Section 24(4) of the National Environmental Management Act (Act No. 107 of 1998) (as amended). An alternative in relation to a proposed activity refers to the different means of meeting the

general purpose and requirements of the activity (as defined in GNR 982 of the EIA Regulations, 2014), which may include alternatives to:

- the property on which or location where it is proposed to undertake the activity;
- the type of activity to be undertaken;
- the design or layout of the activity;
- the technology to be used in the activity;
- the operational aspects of the activity; and
- the option of not implementing the activity.

The following alternatives will be considered as part of the environmental investigations: land use, layout, designs and energy uses, and the No-Go Alternative.

7.1 Land Use Alternatives

7.1.1 Mixed use development (Proposal and Preferred Alternative)

The proposed mixed use township will consist of the following land uses: Special mixed uses (commercial, business, light industrial); Residential 2 (30 units/ha); Residential 3 (60 units/ha); Community Facilities and Public Open Space.

Although the emphasis is on housing, complimentary land uses have been included in the township. People want easy access to job opportunities, shops, community facilities, etc. and want their living environment, such as residential townships to be placed at strategic positions with good access routes in close proximity to these amenities. Included in the proposed township are large pockets of green public open spaces to keep the “green lungs” in the development.

The Community facilities node on site is defined as “a focal point at which a range of essential services can be obtained by people living in its vicinity”. In turn, a commercial node acts as a pool of human and physical resources from which the inputs necessary for development can be distributed efficiently, and from which a community can draw to promote their development. A large number of job opportunities will be provided in the commercial, business and light industrial nodes.

Neighbourhoods are enriched by the integration of different social groups and income levels. Physical and functional integration include provision of essential services within walking distance to limit the need for motorized transport, integration of private and public spaces and of the built and green environment. Mixed use allows and encourages multiple activities, including living, working, trading, accessing services, appropriate structures and recreation in the same areas, as opposed to the old single-use zoning approaches. This is essential to support the informal economy and local economic development.

Based on the above benefits to the community the proposed mixed-use development is regarded as the preferred land use alternative.

7.1.2 Residential development

By providing a residential development only the benefits associated with a mixed-use development to the local community, and subsequent council area, cannot be realised, and hence, is not a preferred land use option.

7.1.3 Agricultural use

The topography of the area, low-nutrient sandy soils and rockiness of many of the soils are not ideal for high-yield, commercial crop production. The study area has now for many years been mined for its clay and sandy soils. There is no to little quality topsoil left in the area, therefore, even after rehabilitation the area will not be ideal for cultivation (crop production).

The soils presently found on the site are of medium to low agricultural potential (in terms of dryland and irrigated cropping) due to a number of reasons. These are:

- The soils are generally sandy and nutrient-poor. Which is the reason it is an ideal sand works area.
- The lack of naturally good cultivation soils, within a small area, makes the agricultural potential of the study site, in terms of crop-yields and economic value low.
- Most of the area has been extremely degraded and transformed with all topsoils removed during mining. Even after rehabilitation the area will not be ideal for cultivation.

The study area is large enough to carry low numbers of cattle or sheep, but too small for any meaningful commercial livestock production in terms of grazing lands. Areas in the south and west of the study site are rocky slopes and ridges with difficult terrain for livestock, not to mention the very low carrying capacity in terms of fodder.

The study area does not have natural water sources for livestock such as streams, rivers or ponds. Borehole water is an option, however, the strength and extent of the underground water in the area is not known.

The study area as a single unit has medium/low to low agricultural potential. Nearly all of the land in the study site has been calculated as being of 'low potential arable land' Due to the low richness of the soils, nature of the present mining activities and rocky ridges. The agricultural potential in terms of cattle farming is therefore 'low potential grazing land'.

In addition, the study area does not fall within an agricultural hub or within an area of high agricultural potential soils according to GAPA 4. Agriculture is therefore not regarded as the preferred land use for the study area.

7.2 Layout Alternatives

Layout Alternative 1

Urban Consult provided a preliminary layout plan at the initiation of the application.

The concept layout was influenced by the following factors:

- existing Roads and access: the K54 and the local access Roads
- future Road PWV 2 (northern boundary of site)
- Topographical features on the site
- The infill and rehabilitation nature of the development
- Access points to the site

Residential Layout

With reference to the layout plan, the design philosophy is to provide for the affordable and middle income groups. The design of the entire site has therefore been laid out in larger development erven (Residential 3) to accommodate a residential Block type development. The size of the erven on which these residential apartment blocks will be built are consistent with the minimum number of potential units which makes it feasible for financial institutions to finance these complexes (minimum 2,5 ha). The residential units are

designed with recreational areas, parks open spaces as well as limited social facilities such as child care and community centers within them.

The layout plan also make provision for Residential 2 erven which will be subdivided as development progresses with proclamation of phases. These erven will accommodate a secure complex environment with full title erven of 150 to 250 sqm on which a modern affordable bank bonded house can be build. The subdivision of these erven will be done after proclamation and the determination of the development need for those different housing typologies.

Mixed use Erven

A relative small mixed use business node has been created along the K54 with the advantage of the passing traffic and the creation of facilities for employment and convenience for the development. These stands will be for local business and the intention was to provide business facilities in support of the local growing community and commuter community using the K54 road.

The future construction of the Freight Road programme in Tshwane, which includes the section of the proposed PWV 2 towards the east from the existing N1/N4 platinum intersection, is planned for the next 5 years according to the road priority plan of Tshwane and the province. The provision of these mixed business erven will then also benefit on that basis.

Supportive land uses

Apart from the above the layout also makes provision for two non-residential supportive land uses. The erven can be used for clinics, nursing homes, school sites or churches. These uses will take form once development commences and the need arises for a specific use.

Public/Private open space

The development is located within an area where positive use of private/public open space can be used. Within the development itself three large sites has been earmarked for open space. This has been done to facilitate storm water runoff as well as to keep the "green lungs" in the development.

The southern section of the land has rocky outcrops and steep slopes and this area can be utilized for a walking trail and an Urban Environmental reserve. It is approximately 28 ha and it will create a viable and sort after park.

The layout changed during the life of the project however, due to the requirements from the Gauteng Draft Ridges Policy. Layout Alternative 1 encroached onto the 50m buffer zones of the Class 2 ridges. **Refer to Figure 21.**

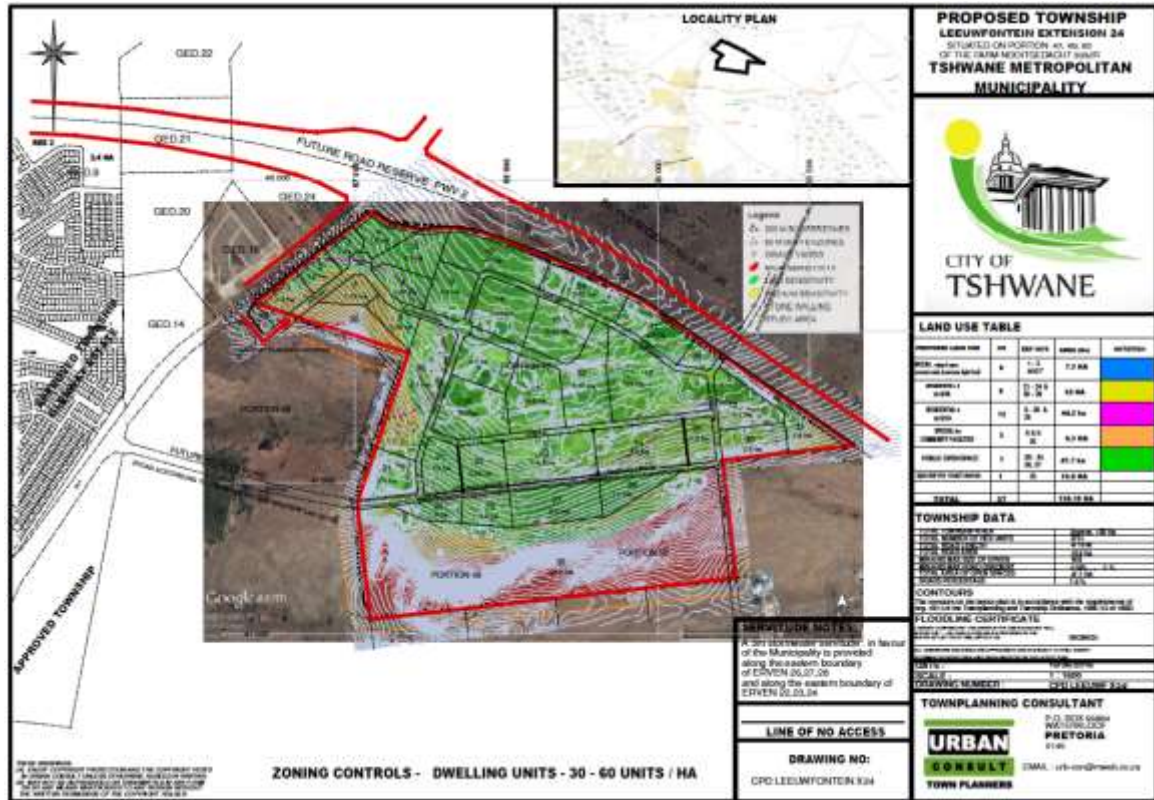


Figure 22: Layout Alternative 2 (Preferred Alternative)

7.3 Design Alternatives

Sustainable design and conventional design alternatives were investigated.

Built environment professionals, government officials and community members all have a vital role to play in making the shift toward building more sustainable settlements and neighbourhoods. *(Information obtained from Sustainable Neighbourhood Design Manual published by the Sustainability Institute).*

Sustainable design criteria should include:

- Thermally Efficient Design
- Sustainable building materials
- Renewable energy options
- Sustainable water and sanitation systems
- Waste minimisation and recycling

Thermally Efficient Design

Orientation and Placement of Windows

Windows allow solar energy to enter a building which is unwanted in summer and desirable in winter. In the southern hemisphere, houses should be orientated to face North. In general, windows facing the north should be larger (for heat gain during winter) but not too large (increased heat losses in winter and heat gains in summer) while windows facing south should be smaller (to prevent heat losses during winter).

The sun changes position in the sky during the year and by designing an appropriate overhang above the window, the summer sun will be blocked while the winter sun can enter. This is a very cost effective and

sustainable way of regulating temperatures within a house or building. An overhang or awning can also be fitted to an existing window.

Appropriate Use of Thermal Mass

Thermal mass is the ability of a material to absorb heat energy. A great portion of heat energy is required to change the temperature of high density materials e.g. concrete, stone, brick and tiles. These materials are therefore considered to have high thermal mass. Lightweight materials such as timber have low thermal mass.

Through the correct application of thermal mass internal temperatures are moderated by averaging the day/night extremes. This increases comfort and reduces energy costs. The ignorant use of thermal mass can exacerbate the worst extremes of the climate and can be a huge energy and comfort liability. To be effective, thermal mass must be integrated with sound passive design techniques. This means having appropriate areas of glazing facing appropriate directions with appropriate levels of shading, insulation and thermal mass.

The appropriate use of thermal mass can delay heat flow through the building envelope by as much as 10 to 12 hours producing a warmer house at night in winter and a cooler house during the day in summer. Building materials with high thermal mass include adobe brick, stone, brick, etc.

Sustainable Building Materials

According to the Western Cape Human Settlement Strategy, building construction and operation results in 50% of all CO₂ emissions worldwide (Department of Local Government and Housing, 2007). The average middle income house uses five to ten tons of cement in the building process, and for every ton of cement manufactured, a ton of CO₂ is released.

Thermally efficient, low carbon emission, structurally sound and inexpensive building materials exist that have been used for centuries in household design. Hemp has huge potential in the building market, as do adobe, sand bag construction, cob, thatch, brick, stone and recycled materials. Other 'low cement' options, including SABS approved compressed earth blocks (CEBs) using 6% soil stabilisers, are currently being investigated and proposed in sustainable neighbourhood designs.

Energy Efficiency Applications

Some of the most common, cost effective energy efficiency applications are listed below.

Ceilings

The benefits associated with ceiling installations include a reduction in expenditure on indoor heating, improved health as a result of improved air quality and more stable internal air temperatures (particularly in households which use paraffin, coal and other heating systems which damage respiratory health), increased productivity resulting from improved health and increased quality of life.

Heat loss through the roof is often greater than heat loss in other areas of the house, thus one of the most effective ways to insulate a house is to put in a ceiling. In cold climactic regions, or regions with cold winters, a ceiling can reduce space heating costs by up to 50 per cent. The Department of Housing's Draft Framework on Environmentally Efficient Housing has identified ceilings as an important intervention within the social housing frameworks.

Insulation

One of the best ways to make a house more efficient is to reduce the flow of heat into and out of the house. Ceiling and roof insulation serve to conserve heat in winter, and maintain cooler temperatures in summer.

Climactic regions can make a difference in the level of insulation necessary for a comfortable living environment within a home.

Sky Lights

A skylight is a window placed in the roof of a building or in the ceiling of a room to admit light into the room. Designs include transparent roof plates, glass windows and plastic domes with a circular ducts connected to the room. Skylights should ideally be incorporated in the building design to keep the costs down, but can be retrofitted to existing buildings with significant contributions to increased light levels and accompanied energy savings.

Solar Blinds

When an existing building does not have an appropriate overhang, a solar blind can be fitted. These blinds block all the summer sun and let the majority of winter sun through. These fixed blinds let sunlight through and does not block the view since they are placed horizontally and are never closed or adjusted. They can be manufactured locally and are cost effective.

CFL Bulbs

The use of energy efficient lighting is one of the best and most cost effective ways of reducing energy consumption. Efficient lighting will reduce energy consumption and in particular peak demand, which will improve energy security, Eskom also recognizes that efficient lighting will play a major role in its demand side management (DSM) process.

Renewable energy applications

Solar Water Heaters

Lack of access to hot water can have negative safety and health impacts on low income households. SWHs can replace the use of "dirtier" fuels, such as paraffin, for water heating. Also, the time lost in heating water by using more 'traditional' fuels, such as wood, could be saved by using solar water heaters. Solar water heaters in the low income sector should become a stronger focus.

Sustainable water and sanitation systems

Water efficiency measures can include low flow fixtures in sinks and showers, dual flush systems in toilets, rain water harvesting and water recycling. Dry or urine diversion toilets can also reduce water consumption in households by approximately 40%. Urine diversion toilets also produce compost, which can be used in agricultural production. Grey water recycling in settlements can be inexpensive and can provide nutrients for agricultural production and greening. On-site sewage systems such as vertically integrated wetlands, membrane filtration systems, biolytix systems and biogas digestors can provide nutrients for agriculture, recycled water for toilet flushing and energy for household use.

Waste Minimisation and Recycling

Waste separation and recycling can generate jobs as well as removing recyclable resources from landfill. Individuals and recycling cooperatives can collect and separate wastes and sell recyclable materials. Buyback centres can be established in neighbourhoods, where recyclers can buy recyclable materials for reprocessing. Organic materials can also be separated and made into compost, adding nutrients to soil for agricultural production and greening.

In order to ensure a more sustainable development, sustainable design is regarded as the preferred alternative.

7.4 Energy Use Alternatives

The following energy alternatives will be encouraged when the different housing units are built:

- Solar geysers
- Heat pumps
- Photovoltaic cells
- Gas stoves
- Gas push through geysers

7.5 No-Go Alternative

The No-Go alternative will entail leaving the site in its present state, utilized for sand mining activities by Aust Sandwerke.

The study area is located within an area that is experiencing growth and has been identified as a priority area for Tshwane Human Settlements. A total of 14 new township applications have been approved in the direct vicinity of the township. Sand mining is no longer an appropriate land use as it falls within an area earmarked for Future Township Residential development and mixed land uses abutting the mobility spines (K54) according to Region 5 RSDF 2014.

Should the development of the subject property not proceed, the 50m buffer zones of the ridges will not be protected, which would ultimately lead to loss of ecological integrity on the ridges due to edge effects. The sand mining activities would also contribute in the long term to noise, vibration and air pollution, dust pollution, visual impacts and loss of habitat. In addition, the demand for a mixed-use development in the area will not be met if the No-Go Alternative is implemented.

The only negative impact associated with the No-Go alternative is the economic impact of the closure of the sand mine. The proposed Leeuwfontein X 24 development will however also supply job opportunities during the construction phase as well as the operational phase.

The No-Go alternative is therefore not regarded as the preferred alternative in the long term.

8 Public Participation Process

Public participation is a process that is designed to enable all interested and affected parties (I&APs) to voice their opinion and/ or concerns which enables the practitioner to evaluate all aspects of the proposed development, with the objective of improving the project by maximising its benefits while minimising its adverse effects. I&APs include all interested stakeholders, technical specialists, and the various relevant organs of state who work together to produce better decisions.

The primary aims of the public participation process are:

- to inform interested and affected parties (I&APs) and key stakeholders of the proposed application and environmental studies;
- to initiate meaningful and timeous participation of I&APs;
- to identify issues and concerns of key stakeholders and I&APs with regards to the application for the development (i.e. focus on important issues);
- to promote transparency and an understanding of the project and its potential environmental (social and biophysical) impacts (both positive and negative);
- to provide information used for decision-making;
- to provide a structure for liaison and communication with I&APs and key stakeholders;
- to ensure inclusivity (the needs, interests and values of I&APs must be considered in the decision-making process);

- to focus on issues relevant to the project, and issues considered important by I&APs and key stakeholders; and
- to provide responses to I&AP queries.

The public participation process must adhere to the requirements of Regulations (GNR 982) under the NEMA.

For the purposes of the scoping phase, the PPP aims to ensure that the full range of stakeholders is informed about project scope. In order to achieve this, a number of key activities have taken place and will continue to take place. These included the following:

- The identification of stakeholders is a key deliverable at the outset, and it is noted that there are different categories of stakeholders that must be engaged, from the different levels and categories of government, to relevant structures in the NGO sector, to the communities of wards of residential dwellings which surround the works;
- The development of a living and dynamic database that captures details of stakeholders from all sectors;
- The convening of focused and general meetings with stakeholders at different times throughout the EIA process;
- The engagement of public leaders to whom the public generally turn for information, keeping such individuals well informed about process and progress;
- The fielding of queries from I&APs and others, and providing appropriate information;
- The convening of specific stakeholder groupings/forums as the need arises;
- The preparation of reports (both baseline and impact assessment) based on information gathered throughout the EIA via the PPP and feeding that into the relevant decision-makers; and
- The PPP includes distribution of pamphlets or Background Information Documents and other information packs.

8.1 Public Participation Activities Undertaken

Table 18 details the public participation tasks that have been undertaken to date.

TABLE 18: PUBLIC PARTICIPATION

Activity	Description and Purpose
Pre-Application	
Preparation of a preliminary stakeholder database	A preliminary database has been compiled of authorities (local and provincial), Non-Governmental Organisations, neighbouring landowners and other key stakeholders (<i>refer to Appendix E5a</i>). This database of registered I&APs will be maintained and updated during the ongoing EIA process.
Preparation and Distribution of a Background Information Document (BID)	BIDs were distributed via email and post to all I&APs on the stakeholder database. See <i>Appendix E2a</i> . The BID provides an introduction to the Project and the EIA process.
Advertisement of the Project and Erection of Site Notices	The Project was advertised on 29 July 2016 in the provincial newspaper Beeld (English) and on 1 August 2016 in the local newspaper Tshwane Sun Mamelodi. See proof of Advertisement in <i>Appendix E1a</i> . Site notices have been placed at the following

	locations on 28 July 2016: <ul style="list-style-type: none"> • Aust Sandwerke Office notice board; • At the entrance to the project site. See proof of Advertisement in <i>Appendix E1b</i> .
Development of an Initial Comments and Response Report	All comments received during the initial consultation period were recorded in a Comments and Response Report. See included in <i>Appendix E3</i> .
Post-Application	
Release of draft Scoping Report for Public Comment	The draft Scoping Report was released for a 30 day public comment period: 30 August 2016 to 3 October 2016. Notifications were sent to all stakeholders on the database. The report was submitted to all I&APs and electronic copies could be downloaded with a link from the Texture website. <i>Appendix E.2b</i> .
Development of a Comments and Response Report	All comments received during the Scoping consultation period were recorded into a Comment and Response Report. See included in <i>Appendix E3</i> .
EIA Phase	
Release of draft EIR and EMP for Public Comment	The draft EIR and EMP document will be made available to stakeholders and the relevant authorities for a 30-day comment period (18 January – 17 February 2017). A notification letter will be sent to all registered I&APs on the project database. The letter invited I&APs to comment on the draft EIR, and included details of the public open day (see below). All comments received, along with responses, will be included in the final EIR in <i>Appendix E3</i> .
Public Open Day	Will be held on 7 February 2017. All comments received, along with responses, will be included in the final EIR in <i>Appendix E3c</i> .
Notification of Environmental Authorisation	I&APs will be notified of the Environmental Authorisation and the statutory appeal period.

Comments on the draft SR were received from the following I&APs:

1. City of Tshwane: Environmental Management Services Department (Environmental Planning & Open Space Management Section) (*refer to correspondence attached as Appendix E3b*).
2. Mr. Vernon Oliver (owner of Portion 46 of the farm Nooitgedacht 333-JR) (*refer to correspondence attached as Appendix E3b*).
3. Mr. Gawie Jansen van Vuuren, Chief Engineer: Integrated Stormwater Planning, City of Tshwane (*refer to correspondence attached as Appendix E3b*).
4. Mr A van Wyk, Petra Diamonds: Premier Game Park (*refer to correspondence attached as Appendix E3b*).

Please note: no comments were received from DWS and SAHRA within the 30 day public participation period (we are still awaiting their comments).

Comments received (if any) will be included in the Final EIAR. Refer to proof of correspondence to DWS and SAHRA attached as Appendix E2b.

A summary of the main concerns raised through the public participation process to date is provided in Table 19. Detailed comments and responses is included in the Comments and Response Report has been included in Appendix E.3.

TABLE 19: SUMMARY OF KEY COMMENTS RAISED DURING THE EIA

Topic	Issue
EMPr and Specialist studies	To be included in EIAR
Cullinan Diamond Mine: Premier Game Park	Impact of proposed development on Premier Game Park i.e. poaching of wildlife, risk of damage/danger to property, risk of damage to property, grazing and wildlife by fires, noise pollution, impact of commercial use, erosion and dongas on Beynespoort due to stormwater runoff.
Ridges	200m buffer to be indicated on layout plans
1:100 year floodline of Melkboslaagte Spruit	To be determined
Stormwater management	Potential impacts on the receiving and surrounding environment by the proposed stormwater infrastructure.
Proposed access road	Access road traverses Portion 46 of the farm Nooitgedacht 333 JR.
Avifauna	Impacts on avifauna
Graves	Impacts on graves
Cultural artefacts	Impact on cultural artefacts of historical value.
Security	The area security will be compromised
Civil Services, infrastructure and light industrial	Availability of Civil Services, infrastructure and possible impacts of light industrial activities.

9 Environmental Impact Assessment

9.1 Introduction

The EIA of the project activities is determined by identifying the environmental aspects and then undertaking an environmental risk assessment to determine the significant environmental aspects. The environmental impact assessment has included all phases of the project namely:

- Construction Phase; and
- Operational Phase.

Please note: due to the nature of the development it is anticipated that the infrastructure would be permanent, thus not requiring decommissioning or rehabilitation. Maintenance of infrastructure will be addressed under the operational phase.

9.2 Impact Assessment Methodology

The potential environmental impacts associated with the project will be evaluated according to its nature, extent, duration, intensity, probability and significance of the impacts, whereby:

- **Nature:** A brief written statement of the environmental aspect being impacted upon by a particular action or activity.
- **Extent:** The area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment phase of a project in terms of further defining the determined significance or intensity of an impact. For example, high at a local scale, but low at a regional scale;
- **Duration:** Indicates what the lifetime of the impact will be;
- **Intensity:** Describes whether an impact is destructive or benign;
- **Probability:** Describes the likelihood of an impact actually occurring; and
- **Cumulative:** In relation to an activity, means the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

TABLE 20: CRITERIA TO BE USED FOR RATING OF IMPACTS

Criteria	Description			
Extent	National (4) The whole of South Africa	Regional (3) Provincial and parts of neighbouring provinces	Local (2) Within a radius of 2 km of the construction site	Site (1) Within the construction site
Duration	Permanent (4) Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient	Long-term (3) The impact will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter. The only class of impact which will be non-transitory	Medium-term (2) The impact will last for the period of the construction phase, where after it will be entirely negated	Short-term (1) The impact will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase
Intensity	Very High (4) Natural, cultural and social functions and processes are altered to extent that they permanently	High (3) Natural, cultural and social functions and processes are altered to extent that they temporarily	Moderate (2) Affected environment is altered, but natural, cultural and social functions and processes continue	Low (1) Impact affects the environment in such a way that natural, cultural and social functions and

	cease	cease	albeit in a modified way	processes are not affected
Probability of occurrence	Definite (4) Impact will certainly occur	Highly Probable (3) Most likely that the impact will occur	Possible (2) The impact may occur	Improbable (1) Likelihood of the impact materialising is very low

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

TABLE 21: CRITERIA FOR THE RATING OF CLASSIFIED IMPACTS

Low impact (4 - 6 points)	A low impact has no permanent impact of significance. Mitigation measures are feasible and are readily instituted as part of a standing design, construction or operating procedure.
Medium impact (7 - 9 points)	Mitigation is possible with additional design and construction inputs.
High impact (10 - 12 points)	The design of the site may be affected. Mitigation and possible remediation are needed during the construction and/or operational phases. The effects of the impact may affect the broader environment.
Very high impact (13 - 20 points)	Permanent and important impacts. The design of the site may be affected. Intensive remediation is needed during construction and/or operational phases. Any activity which results in a "very high impact" is likely to be a fatal flaw.
Status	Denotes the perceived effect of the impact on the affected area.
Positive (+)	Beneficial impact.
Negative (-)	Deleterious or adverse impact.
Neutral (/)	Impact is neither beneficial nor adverse.
It is important to note that the status of an impact is assigned based on the status quo – i.e. should the project not proceed. Therefore not all negative impacts are equally significant.	

The suitability and feasibility of all proposed mitigation measures will be included in the assessment of significant impacts. This will be achieved through the comparison of the significance of the impact before and after the proposed mitigation measure is implemented. Mitigation measures identified as necessary will be included in an EMPr. The EMPr will form part of the Environmental Impact Report (EIR).

9.3 Impacts

9.3.1 Geology Impacts

Where E = Extent, D = Duration, I = Intensity and P = Probability of occurrence.

Potential Aspect and / or Impact	Before Mitigation				Significance Rating (before mitigation)	Mitigation and management measures	After Mitigation				Significance Rating (after mitigation)
	E	D	I	P			E	D	I	P	
CONSTRUCTION											
Disturbance of surface geology for development foundations. Stability of structures due to underlying geology and sand mining activities.	1	2	2	3	Negative Medium (-8)	<ul style="list-style-type: none"> • Good site drainage should be ensured across the site and damp proof installed in all buildings due to fluctuating perched water table and the clayey nature of the soil. • It is recommended that all excavations with a depth in excess of 1,5m be supported before any person is allowed to enter such an excavation. • Quarried areas need rehabilitation by replacement with a controlled backfilling before commencement of any construction. Alternatively can the filling be removed and then be replaced by a controlled filling. Soil replacement by an engineered fill soil raft by removing all or part of the filling horizon to 1,0m beyond the perimeter of the structure and replacing with inert backfill, compacted to 93% MOD ASSHTO density at or near optimum moisture content, where after normal strip footing foundations can be used. Large impact rollers could also be an option to increase the bearing capacities of the soil when used in smaller layers with the soil at or near optimum moisture content, but where the 	1	2	1	2	Negative Low (-6)

						layers exceed 0,5m in thickness (compaction usually takes place in layers of 150mm) it may not have any influence in depths up to and exceeding 2m of filling.					
						<ul style="list-style-type: none"> • Development should be restricted to outside the drainage features within the 1:50 year flood line. Quarried areas that filled with water could be rehabilitated through landscaping and filling of these areas. • Good site drainage should be ensured through landscaping and plumbing/service precautions are required. • Some excavatability problems are foreseen for service excavations deeper than a depth of 1,5m, and a competent TLB or pneumatic tools and even blasting may be required to reach installation depths for services. 					
Gully or donga erosion by concentrated, uncontrolled water-flow.	1	2	2	2	Negative Medium (-7)	Provide adequate storm water surface drainage as per the storm water management plan as part of the infra structural development of the area.	1	1	1	1	Negative Low (-4)

9.3.2 Topographical Impacts

Where E = Extent, D = Duration, I = Intensity and P = Probability of occurrence.

Potential Aspect and / or Impact	Before Mitigation				Significance Rating (before mitigation)	Mitigation and management measures	After Mitigation				Significance Rating (after mitigation)
	E	D	I	P			E	D	I	P	
CONSTRUCTION											
Alteration of topography due to stockpiling of soil, building material and debris and waste material on site.	1	3	2	3	Negative Medium (-9)	<ul style="list-style-type: none"> • All stockpiles must be restricted to designated areas and are not to exceed a height of 2 metres. • Stockpiles created during the construction phase are not to remain during the operational 	1	2	1	2	Negative Low (-6)

						phase. • The contractor must be limited to clearly defined access routes to ensure that sensitive and undisturbed areas are not disturbed.					
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9.3.3 Hydrogeology Impacts

Where E = Extent, D = Duration, I = Intensity and P = Probability of occurrence.

Potential Aspect and / or Impact	Before Mitigation				Significance Rating (before mitigation)	Mitigation and management measures	After Mitigation				Significance Rating (after mitigation)
	E	D	I	P			E	D	I	P	
CONSTRUCTION											
Groundwater contamination: <ul style="list-style-type: none"> • Spillage of fuels, lubricants and other chemicals. • Construction equipment, vehicles, workshop and wash bay areas will be a likely source of pollution as a non-point source. • Lack of provision of ablutions that may lead to the creation of informal ablutions. 	1	2	2	2	Negative Medium (-7)	<ul style="list-style-type: none"> • All hazardous substances must be stored on an impervious surface in a designated bunded area, able to contain 110% of the total volume of materials stored at any given time. • Material safety data sheets (MSDSs) are to be clearly displayed for all hazardous materials. • The integrity of the impervious surface and bunded area must be inspected regularly and any maintenance work conducted must be recorded in a maintenance report. • Employees should be provided with absorbent spill kits and disposal containers to handle spillages. • Train employees and contractors on the correct handling of spillages and precautionary measures that need to be implemented to minimise potential spillages. • All earth moving vehicles and equipment must be regularly maintained to ensure their integrity and reliability. No repairs may be undertaken 	1	2	1	2	Negative Low (-6)

						<ul style="list-style-type: none"> beyond the contractor laydown area. • Employees should record and report any spillages to the responsible person. • An Emergency Preparedness and Response Plan will be developed and implemented should and incident occur. • Access to storage areas on site must be restricted to authorised employees only. • Contractors will be held liable for any environmental damages caused by spillages. • Adequate provision of ablutions for construction employees. 					
OPERATIONAL											
Leaks of untreated water from pipelines may occur and impact on the groundwater quality.	2	1	1	2	Negative Low (-6)	Any leaks should be fixed immediately and areas rehabilitated as needed.	2	1	1	1	Negative Low (-5)

9.3.4 Hydrology Impacts

Where E = Extent, D = Duration, I = Intensity and P = Probability of occurrence.

Potential Aspect and / or Impact	Before Mitigation				Significance Rating (before mitigation)	Mitigation and management measures	After Mitigation				Significance Rating (after mitigation)
	E	D	I	P			E	D	I	P	
CONSTRUCTION											
Contaminated run-off: <ul style="list-style-type: none"> • Spillage of fuels, lubricants and other chemicals; • Inadequate stormwater management around the site; the dumping of construction material, including fill or excavated material into, or close to surface water features that may then be washed into these features; 	2	2	2	1	Negative Medium (-7)	<ul style="list-style-type: none"> • Bunded areas should be used to store chemicals. • Clean-up of spills as soon as they occur. • Keep construction activities away from the surface water resources. • Adequate provision of ablutions for construction employees. • Wastewater must not be allowed to come into direct contact with exposed soils or run across 	2	1	1	1	Negative Low (-5)

<ul style="list-style-type: none"> • Construction-related activities such as cement batching; • Construction equipment, vehicles and workshop areas will be a likely source of pollution as a non-point source; and • Lack of provision of ablutions that may lead to the creation of 'informal ablutions' within or close to a surface water resource. 						the site. Vehicles and machinery may not be washed on site. All wastewater must be collected in a sealed container and disposed of by an approved waste contractor. Waybills must be retained for inspection.					
Increased urban run-off	2	2	2	1	Negative Medium (-7)	<ul style="list-style-type: none"> • Land disturbance must be minimized in order to prevent erosion and run-off - this includes leaving exposed soils open for a prolonged period of time. As soon as vegetation is cleared (including alien) the area must be re-vegetated if it is not to be developed on in future. • Any inlet to the piped stormwater system shall be fitted with a screen, or grating to prevent debris and refuse from entering the stormwater system. This must be done immediately on installation of the piped system. • The stormwater management plan must be implemented. 	2	1	1	1	Negative Low (-5)
OPERATIONAL											
Increased urban run-off from urban infrastructure and roads.	2	2	2	3	Negative Medium (-9)	The stormwater management plan must be implemented.	2	1	1	2	Negative Low (-6)
Leaks from pipelines – leaks of untreated water from pipelines may occur.	2	1	1	2	Negative Low (-6)	Any leaks should be fixed immediately and areas rehabilitated as needed.	1	1	1	2	Negative Low (-5)

9.3.5 Soils and Agricultural Impacts

Where E = Extent, D = Duration, I = Intensity and P = Probability of occurrence.

Potential Aspect and / or Impact	Before Mitigation				Significance Rating (before mitigation)	Mitigation and management measures	After Mitigation				Significance Rating (after mitigation)
	E	D	I	P			E	D	I	P	
CONSTRUCTION											
Removal and compaction of soil during construction activities.	1	2	2	4	Negative Medium (-9)	<ul style="list-style-type: none"> Strip topsoil prior to any construction activities. Reuse topsoil to rehabilitate disturbed areas. Topsoil must be kept separate from overburden and must not be used for building purposes or maintenance or access roads. 	1	1	2	3	Negative Medium (-7)
Erosion, degradation and loss of topsoil due to construction activities as well as surface and stormwater run-off.	1	3	2	3	Negative Medium (-9)	<ul style="list-style-type: none"> Minimise the clearance of vegetation to avoid exposure of soil. Protect areas susceptible to erosion with mulch or a suitable alternative. Implement the appropriate topsoil and stormwater runoff control management measures as per the EMP to prevent the loss of topsoil. Topsoil should only be exposed for minimal periods of time and adequately stockpiled to prevent the topsoil loss and run-off. 	1	2	2	2	Negative Medium (-7)

9.3.6 Vegetation and Fauna Impacts

Where E = Extent, D = Duration, I = Intensity and P = Probability of occurrence.

Potential Aspect and / or Impact	Before Mitigation				Significance Rating (before mitigation)	Mitigation and management measures	After Mitigation				Significance Rating (after mitigation)
	E	D	I	P			E	D	I	P	
CONSTRUCTION											
Impact on Thornveld vegetation	1	3	2	3	Negative Medium (-9)	<ul style="list-style-type: none"> Any temporary storage or accommodation facilities to be setup in existing built-up areas or disturbed areas only. No temporary facilities or portable toilets to be setup within 50m of any watercourses. Ensure small footprint during construction phase. Avoid and minimise the removal of any indigenous trees. All excess materials to be removed after construction No movement of construction workers or vehicles outside of study area boundaries Dust control to be implemented during the construction phase All hazardous materials such as but not limited to paint, turpentine and thinners must be stored appropriately to prevent these contaminants from entering the terrestrial and water environments 	1	2	2	2	Negative Medium (-7)
Impacts on fauna: <ul style="list-style-type: none"> Noise and vibration during construction Loss of habitat Poaching of wildlife 	1	3	2	2	Negative Medium (-9)	<ul style="list-style-type: none"> Provide all equipment with standard silencers. Maintain silencer units in vehicles and equipment in good working order. All earth moving vehicles and equipment must be regularly maintained to ensure their integrity and reliability. 	1	2	2	2	Negative Medium (-7)

						<ul style="list-style-type: none"> • All operations should meet the noise standard requirements of the Occupational Health and Safety Act (Act No. 85 of 1993). • A solid wall of bricks or similar material, to a minimum height of 8 feet, to function as a buffer between the proposed development and the Game Park, should be erected. • No poaching of wildlife or selling of firewood will be allowed. 					
Impacts on/ loss/ degradation of ridges	2	3	2	3	Negative High (-10)	<ul style="list-style-type: none"> • Ridges are 'No-Go' zones for development and also during the construction phase. The ridges need to be totally off-limits to all construction personnel as well as vehicles, materials, etc. • A 50m buffer zone should be demarcated in which no, or very limited development is allowed. Signs should be erected showing the 50m buffer zone and saying that it is sensitive and that access is limited or not allowed. These can be removed once construction is completed. • Heavy vehicles, materials, equipment and movement of contractors must be prohibited or at least limited and controlled within the 50m buffer zones of the ridges. 	2	3	1	2	Negative Medium (-8)
OPERATIONAL/CUMULATIVE											
Impact on Thornveld vegetation and ridges	2	3	2	3	Negative High (-10)	<ul style="list-style-type: none"> • Mechanical control and monitoring of alien plants around disturbed areas and developed areas to be implemented. • No chemical control (herbicides) of alien plants to be used within 100m of watercourses. Herbicides could get into the water system and will have a detrimental effect on the environment. • Potential erosion areas to be inspected and corrected where necessary. • Stormwater culverts, channels, etc. to be 	2	3	1	1	Negative Medium (-8)

Impacts on fauna: <ul style="list-style-type: none"> Noise associated with the development Loss of habitat Poaching of wildlife 	2	3	1	2	Negative Medium (-8)	<ul style="list-style-type: none"> inspected and maintained on an ongoing basis. No declared invasive weed alien plant species allowed to be used in gardens and landscaping. Rubbish must be routinely cleaned up from public access areas to the ridges. 	2	3	1	1	Negative Medium (-7)	<ul style="list-style-type: none"> A solid wall of bricks or similar material, to a minimum height of 8 feet, to function as a buffer between the proposed development and the Game Park, should be erected. No poaching of wildlife or selling of firewood will be allowed. 		

9.3.7 Wetland Impacts

Where E = Extent, D = Duration, I = Intensity and P = Probability of occurrence.

Potential Aspect and / or Impact	Before Mitigation				Significance Rating (before mitigation)	Mitigation and management measures	After Mitigation				Significance Rating (after mitigation)
	E	D	I	P			E	D	I	P	
CONSTRUCTION											
Erosion and sedimentation of wetland soils as a result of uncontrolled stormwater run-off generated from the construction sites	2	3	2	2	Negative Medium (-9)	<ul style="list-style-type: none"> Stormwater run-off should be appropriately managed so as not to alter the timing and intensity of flows entering the wetland under the natural condition. This will include the use of temporary attenuation ponds and temporary berms or furrows to direct flows to less sensitive areas as well as bioswales. It is assumed that if stormwater is properly managed in the catchment during construction, erosion will not become a major problem. In addition to properly managing stormwater, 	2	2	1	2	Negative Medium (-7)

						methods to prevent and contain erosion such as geo-textiles and silt fences should be used on exposed slopes.					
Decrease in water quality as a result of contamination of run-off from construction site	2	3	2	2	Negative Medium (-9)	<ul style="list-style-type: none"> Care should be taken at construction sites to store hazardous substances, such as fuel, and oil appropriately, not allowing these substances to enter watercourses. Stormwater run-off should be appropriately managed so as not to alter the timing and intensity of flows entering the wetland under the natural condition. This will include the use of temporary attenuation ponds and temporary berms or furrows to direct flows to less sensitive areas. It is assumed that if stormwater is properly managed in the catchment during construction, erosion will not become a major problem. In addition to properly managing stormwater, methods to prevent and contain erosion such as geo-textiles and silt fences should be used on exposed slopes. Any inlet to the piped stormwater system shall be fitted with a screen, or grating to prevent debris and refuse from entering the stormwater system. This must be done immediately on installation of the piped system. 	2	2	1	2	Negative Medium (-7)
Impact on Wetland Fauna											
OPERATIONAL /CUMULATIVE											
Erosion and sedimentation of wetland soils as a result of uncontrolled stormwater run-off generated from the development Decrease in water quality as a result of contamination of run-off from construction site	2	3	2	2	Negative Medium (-9)	<ul style="list-style-type: none"> The stormwater management plan must be implemented 	2	2	1	2	Negative Medium (-7)

9.3.8 Waste Impacts

Where E = Extent, D = Duration, I = Intensity and P = Probability of occurrence.

Potential Aspect and / or Impact	Before Mitigation				Significance Rating (before mitigation)	Mitigation and management measures	After Mitigation				Significance Rating (after mitigation)
	E	D	I	P			E	D	I	P	
CONSTRUCTION											
Contamination of the surface and site with general waste. General waste produced on site includes: <ul style="list-style-type: none"> • Office waste (e.g. food waste, paper, plastic); • Operational waste (clean steel, wood, glass); and • General domestic waste (food, cardboards, paper, bottles, tins). 	1	2	2	3	Negative Medium (-8)	<ul style="list-style-type: none"> • An adequate number of general waste receptacles, including bins must be arranged around the site to collect all domestic refuse, and to minimise littering. • Bins must be provided on site for use by employees. • Bins should be clearly marked and lined for efficient control and safe disposal of waste. • Different waste bins, for different waste streams must be provided to ensure correct waste separation. • A fenced area must be allocated for waste sorting and disposal on the site. • General waste produced on site is to be collected in skips for disposal at the local municipal waste site. • Hazardous waste is not to be mixed or combined with general waste earmarked for disposal at the municipal landfill site. • Under no circumstances is waste to be burnt or buried on site. • Waste bins should be cleaned out on a regular basis to prevent any windblown waste and/or visual disturbance. • All general waste must be removed from the site at regular intervals and disposed of in 	1	2	1	2	Negative Low (-6)

Contamination of the surface and site with general and hazardous waste. Hazardous waste produced on site include: <ul style="list-style-type: none"> Oil and other lubricants, diesel, paints, solvent; Containers that contained chemicals, oils or greases; and Equipment, steel, other material (rags), soils, gravel and water contaminated by hazardous substances (oil, fuel, grease, chemicals or bitumen). 	1	2	3	3	Negative Medium (-9)	suitable waste receptacle <ul style="list-style-type: none"> Hazardous waste is to be disposed at a Permitted Hazardous Waste Landfill Site. The Environmental Manager must have as part of his/her records the waste manifest for each batch based disposal. Hazardous waste bins must be clearly marked, stored in a contained area (or have a drip tray) and covered (either stored under a roof or the top of the container must be covered with a lid). A hazardous waste disposal certificate must be obtained from the waste removal company as evidence of correct disposal. In the case of a spill of hydrocarbons, chemicals or bituminous, the spill should be contained and cleaned up and the material together with any contaminated soil collected and disposed of as hazardous waste to minimize pollution risk. 	1	1	2	2	Negative Low (-6)
Generation and disposal of sewage waste of temporary construction toilets.	1	2	3	2	Negative Medium (-8)	<ul style="list-style-type: none"> On-site chemical toilets will be provided for domestic purposes during construction phase. The contractors will be responsible for the maintenance of the chemical toilets. Should any spills or incidents occur; the material will be cleaned up immediately and disposed off appropriately. All incidents must be reported to the responsible site officer as soon as it occurs. 	1	2	2	2	Negative Medium (-7)
OPERATIONAL											
Generation and disposal of domestic waste by the proposed development.	2	3	3	3	Negative High (-11)	Waste will be collected by an accredited waste company and disposed of at an appropriate and licensed waste disposal facility.	1	3	2	2	Negative Medium (-8)
Generation and disposal of sewage waste by the proposed development.	2	3	3	3	Negative High (-11)	All sewage will be sent through to the Baviaanspoort Sewage Treatment Works	1	3	2	2	Negative Medium (-8)

9.3.9 Air Quality Impacts

Where E = Extent, D = Duration, I = Intensity and P = Probability of occurrence.

Potential Aspect and / or Impact	Before Mitigation				Significance Rating (before mitigation)	Mitigation and management measures	After Mitigation				Significance Rating (after mitigation)
	E	D	I	P			E	D	I	P	
CONSTRUCTION											
Dust and emissions during construction generated by debris handling and debris piles, truck transport, bulldozing, general construction.	1	2	2	3	Negative Medium (-8)	<ul style="list-style-type: none"> Dust must be suppressed on the construction site and during the transportation of material during dry periods by the regular application of water. Water used for this purpose must be used in quantities that will not result in the generation of run-off. Loads could be covered to avoid loss of material in transport, especially if material is transported off site. Dust and mud should be controlled at vehicle exit and entry points to prevent the dispersion of dust and mud beyond the site boundary. Facilities for the washing of vehicles should be provided at the entry and exit points. A speed limit of 40 km/hr should be set for all vehicles travelling over exposed areas. During the transfer of materials, drop heights should be minimised to control the dispersion of mater being transferred. The height of all stockpiles on site should be a maximum of 2m. Use of dust retardant road surfacing if made necessary due to the exceedance of Air Quality Guidelines. 	2	1	1	2	Negative Low (-6)

9.3.10 Odour Impacts

Where E = Extent, D = Duration, I = Intensity and P = Probability of occurrence.

Potential Aspect and / or Impact	Before Mitigation				Significance Rating (before mitigation)	Mitigation and management measures	After Mitigation				Significance Rating (after mitigation)
	E	D	I	P			E	D	I	P	
CONSTRUCTION											
Release of odours as a result of the chemical toilets on site.	1	2	3	2	Negative Medium (-8)	Chemical toilets must be provided and cleaned on a regular (weekly) basis.	1	1	1	2	Negative Low (-5)

9.3.11 Noise Impacts

Where E = Extent, D = Duration, I = Intensity and P = Probability of occurrence.

Potential Aspect and / or Impact	Before Mitigation				Significance Rating (before mitigation)	Mitigation and management measures	After Mitigation				Significance Rating (after mitigation)
	E	D	I	P			E	D	I	P	
CONSTRUCTION											
During the construction phase there is likely to be an increase in noise pollution from construction vehicles and construction staff.	1	2	3	4	Negative High (-10)	<ul style="list-style-type: none"> All construction activities should be undertaken according to daylight working hours between the hours of 07:00 – 17:00 on weekdays and 7:30 –13:00 on Saturdays. No construction activities may be undertaken on Sunday. Provide all equipment with standard silencers. Maintain silencer units in vehicles and equipment in good working order. All earth moving vehicles and equipment must be regularly maintained to ensure their integrity and reliability. Construction staff working in area where the 8- 	1	2	2	3	Negative Medium (-8)

						hour ambient noise levels exceed 60 dBA must have the appropriate Personal Protective Equipment (PPE). <ul style="list-style-type: none"> All operations should meet the noise standard requirements of the Occupational Health and Safety Act (Act No. 85 of 1993). 					
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9.3.12 Heritage Impacts

Where E = Extent, D = Duration, I = Intensity and P = Probability of occurrence.

Potential Aspect and / or Impact	Before Mitigation				Significance Rating (before mitigation)	Mitigation and management measures	After Mitigation				Significance Rating (after mitigation)
	E	D	I	P			E	D	I	P	
CONSTRUCTION											
Disturbance of graves and sites of archaeological, historical and cultural significance.	1	3	3	3	Negative High (-10)	<ul style="list-style-type: none"> Site no. 1 should be recorded after which it may be demolished. The graves must be fenced in and a management plan drafted for the sustainable preservation thereof. Access to descendants should be granted. A cultural management plan should be drafted and implemented to preserve and protect Sites no. 4 & 5. The plan should also include measures for the sustainable utilization of the structure (e.g. walking trails and information panels). The body corporate of the new development will have to assume responsibility for the implementation of the plan in the future. Such a plan should be drafted by a heritage expert and should be completed before the development may commence. 	1	3	2	2	Medium High (-8)
OPERATIONAL											

Disturbance of graves and sites of archaeological, historical and cultural significance.	1	3	3	3	Negative High (-10)	<ul style="list-style-type: none"> The management plan for the sustainable preservation of the graves must be implemented. Access to descendants should be granted The cultural management plan should be implemented to preserve and protect Sites no. 4 & 5. 	1	3	2	3	Medium High (-8)
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9.3.13 Visual Impacts

Where E = Extent, D = Duration, I = Intensity and P = Probability of occurrence.

Potential Aspect and / or Impact	Before Mitigation				Significance Rating (before mitigation)	Mitigation and management measures	After Mitigation				Significance Rating (after mitigation)
	E	D	I	P			E	D	I	P	
CONSTRUCTION											
Site clearing and removal of vegetation could partially alter the landscape as viewed from the surrounds of the site, with the emergence of exposed areas of bare soil.	2	1	1	2	Negative Low (-6)	Phased, rather than indiscriminate clearing of the site to be undertaken. The architectural and landscape architectural guidelines for the proposed development will be developed to allow for a positive aesthetic influence on the surrounding environment. The guidelines will include aspects of finishes, lights pollution, colours to blend into the surrounding colours, heights of buildings, and roof finishes. Aesthetics and contextual appropriateness is to be a major aspect of these guidelines.	2	1	1	1	Negative Low (-5)
OPERATIONAL											
The proposed development will be able to blend in with the surrounding environment and will not look out of place due to the occurrence of relatively similar land uses in the surrounding	2	3	2	2	Negative Medium (-9)	The architectural and landscape architectural guidelines for the proposed development will be developed to allow for a positive aesthetic influence on the surrounding environment. The	2	3	1	1	Negative Medium (-7)

area (to the west, south-west and north). The proposed development will enhance the visual appearance of the site which is currently being utilized for sand mining activities.						guidelines will include aspects of finishes, lights pollution, colours to blend into the surrounding colours, heights of buildings, and roof finishes. Aesthetics and contextual appropriateness is to be a major aspect of these guidelines.					
CUMULATIVE											
The development of the site would contribute to the cumulative effects of the gradual transformation of the area from an area with rural / part-natural landscape components to an area dominated by urban development. It should be noted that this cumulative visual change in the landscape is not necessarily negative as the area is located on the margins of a large urban area, however this may be perceived as detracting from the aesthetics of the area in which rural / part natural components of the landscape (including ridges and conserved areas are visible).						Refer to activity / phase specific mitigation measures above					

9.3.14 Traffic Impacts

Where E = Extent, D = Duration, I = Intensity and P = Probability of occurrence.

Potential Aspect and / or Impact	Before Mitigation				Significance Rating (before mitigation)	Mitigation and management measures	After Mitigation				Significance Rating (after mitigation)
	E	D	I	P			E	D	I	P	
CONSTRUCTION											
There is likely to be an increase in traffic from construction vehicles.	1	2	2	3	Negative Medium (-8)	<ul style="list-style-type: none"> Construction vehicles are to avoid main roads during peak traffic hours. All vehicles entering the Site are to be roadworthy. When using heavy or large vehicles / equipment, "spotters" are to be present to 	1	1	1	2	Negative Low (-5)

						assist the driver with his blind spots. • Any incident or damage to a vehicle must be reported immediately.					
The proposed development would have a significant impact on the current road network when developed to its full potential	2	3	2	3	High Negative (-10)	<ul style="list-style-type: none"> • Access to the site should be provided via the existing planned access points along P207-1 (future K54) as shown on the site layout plan • The developer(s) will have to provide the upgrades required for the existing P207-1 at the access intersection to ensure that sufficient capacity is available to accommodate the expected traffic to be generated 	2	3	2	2	Negative Medium (-9)
OPERATIONAL											
The proposed development would have a significant impact on the current road network when developed to its full potential.	2	3	2	3	High Negative (-10)	<ul style="list-style-type: none"> • Access to the site should be provided via the existing planned access points along P207-1 (future K54) as shown on the site layout plan • The developer(s) will have to provide the upgrades required for the existing P207-1 at the access intersection to ensure that sufficient capacity is available to accommodate the expected traffic to be generated. 	2	1	1	1	Negative Low (-5)
CUMULATIVE											
The proposed development together with other developments in the region would have a significant impact on the current road network.						<ul style="list-style-type: none"> • Traffic control measures at intersections along the main roads will have to be changed once more development occurs in the region. • Additional road upgradings may be required. 					

9.3.15 Socio-Economic Impacts

Where E = Extent, D = Duration, I = Intensity and P = Probability of occurrence.

Potential Aspect and / or Impact	Before Mitigation				Significance Rating (before mitigation)	Mitigation and management measures	After Mitigation				Significance Rating (after mitigation)
	E	D	I	P			E	D	I	P	
CONSTRUCTION											
Employment											
The development will result in job creation and provision of employment.	1	3	3	3	Positive High (+10)	<ul style="list-style-type: none"> All labour (skilled and unskilled) and contractors should be sourced locally where possible. A labour and recruitment policy must be developed, displayed and implemented by the contractor. Recruitment at the construction site will not be allowed. Where possible, labour intensive practices (as opposed to mechanised) should be practiced. The principles of equality, BEE, gender equality and non-discrimination will be implemented. 	2	4	4	4	Positive Very High (+14)
Population Change											
Job creation during the construction phase could result in the influx of people to the area.	2	2	2	2	Negative Medium (-8)	<ul style="list-style-type: none"> If possible all labour should be sourced locally. Contractors and their families may not stay on site. No informal settlements will be allowed 	2	1	1	1	Negative Low (-5)
Security and Social Life											
Contractors, the influx of people and potential job creation will result in the proliferation of social ills and issues such as crime, prostitution, the spread of HIV/AIDS, informal settlements etc.	2	4	3	2	Negative High (-11)	<ul style="list-style-type: none"> The developers need to be actively involved in the prevention of social ills associated with contractors. If possible all labour should be sourced locally. Contractors and their families may not stay on site. No informal settlements will be allowed. 	2	3	2	2	Negative Medium (-9)

<ul style="list-style-type: none"> Service contractors could have access to other developments or projects in the area thereby creating long term employment. 													
PROVISION OF MIXED USE DEVELOPMENT													
<ul style="list-style-type: none"> Provision of a mixed use development within the urban edge Provision of different housing options Provision of community facilities 	2	3	3	4	Positive Very High (+12)								
ENERGY													
Energy consumption.	2	3	3	3	Negative High (-11)	<ul style="list-style-type: none"> It is recommended that renewable energy options and/or alternative energy sources be used. Sustainable design principles must be implemented. 	2	2	2	2			Negative Medium (-8)
AVAILABILITY OF CIVIL SERVICES													
The availability of bulk water and sewer had been confirmed.	2	3	2	3	Positive High (+10)								
SAFETY AND SECURITY													
Safety and security	1	3	1	2	Negative Medium (-7)	The proposed development could have an impact on safety and security of surrounding landowners	1	3	1	2			Negative Medium (-7)
HEALTH RISKS ASSOCIATED WITH LIVING ON LAND PREVIOUSLY USED FOR MINING													
Residential developments on land previously used for mining can pose health risks: <ul style="list-style-type: none"> Soil and water contamination Stability of structures 	1	3	1	2	Negative Medium (-7)	The site will be rehabilitated according to engineering specifications to ensure stability of structures. Sand mining operations do not result in water and soil pollution	1	3	1	1			Negative Low (-6)
LOSS OF AGRICULTURAL LAND													
The proposed development will result in loss of agricultural land	1	3	1	2	Negative medium (-7)	<ul style="list-style-type: none"> Only small portions of the property are used for agricultural purposes The study area is not situated within any Agricultural Hub or any area with high agricultural potential according to the Gauteng Agricultural Potential Atlas (GAPA) Version 4. 	1	3	1	2			Negative medium (-7)

<p>property, grazing and wildlife by fires being started</p> <ul style="list-style-type: none"> Noise pollution from vehicles, noise associated with human habitation as well as domestic animals, dogs etc. 											
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9.4 Comparative Assessment of Alternatives

Table 22 provides a comparative assessment of the two site layout options i.e. Layout Alternative 1 and Layout Alternative 2. A description of these alternatives is provided in Section 7.2.

For many of the specialist fields, the potential impacts for the different project phases (construction and operations) for the two site layout options are relatively the same and have been combined to prevent repetition.

The comparative assessment below takes into account the impact assessment provided in Section 9.3.

TABLE 22: COMPARATIVE ASSESSMENT OF THE TWO SITE LAYOUT OPTIONS AFTER MITIGATION

	Preferred Alternative (Alternative 2)	Alternative 1
Geology	-6	-6
Construction	Developing either site will result in disturbance to surface geology for development foundations and the potential of gully erosion and dongas exists for both alternatives. The geological impacts before mitigation for both sites are of a medium significance and the post mitigation significance is low .	
Topography	-6	-6
Construction	Developing either site will result in disturbance to topography which is similar for both alternatives. The potential impacts before mitigation for both sites are of a medium significance and the post mitigation significance is low .	
Hydrogeology	-6	-6
Construction	Groundwater contamination through the spillage of fuels, lubricants, lack of provision of ablutions and other aspects such as construction equipment, vehicles and workshop and wash bay areas – for both site options exist and the mitigation measures listed in the EMP, needs to be complied with to reduce this impact from a medium to a low rating.	
Hydrogeology	-5	-5
Operations	Leaks of untreated water from pipelines may occur and impact on the shallow groundwater quality. Fixing of the leaks should be executed immediately and affected areas need to be rehabilitated. The significance of this impact before mitigation is low and after mitigation is also low .	
Hydrology	-5	-5
Construction	The spillage of fuels, lubricants and other chemical, cement batching activities maybe lead to contaminated runoff entering surface water bodies. For both options the mitigation measures listed in the EMP, need to be complied with to reduce this impact from a medium significance to low .	
	-5	-5
	Increased urban run-off could result in erosion. The potential impacts before mitigation for both sites are of a medium significance and the post mitigation significance is low .	
Hydrology	-6	-6
Operations	Run-off from urban infrastructure is likely to constitute low significance impact pre-mitigation. It is imperative that there is adequate stormwater management around the site.	
	-5	-5
	Leaks of untreated water from pipelines may occur and impact on the surface water resources. Fixing of the leaks should be executed immediately and affected areas need to be rehabilitated. The significance of these impacts is medium before and low after mitigation.	
Soils	-7	-7
Construction	Soil disturbance, erosion and degradation are potential impacts which must be mitigated against as outlined in the EMP. The average significance of the impacts post-mitigation for both alternatives is medium .	
Vegetation	-7	-11
Construction	There will be a loss of Thornveld vegetation for both alternatives however the loss of Thornveld vegetation on Alternative 1 will have a significance rating of high after mitigation since the 50m buffer zone of the ridge will not be excluded from development. The significance rating after mitigation for Alternative 2 will be medium since the 50m buffer zone will be excluded from development.	
Vegetation	-7	-11
Operations	There will be a loss of Thornveld vegetation for both alternatives however the loss of Thornveld vegetation on Alternative 1 will have a significance rating of high after mitigation since the 50m buffer zone of the	

	ridge will not be excluded from development. The significance rating after mitigation for Alternative 2 will be medium since the 50m buffer zone will be excluded from development.	
Impact on ridges Construction	-8	-11
	The impact on the ridges on Alternative 1 will have a significance rating of high after mitigation since the 50m buffer zone of the ridges will not be excluded from development. The significance rating after mitigation for Alternative 2 will be medium since the 50m buffer zones will be excluded from development.	
Impact on ridges Operations / Cumulative	-8	-11
	The impact on the ridges due to edge effects on Alternative 1 will have a significance rating of high after mitigation since the 50m buffer zone of the ridges will not be excluded from development. The significance rating after mitigation for Alternative 2 will be medium since the 50m buffer zones will be excluded from development.	
Wetlands Construction	-7	-7
	Erosion and sedimentation of wetland soils as a result of uncontrolled stormwater run-off generated from the construction sites. The post mitigation significance impact is medium .	
Wetlands Operations	-7	-7
	Increased run-off into remaining wetland units within the catchment due to hardened surfaces. The post mitigation significance is medium .	
Wetlands Cumulative	-7	-7
	Impacts on the wetland from the overall development could result in an important cumulative impact on the wetland habitat.	
Waste Construction	-6	-6
	During construction, impacts such as contamination of the surface and site with general and hazardous waste are applicable to both alternatives. The same is for sewerage. The mitigation measures included in the EMPr must be complied with to achieve the post-mitigation significance rating of low and medium .	
Waste Operations	-8	-8
	The quantities of general waste and sewerage created during operations are the same for both alternatives. The post-mitigation significance rating is medium .	
Air Quality Construction	-6	-6
	Dust and emissions during construction generated by debris handling and debris piles, truck transport, bulldozing and general construction will exist regardless of the site alternatives. The post-mitigation significance rating is medium .	
Odour Construction	-5	-5
	There is the potential of the release of odours as a result of the chemical toilets on site regardless of the locations of the site. The post-mitigation significance rating is low .	
Noise Construction	-8	-8
	During the construction phase there is likely to be an increase in noise pollution from construction vehicles and construction staff. The post-mitigation significance rating is medium	
Heritage Construction	-8	-8
	Disturbance of graves and sites of archaeological, historical and cultural significance could take place during construction. The mitigation measures included in the EMPr must be complied with to achieve the post-mitigation significance rating of medium .	
Heritage Operations	-8	-8
	Disturbance of graves and sites of archaeological, historical and cultural significance could take place during the operational phase of the development. The mitigation measures included in the EMPr must be complied with to achieve the post-mitigation significance rating of medium .	
Visual Construction	-5	-5
	Site clearing and removal of vegetation could partially alter the landscape as viewed from the surrounds of the site, with the emergence of exposed areas of bare soil. The post-mitigation significance rating is low .	
Visual Operations	-7	-7
	The proposed development will enhance the visual appearance of the site which is currently being utilized for sand mining activities.	
Traffic Construction	-5	-5
	During the construction phase there is likely to be an increase in traffic from construction vehicles. Construction vehicles are to avoid main roads during peak traffic hours and mitigation measures outlined in the EMPr are to be implemented. The post mitigation significance is low .	
Traffic Operations	-9	-9
	The proposed development would have a significant impact on the current road network when developed to its full potential. The mitigation measures included in the EMPr must be complied with to achieve the	

	post-mitigation significance rating of medium .	
Traffic Cumulative	-9	-9
	The proposed development together with other developments in the region would have a significant impact on the current road network.	
Socio-economic Construction	+10	+10
	The development will result in a significant number of construction phase jobs for the local people. The significance rating is high .	
	-6	-6
	Construction staff and public safety during construction. The post mitigation significance is low .	
Socio-economic Operations	+12	+12
	The development will result in permanent employment opportunities. The significance rating is very high .	
	+12	+12
	Provision of a mixed use development within the urban edge. The significance rating is very high .	
	-8	-8
	It is recommended that renewable energy options and/or alternative energy sources be used. Sustainable design principles must be implemented. The significance rating is high .	
	+10	+10
	The availability of bulk water and sewer had been confirmed. The significance rating is high	
	-7	-7
	The proposed development could have an impact on safety and security of surrounding landowners. The significance rating is medium .	
	-6	-6
-	Health risks associated with living on land previously used for mining is Low	
	-7	-7
	The proposed development will result in loss of small portions of agricultural land. The impact significance for loss of agricultural land is medium .	
Impacts on Premier Game Park Construction	-7	-7
	The significance rating for impacts on Premier Game Park after mitigation is medium .	
Impacts on Premier Game Park Operations	-7	-7
	The significance rating for impacts on Premier Game Park after mitigation is medium .	
TOTAL	-234	-248
	+44	+44

10. ENVIRONMENTAL IMPACT STATEMENT

This draft EIAR provides an assessment of both the benefits and potential negative impacts anticipated as a result of the project. It further provides a description of the affected environment and alternatives proposed for the Leeuwfontein X 24 development.

Based on the comparative assessment of the two layout options and the impact identification and assessment, it is evident that there is a difference in the impacts for the preferred and alternative layouts (-234 for the preferred layout (Alternative 2) compared to -248 for the alternative layout (Alternative 1)).

The majority of the impacts, which have contributed to the greater impact rating score for the alternative layout (Alternative 1), pertain to the fact that the proposed layout (Alternative 2) makes provision for a 50m buffer zone along both Class 2 ridges to be excluded from development. The only exception is a small section in the south-eastern section of the development where the 50m buffer zone is encroached by a planned future access road (according to the City of Tshwane Traffic Master Plan (2015)) and two adjacent erven (to the north of the road).

The results of the impact assessment indicate that the most significant impacts as a result of the proposed project would include impacts on topography, existing man made dams and quarries, surface and ground water, Class 2 ridges, aquatic ecology (wetland adjacent to property), socio-economic, cultural heritage and graves, noise, waste, impacts on Premier Game Park, health risks associated with residential development on land previously used for mining, increase in traffic, civil services and infrastructure, and safety and security of surrounding land owners.

Should the proposed mitigation measures be implemented correctly, the Leeuwfontein X 24 development will provide a sustainable development and improved quality of household life. The findings conclude that there are no significant environmental fatal flaws that could prevent the proposed Leeuwfontein X 24 development if the recommended mitigation and management measures contained in the preceding chapter and EMPr (*Appendix F*) are implemented. From the outcomes of this assessment it is the view of the EAP that this project will have a positive social and economic contribution.

Prior to the construction of the proposed development an application will be made to the Department of Mineral Resources (DMR) for the closure of the existing Aust Sandwerke mine, which will include the decommissioning and rehabilitation of the mine.

It has been acknowledged that there will be impacts on the potential biophysical environment; however with the implementation of the mitigation measures outlined in this report and the EMPr as well as through adequate environmental monitoring and enforcement those impacts can be successfully mitigated. This will in turn enable the development proposal to take place in an appropriate manner.

Thus, from all the findings of this report, it is recommended that the development be authorised. It is further recommended that due to the greater significance ratings for the alternative layout (Alternative 1) that the preferred layout (**Alternative 2**) be authorised.

Conditions and Final Recommendations

In order to achieve appropriate environmental management standards and ensure that the findings of the environmental studies are implemented through practical measures, the recommendations from this EIA study are included within an EMPr (*Appendix F*).

The EMPr must be used to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for the life cycle phases of the project is considered to be vital in achieving the appropriate environmental management standards as detailed for this project.

In addition, the following key conditions should be included as part of the authorisation:

- The proponent must appoint a suitably experienced (independent) Environmental Control Officer (ECO) for the construction phase of the development that will have the responsibility to ensure that the mitigation / rehabilitation measures and recommendations are implemented and to ensure compliance with the provisions of the EMPr.
- The Stormwater Management Plan must be complied with.
- The Class 2 Ridges and 50m buffer zones must be protected at all times, during both construction and operation.
- The submission of a Cultural Management Plan to ensure the preservation and protection of identified cultural sites and graves.
- The submission of a Rehabilitation Plan for the mining activities (quarries and man-made dams).
- The closure and decommissioning of the existing mine.
- Environmental authorisation must be obtained for the decommissioning of the mining activities.

